Legislative History for Connecticut Act

Act Number:	PA 04–246	
Bill Number:	5418	
Senate Pages:	3409, 3430-3432	**4**
House Pages:	4354-4416	**63**
Committee:	Energy & Technology: 489-494, 502-517, 524-526, 529-717, 732-816	**299**

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Transcripts from the Joint Standing Committee Public Hearing(s) and/or Senate and House of Representatives Proceedings

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sometimes she probably is ready to kill me. I have appreciated the work she's done for me.

So if the Chamber would please stand and give her their standard, better than. Thank you. (APPLAUSE)

THE CHAIR:

Thank you, Senator. Senator Looney.

SEN. LOONEY:

Thank you very much, Madam President. Madam President, would ask the Clerk to call the First Consent Calendar.

THE CHAIR:

Mr. Clerk, would you announce a roll call vote on the Consent Calendar.

THE CLERK:

The Senate is now voting by roll call on the Consent Calendar. Will all Senators please return to the Chamber.

The Senate is now voting by roll call on the Consent Calendar. Will all Senators please return to the Chamber.

Madam President, the First Consent Calendar begins on Calendar Page 5, Calendar 522, H.B. 5606.

Calendar Page 7, Calendar 555, Substitute for H.B. 5418.

Calendar 557, Substitute for H.B. 5628.

Calendar Page 8, Calendar 561, H.B. 5417.

Calendar 562, Substitute for H.B. 5584.

Calendar 563, Substitute for H.B. 5420.

Calendar 564, Substitute for H.B. 5571.

Calendar Page 9, Calendar 565, H.B. 5245.

Calendar 567, Substitute for H.B. 5025.

Calendar 569, Substitute for H.B. 5522.

Calendar Page 10, Calendar 570, H.B. 5163.

Madam President, there's also one addition matter placed on the Consent Calendar. Calendar Page 9, Calendar 566, Substitute for H.B. 5064.

Madam President, that completes those items placed on the First Consent Calendar.

THE CHAIR:

Thank you, Sir. Would you once again announce that we are in the process of a roll call vote. The machine will be opened.

THE CLERK:

The Senate is voting by roll call on the Consent Calendar. Will all Senators please return to the Chamber.

The Senate is voting by Consent Calendar. Will all Senators please return to the Chamber.

THE CHAIR:

Have all members voted? If all members have voted,

please check the machine to make sure your vote is properly recorded. If all members have voted, the machine will be locked. The Clerk please announce the tally.

THE CLERK:

Motion is on adoption of Consent Calendar No. 1.

Total number voting 36; necessary for adoption, 19. Those voting "yea", 36; those voting "nay", 0. Those absent and not voting, 0.

THE CHAIR:

The Consent Calendar is adopted.

Senator Looney.

SEN. LOONEY:

Yes, thank you, Madam President. I believe that most of the items on the Consent Calendar were in concurrence but if there are any that require additional action by the House of Representatives, would move for immediate transmittal of those items to the House.

THE CHAIR:

Without objection, so ordered, Sir.

Mr. Clerk, I believe we have an Order of the Day.

THE CLERK:

Calling from Senate Calendar for Wednesday, May 5, 2004, Favorable Reports, Matter Previously Marked Order of the Day, Calendar Page 5, Calendar 516, File 579 and

H-922

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SPEAKER LYONS:

Thank you Madam Speaker. Madam Speaker it's my privilege to announce a very very important birthday today, it is Madam Moira Lyons, Speaker Lyons birthday today. So happy birthday Madam Speaker.

APPLAUSE.

UNIDENTIFIED SPEAKER:

I think we can do better than that. I think we should sing to her.

REPRESENTATIVES:

Happy birthday to you, happy birthday to you, Happy birthday dear Moira, happy birthday to you.

APPLAUSE.

SPEAKER LYONS:

Will the Clerk please call Calendar 108.

CLERK:

On page twenty, Calendar 108, substitute for H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA. Favorable report of the Committee on Public Health.

SPEAKER LYONS:

Representative Terry Backer you have the floor sir.

REP. BACKER: (121st)

Thank you Madam Speaker. I move acceptance of the Joint Committees favorable report and passage of the

bill.

SPEAKER LYONS:

The question before the Chamber is on acceptance and passage, will you remark?

REP. BACKER: (121st)

Yes Madam Speaker the Clerk has LCO 4943, will he please call and may I be allowed to summarize?

SPEAKER LYONS:

The Clerk has in his possession LCO 4943, designated House "A" will the Clerk please call, the gentleman has asked leave to summarize.

CLERK:

LCO 4943 House "A" offered by Representative Backer, Senator Peters, and Representative DelGobbo, et al.

SPEAKER LYONS:

Representative Backer you have the floor.

REP. BACKER: (121st)

Thank you Madam Speaker. This amendment is a strike all amendment. This strikes the file copy an it produces the work product of many people in this room over the last several weeks. In terms of transmission siting we set a new standard, a new national standard. A very high bar for any utility or any construction transmission company to jump over.

We didn't do it with any degree of being cavalier. We looked at the evidence that came to us from various committees and various work groups and we started to measure something in the past has not been too easily established. We decided to look at the impact on the public health of electromagnetic fields and other issues around transmission.

What we found was no conclusive evidence one way or the other. If you could produce 100 experts on one side and if you produce 100 on the other side you get another answer. But what the Committee did and what the working grouping groups did was to take a look at this and decided to err on the side of caution for the people of the State of Connecticut and its children.

The bill contemplates recovery of costs for burial, which is fully adequate. We set the standard of burial that we hadn't done before. Basically the bill says coming out that the line will be buried particularly in regards to schools, playgrounds, licensed day cares and other facilities where there are children or groups for a large period of time.

It goes on the presumption that the line will be buried and sets several caveats, which include invisibility for burying it and various reliable costs. At this time Madam Speaker I would like to yield to

Representative DelGobbo who without his clear thought and his even hand ways we probably would not have gotten here.

SPEAKER LYONS:

Thank you sir, just before that just for clarification did you move adoption of the amendment?

REP. BACKER: (121st)

If I did not Madam Speaker I move adoption.

SPEAKER LYONS:

Thank you sir. Representative DelGobbo will you accept the yield?

REP. DELGOBBO: (70th)

Thank you Madam Speaker, I will.

SPEAKER LYONS:

Please proceed.

REP. DELGOBBO: (70th)

Thank you Madam Speaker. And I appreciate the comments of the Chair and he would also agree the issues contained in this bill have been ones that have been expressed by a great many members of this House on both sides of the aisle. Concerns on to appropriately how to appropriately address this issue.

Let's begin with the premise - and I hope it's understood by all the members of the House -- that as we began this issue we understood one critical fact and

that is that energy reliability is not - as in the words of the Chairman of the Department of Public Utility Control - it's not just a sort of important issue. It's not just something that we should do. It is an absolutely critical issue not just to energy but to the health, safety and welfare of the people of this State.

How we proceed in moving forward in what we've all heard of as this transmission fix. This transmission fix, which has been an issue of concern for many members in this Chamber for quite some time. How we do this in a manner that deals with the concerns of many members on health and safety in terms of where these lines are. But at the same time allows us to move forward.

Allows us to move forward in a reasonable way in insuring that these lines are constructed. Madam Speaker let's remember that today, today with the absence of these sections of -- significant sections of -- transmission line upgrades not having taken place today that Connecticut consumers are bearing a substantial cost somewhere in the order of $100 to $150 million a year at least is being borne by Connecticut consumers until we fix these lines.

It would be very nice for all of us to go back to our constituents and say that yes we were able to move forward and get these lines constructed in a safe and

reasonable way for all of our constituents. And guess what, as a result of that your electric bills will also be reduced because we're no longer bearing those congestion costs. And there are, there is a very real concern Madam Speaker that if we do not complete this process in a very short time - meaning in the next approximate two years - if we cannot move forward and complete this process that Connecticut consumers would have to bear the entire cost of these transmission upgrades.

Right now all the millions and millions of dollars that would be spent on the needed upgrades will be borne by all of the ratepayers throughout New England. Sort of like our state highway our interstate highway system. Those are something that is for the public good throughout the United States and throughout New England.

And if we get this completed on time that that will in fact take place. Madam Speaker, I wanted to - if I could - ask a few questions for the purposes of legislative intent. So through you to the proponent of the amendment if I could pose a question.

SPEAKER LYONS:

Please frame your question sir.

REP. DELGOBBO: (70th)

Madam Speaker, actually this amendment was brought

up so quickly that I hadn't been able to prepare certain things. Through you Madam Speaker could you identify the lines of the bill that relate to the balance of technologically feasible and reliability? Through you Madam Speaker.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Thank you Madam Speaker. If you'd look between lines 512 and 522 I believe Representative DelGobbo will find the language he looks for.

SPEAKER LYONS:

Representative DelGobbo.

REP. DELGOBBO: (70th)

Thank you Madam Speaker. I knew there was an issue there that I wanted to address. In that case maybe it's line 75. Thank you Madam Speaker. In line 522 there's a sentence regarding in determining such end feasibility the council shall consider the effect of burying the facility on the reliability of the electric transmission of the State.

Through you Madam Speaker. Is it your understanding and we use sort of terms of ours that by definition reliability is a broad issue of the technological capacity to have these lines be there and in fact have

the kind of service life so that you don't need to in there every other day to repair them? In fact it is a function of what would be known sort of practical and operability. Is it for purposes of legislative intent does, would that be your understanding of the term reliability?

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker to Representative DelGobbo. When we speak of reliability in the bill we obviously are speaking to a system that would function. That it would function in accordance with the standards of ISO and what is technically feasible. So I think the simple answer to that question is yes. Reliability and operability are very much one in the same. You can't have something that is operable if it's not reliable.

And it's not operable the inverse is true. So I think the simple question is operability and reliability for the sake of this are married together.

SPEAKER LYONS:

Representative DelGobbo.

REP. DELGOBBO: (70th)

Thank you Madam Speaker. And I thank the gentleman for his answer. You are in fact referring my mind to

some of the - we go through so many arcane elements of this issue that in fact the term about reliability to my understanding refers to the independent system operators operability of the electric transmission system. That's sort of a common standard. Is that your understanding? Through you Madam Speaker.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker to Representative DelGobbo, the answer is yes that is exactly what I mean.

SPEAKER LYONS:

Representative DelGobbo.

REP. DELGOBBO: (70th)

Thank you Madam Speaker. And in section 11 of the bill somewhere beginning line 622 through 633 there is a set of, there's some language that relates to how the costs of this issue that are going to be recovered. As we all know as this line is going to be constructed like any other facility for a utility that that is an understood cost that is recoverable through rates.

It's my understanding that because of the nature of this transmission fix that very likely the applicants will submit the costs of this project to another entity and that that entity then arranges for the recovery of

costs to the applicants. However, because as a result of this legislation we may be forcing the applicants to engineer or install certain technology that goes beyond what would have normally been the standard anywhere else in the country.

In other words we might require them to bury the lines in certain areas that might not otherwise have been buried anywhere else. We might tell them to use certain types of technology that might not have otherwise been utilized.

But we've talked about that as known as gold plating. That we may not be able to recover all of that extra cost on a regional basis and that in fact Connecticut consumers would have to make up that difference. And that perhaps is a fair cost for us to bear for the improved safety and public health. However there then becomes the issue of the applicant going to the DPUC who normally wouldn't pay for things that are known as extras. So we have this language in here and I'll give credit also to Representative Nardello who wanted to make sure that it was very carefully worded so it didn't go farther than we wanted to.

But is it your understanding that for purposes of this section that the reasonable costs that are being discussed and that the prudent cost incurred what that

is referring to costs that are being discussed and that the prudent costs incurred what that is referring to is that if there are - because we are requiring lines to be buried that might not have otherwise been or added technologies a cost to be submitted - that those incremental costs that in fact we're deeming those to be appropriate to be reimbursed.

What the language here only speaks to is limiting saying well DPUC you can't recover costs if you are expending $100 million for that additional element rather than what would have been a reasonable $50 million. Through you Madam Speaker.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Thank you Madam Speaker. Through you, I think the answer to the rather complicated question the Representative well knows that there are any number of agencies that could affect the outcome of cost here. If this amendment should pass we will set one of the highest bars in the country for electromagnetic fields and standards for construction of transmission lines.

It still has to go to the Siting Council and that's the first stop where costs could vary and change. We cannot in this body engineer and dictate the engineering

of a transmission line. It's incredibly complicated and difficult. But we have set a very high bar. The next stop would be for FERC. And at FERC, certain recoverable costs would be set for the building of the transmission line. However, FERC may not approve of some of those costs created in the Siting Council.

This bill has considered the fact that some of those normally recoverable costs within the standard construction practice would be recognized but some of the extraordinary gold plating that we have required here in this legislature may not be recoverable at the federal level. This language attempts to be certain that those costs - legitimate costs that were created in this Chamber and in the Senate of this Legislature - will be recoverable at DPUC.

So the answer to that is yes it does contemplate that if certain costs that we've created here in the legislature are not recoverable from the Federal Energy Commission we will make them recoverable through DPUC. Through you Madam Speaker.

REP. DELGOBBO: (70th)

Through you Madam Speaker.

SPEAKER LYONS:

Please proceed sir.

REP. DELGOBBO: (70th)

Thank you Madam Speaker. And I appreciate the gentleman's answer. By way of conclusion on my part for this portion of the discussion I just wanted to mention - obviously many many people worked very diligently to make this happen. There are many legislators here who represent constituents who are very legitimately concerned. I want it to be understood, however, that first and foremost I couldn't let the debate go by without reinforcing an understanding that we have a Siting Council process in this State.

Which I think is there very appropriately and that they do as we've seen more recently they do an extraordinary job. Yeomen's work in fact with the responsibility that we put on them. And in fact it would be beyond comprehension if we tried to deal - in the legislature - some of the issues that the Siting Council has to grapple with.

Although I'm here and I'm obviously a co-sponsor of this bill and was participating in trying to negotiate something reasonable I am concerned and hopeful that this doesn't go too far. As we try and balance the legitimate public health and safety needs. That we need to insure that we're able to move forward and set parameters for the Siting Council that allows them to use their expertise and their judgment of all the

information that they take in and balancing all the public needs here. I want to support and reinforce their efforts to be able to do that in a way that serves all the citizens of this State. Madam Speaker, with those concerns expressed and with those understandings and the colloquy with the chairman I rise in support of this legislation. Thank you Madam Speaker.

SPEAKER LYONS:

Thank you sir. Representative Backer you still have the floor.

REP. BACKER: (121st)

Thank you Madam Speaker. Before we move on I would like people to understand that this amendment would become law hopefully, does not speak solely to costs that would be created through here. In the future other lines will be built in Connecticut. Other 345's will be built in other parts of the State, in eastern Connecticut and other places. Particularly as some communities start to grow and as we try to tie the grid together. So the legislation created here today will provide those protections to other people around the State by setting a new standard.

All of us are tied together and we all will inherit the cost whether the congestion zone is in West Hartford or eastern Connecticut or if the power needs to be

brought in from Massachusetts or Rhode Island. So these standards set up will certainly help and where new places, where new lines are built and it will set a new standard across the State.

I wanted to be certain that people understand that this was not the last transmission line that will be built in Connecticut. And anyone who thinks it is, is fooling themselves. As other parts of the State grow lines will be built. I think we've now taken this standard from Middletown to Norwalk and now we'll apply it across the State.

So I think that is in part should be some comfort to people if they should find one of the 345's going through their town in some other part of the state in the not too distant future. Thank you Madam Speaker.

SPEAKER LYONS:

Thank you sir. Will you remark? Will you remark further on the legislation before us? Representative Kalinowski.

REP. KALINOWSKI: (100th)

Thank you Madam Speaker. I rise in support of this bill and I'd like to acknowledge the working group that was in a flurry of activity these past many days. Especially Representatives Backer and DelGobbo to get the language that we have in this product before us.

This bill is indeed a public health and safety measure; there's no question about that. The salient features in the bill refer to residential areas, private and public schools, licensed day care facilities, licensed youth camps and public playgrounds. Now aside from the visual pollution that any overhead line creates in any community and aside from any reduction in property values that result because of overhead lines and the concomitant lessening for town coffers. What we have here is the concern of possibly hazardous health risks due to EMF and the relationship to childhood leukemia.

I realize there is medical and scientific research arguments on both sides. But it is a public and health safety issue that we cannot ignore. The committees that this passed through were Energy and Technology, the Environment Committee and Public Health. There were only two dissenting votes, there were only two no votes during those three committee hearings.

And what gave rise in the Energy and Technology initial hearings were the people who appeared and gave some compelling emotional and heartfelt testimony and sometimes indeed frightening testimony about the health of their children because of EMF.

So residential barriers were included in the bill and rightfully so. If I could explain to you in my

district - which encompasses parts of Middletown, the towns of Durham and Middlefield where this particular proposal this upgrade goes through - many many homes over 100 homes border that right of way. Some homes are as close as 12 feet to that right of way. Some bedrooms are even closer than that. And this is of the concern of the parents of the children who live in those areas.

Homes in that area normally sell in years past in three or four days. Because of this proposal homes have been on the market now for six and seven months and there's no end in sight to the consternation of the people who live in this area. As legislators we have a duty to provide for the health, safety and welfare of the citizens of Connecticut. This bill is not perfect.

But it does afford the opportunity for us to act in the best interests of the people. And not some economic advantage that disregards that interest. Many of you may have heard the expression 'the path of progress.' The path of progress referring to the right of way, the line that's been going to go - Phase II - from Middletown to Norwalk. Well let's make that path of progress a true path of progress, in this bill go a long way in making that transmission line underground. I ask all my colleagues for your support. Thank you very much.

SPEAKER LYONS:

Thank you very much sir. Will you remark further? Representative Mary Fritz.

REP. FRITZ: (90th)

Thank you Madam Speaker. I also rise in support of this amendment, which will become the bill. I also thank the people who came together in these last few days as perhaps the mini working group who put the final product together that is before us. But also you should know that as early as last December Representative Amann and myself put together another working group.

And what we did, it was bi-partisan, and it was both Senators and Representatives from all of the communities that are affected in Phase II. We met several times and what we tried to do is to come to a consensus of what eventually we really needed to see happen. When 5418 came out in its original form in the Energy and Technology Committee and all supported it but we still felt we needed something different.

Many of us worked collectively as well to go to the Siting Council hearings throughout the towns in Phase II. We listened to the arguments from people - not only from our own towns and our own communities - but from those in other communities. And it was such a similarity it was a sameness about everything. The concerns were universal. We knew that in the end whatever product we

came out with we had to address those universal concerns. For myself my district in Wallingford has the longest stretch of the proposed transmission lines. I have 11 miles. I have neighborhoods, residential areas severely impacted. I believe that this product before us, this amendment before us will help those neighborhoods. I also believe that this bill is truly something that reflects the art of compromise.

Because at the same time what some legislators gave up and is reflected in this bill is something that the utility companies were really adversely against. So together, I believe, we have worked out a compromise that will help the people and yet not severely punish anybody who works or has a business in this State.

So I ask my colleagues and I urge passage of this amendment.

SPEAKER LYONS:

Thank you very much. Will you remark further? Representative Miller.

REP. MILLER: (122nd)

Thank you Madam Speaker. I rise in support of this amendment. I want to thank the committee who worked on it to get this thing through, a bi-partisan committee I would point out. They took into account all those people who came to the public hearings and testified and we had

some I would say very outstanding people testify before the Energy and Technology Committee. It was some people with outstanding degrees and they were very impressive. I can't help but sometimes thing that maybe the utilities could have done something 20 to 25 years ago. I think this is not something that came out of the woodwork at the last second. I think many utilities knew that they were going to have to do this and it may have been a lot easier to do in the past but here we are and here is what we've come up with as far as an amendment bill goes. So I urge support of the assembly. Thank you Madam Speaker.

SPEAKER LYONS:

Thank you very much Representative Farr.

REP. FARR: (19th)

Thank you Madam Speaker. Madam Speaker first a general comment on power lines. If there is anything that we can do as a society to improve the economy, to improve to give rate relief for consumers, and to make our electrical system more reliant it's the construction and improvement of our electrical grid. There is absolutely nothing that we can do that's better that.

People say well gee we don't want to have these high power electrical grids. But when you build them what they allow us to do is they allow us to have an

electrical supply system that's more efficient. What it means is that you're going to take power from the cheapest source and transport it and use that. Instead of having to use power from another more expensive source. What that means for example in Fairfield County is that instead of locally - a small local power generator that will decrease the air quality in Fairfield County you're going to transport electricity from other areas.

Where will that be? It will be at the area we can do it most cheapest and most efficient. It may be a nuclear power plant, it may be a wind generator but it will be the most efficient use of electricity. So there is nothing as a society that we can do that will improve our environment and reduce the emissions. You talk about global warming if you want to reduce global warming then build a better transmission system.

First of all when voting on this bill I want to be assured that in fact this bill does not make it impossible to do to build that necessary power grid. And I guess through you Madam Speaker to Representative Backer. My concern today is, does this bill make it more difficult to build the necessary power grid that we in the State of Connecticut?

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Thank you Madam Speaker. Through you to Representative Farr. The simple answer to that question I think is yes. It does make it somewhat more difficult.

SPEAKER LYONS:

Representative Farr.

REP. FARR: (19th)

Thank you Madam Speaker. And then the next question is when you say it makes it more difficult how much more difficult and how much more expensive?

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker to Representative Farr. The cost increase is probably indeterminate at this point because the Siting Council will take this up, already had this application and if this amendment passes will then change somewhat the standards that it's dealing with now. That said this legislation calls for undergrounding. However, it sets up some caveats on reliability and operability. And I can assure you that the whole line will not be buried right now. As originally constructed the 29 miles would have been largest, longest length of 345 buried in the world.

I think this amendment moves to create a situation where it can buried in the most sensitive spots, schools, playgrounds, things that are listed in the longer list I gave earlier. I can't tell you what the additional costs will be because only the Siting Council can determine how many miles of underground will. Through you Madam Speaker.

SPEAKER LYONS:

Representative Farr.

REP. FARR: (19th)

Yes, I'm sorry but I'm not sure I fully understood that answer. Does passage of this amendment and this bill now mean that the line will be underground for its entire length? Through you Madam Speaker to Representative Backer.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker to Representative Farr. Certainly this legislation presumes that the line will be buried. And if you take a look at ii, it sets up -- and I hate to use the term because I'm not a lawyer -- but it sets up a somewhat of a rebuttable situation. Where you assume it will be buried and you back to the various caveats of reliability, operability and the

technical feasibility of burying the line. And that of course will in the end mitigate those, mitigate the installation of being completely underground. That said I cannot answer Representative Farr's question on cost because only the Siting Council when they are done with their deliberations will determine how much goes underground.

REP. FARR: (19th)

Through you Madam Speaker to Representative Backer. My recollection is that the utility companies talked at one point about the extra costs of putting the line underground and they were talking hundreds of millions of dollars. Do you have the actual testimony as to how much they say it will cost to do this underground?

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Madam Speaker if Representative Farr would indulge me for a second I'll take a quick look at my notes and see if I can get a number for him, which I'm probably not going to be able to produce the number that he wants but maybe something close. Madam Speaker.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker to Representative Farr. I do have some notes on it. The exact configuration of how it will be buried by schools and playgrounds and densely populated areas is not something we can determine. Right now the best I can tell you is that five miles of underground would be approximately $6.7 million per mile and I don't have a figure for you, I think that's additional cost. And that's the best I can give you.

There is no doubt in my mind that this will add millions, if not a hundred million dollars in cost, I don't have those exact figures. There's no doubt in my mind that it will add those costs when spread out across the State I think you'll see something along the lines of a 1% or 2% increase. But as earlier I set a caveat to make sure people understood.

That this line passing through the towns from Middletown to Norwalk is not the last to be built. So in the future we will all be sharing in additional costs to create a reliable and operable grid in Connecticut. Through you Madam Speaker.

SPEAKER LYONS:

Representative Farr.

REP. FARR: (19th)

Yes, through you Representative Speaker to Representative Backer. When I look out the front door of

my house I look at power lines. I live in a town where most of the lines are above ground. These are the local distribution lines. Is there anything in this bill, which would now allow us to pass the cost of putting them underground because they go by all the schools, by my front bedroom, etcetera? Through you Madam Speaker to Representative Backer.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker. The answer is no.

REP. FARR: (19th)

Well let me just make the observation then, I've taken a little bit of time to take a look at the so called health risk from EMF levels and exposure. It is my understanding in reading the report that was supplied by the Office of Legislative Research that if you really wanted to reduce electronic, the EMF exposure there are a number of things you can do.

First thing of course would be to get rid of copy machines. The next thing you would do is get rid of electric shavers, another major source is pencil sharpeners, hair dryers and electric can openers. And if you really wanted to reduce exposure get rid of electric blankets. The fact of the matter is the closer you are

to the source the more exposure you have.

So when somebody says there's a danger because there's a high power line 100 feet away on its base from somebody's house, there's an increase in exposure but it depends on how far away the line is. The fact of the matter is we all live with great exposure to electric magnetic forces because they're all around us. We're all sitting here in front of a computer, there's a minimal amount of exposure from a computer but I'm sure there is some. You don't see us having our aids do it and we sit in the back of the room.

That's the tradeoff. And I guess we live in a society where there are tradeoffs. I'm very uncomfortable saying that I'm willing to spend what could be hundreds of millions of dollars to put lines underground in some areas. Recognizing that there are impacts and I'm willing to recognize that there are negative impacts from the visuals, recognize that people don't want them going through their back yards and there ought to be ways to compensate for that.

But I'm not comfortable and I'm not persuaded that it's necessary to put these lines underground for the length of these lines. And that the extra cost to the consumers is not worth it and I'm not sure I understand that. I was hopeful that we would get some kind of

legislation that balances the concern, the legitimate concerns that consumers have about property values and visuals and everything else with the need for providing high powered lines.

And if the end result is a bill that ultimately requires them all to be buried then I guess I'm going to vote against it. I may be the only one in the Chamber to do that but I'm going to vote against it. I live in a community where when they wanted to build I84 they just went through and took houses and we've got people who have highways in their backyard. And we didn't say we're going to put I84 underground because we couldn't afford to put I84 underground.

We have tradeoffs all the time and I'm not persuaded that putting this line underground is necessary or desirable. I do understand and I heard a little bit of the testimony of the utility companies that if you get into Fairfield County to get into more dense areas it isn't as extensive because the acquisition rights of way would be so high that putting them underground doesn't bump up the costs that much.

But their testimony was that if you're out in the other areas where the population wasn't as dense, where the property values weren't as expensive that requiring them to go underground caused a tremendous increase in

the cost of these lines. And I believe also probably there are concerns about reliability. So I guess at this point I guess I'm just not persuaded that I understand why were doing this bill in this fashion. Maybe, I'll continue to listen and hear the debate. Thank you.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker. I'd like to address some of those. I mean, certainly we are exposed to electromagnetic fields everywhere we go. However, we are rarely exposed to them from a single source without interruption for tremendous long periods of time. Electromagnetic fields emitted by appliances, lights and those things certainly are there and to some they are a matter of concern.

However the constant bombardment of electromagnetic fields from transmission towers that emit that carry such voltage would be much much higher than Representative Farr's analogy with various devices in the house. I think the bill steps forward and says the school is still out on this, we're not really sure. However, there seems to be compelling sides on the electromagnetic field argument. With that we made a step into erring on the side of caution.

Certainly certain miles of these lines will not be buried. It's conjecture on my part but if I think about it whether it's rambling through some fields or through areas where there are not schools, where there are not playgrounds, where there are not these types of public facilities where people are exposed for long periods of time. I can only imagine that the Siting Council in its process would not have that underground there.

However, the bill is very clear on what we do in areas where we have schools, playgrounds, licensed day care centers and so forth. So while understand Representative Farr's concerns I would say that the magnitude of these, and there's many many of them in the State already, but the magnitude of the emissions here have driven us to come to this process and I hope others will vote for it.

SPEAKER LYONS:

Thank you very much. Will you remark further? Representative Klarides.

REP. KLARIDES: (114th)

Thank you Madam Speaker. I too rise in support of this amendment. And would also like to thank everybody involved in the working group, people that are involved in this power line -- the line is actually going through their towns -- in addition to members and chairmen of

the various committees that have heard this bill and have worked very diligently in trying to come up with a compromise that clearly seems workable. I do have a couple questions for the proponent of the amendment through you?

SPEAKER LYONS:

Please frame your question.

REP. KLARIDES: (114th)

Thank you Madam Speaker. Through you on line 329 we talk about buffer zone in protecting the public health and safety. I would like to know what the standards of public health and safety we're using? Through you Madam Speaker.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Thank you Madam Speaker and through you. It is, as I said before, this amendment has moved in a way, in a cautionary way to protect various citizens. I think I made it clear from the onset and I think it's been repeated several times not only by me but by others. That the impact of electromagnetic fields is fiercely debated between experts from both sides.

Fiercely debate and yet there is no conclusion. And so in answer to the Representative's question I would

say that we have not established those public health and safety standards with the exception of trying to mitigate electromagnetic fields near those very sensitive laundry list that we gave before about schools and playgrounds and licensed day care center. Since we're unable to define that we will move it to the Siting Council to use best management practices for electromagnetic fields which may include obviously burying in the first place, phase swapping, re-routing or various mechanisms.

So the answer to your question is we don't have, we have not set the standard for public health and safety here. We will leave that to those who are better qualified than we are here today. Thank you. Through you Madam Speaker.

SPEAKER LYONS:

Representative Klarides.

REP. KLARIDES: (114th)

Thank you Madam Speaker. Through you in establishing the buffer zones on line 331 we look into certain considerations such as residential areas, private or public schools, licensed child day care facilities, licensed youth camps, public playgrounds, etcetera. In this particular situation is that the focus of the Siting Council's determination of public health

and safety? Through you.

SPEAKER LYONS:

Representative Backer.

REP. BACKER: (121st)

Through you Madam Speaker, I would say yes. Obviously buffer zones here are set at a minimum is the existing right of way as defined in the bill. So I think that establishes that. In terms of the areas we are looking at in terms of very sensitive areas it includes the laundry list that's in the bill, residential and so forth. Of course residential is something very difficult to determine, is it a five-acre zone, is it a quarter acre lot residential zone?

What is the extent of the exposure of EMFs and what potential harm they can cause? It's going to be left to the Siting Council to define that. For the most part, almost all of Connecticut could be deemed residential. A farmer's field is residential, a lot of places in our cities where there are commercial zones there are residents. So we've left up to the Siting Council to try to define residential based upon on hopefully what they can determine about electromagnetic fields. Through you Madam Speaker.

SPEAKER LYONS:

Representative Klarides.

REP. KLARIDES: (114th)

Thank you Madam Speaker. I thank the gentleman for his answers. In conclusion I would just like to say that as we took a lot of time working on this and coming to a compromise that everybody could work with our focus was children's areas. And as Representative Backer stated in those particular areas where there is a high concentration of children that's where we're taking the most time. That everybody isn't affected in a possible detrimental way, but there has been a direct link to childhood leukemia through EMF.

And that was the focus of this bill. And I think that it is a very conscientious part of the State of Connecticut to come to this conclusion, to come to this compromise and I thank everybody for the work that they've done and I urge support.

SPEAKER LYONS:

Thank you Madam, Representative Rich Roy.

REP. ROY: (119th)

Thank you Madam Speaker. I too rise in favor of the amendment. Madam Speaker much has been said about burying the lines in Fairfield County. They already are buried in Fairfield County. We are going after other areas where we feel that children are very susceptible to these power lines.

We're asking for additional areas underground. We've offered to have power companies follow routes already in the streets where they could dig up and run power cables along with other utilities and that would be far less expensive than what has been said. Thank you Madam Speaker.

SPEAKER LYONS:

Thank you sir, will you remark further? Representative Ferrari.

REP. FERRARI: (62nd)

Thank you Madam Speaker. Just so everybody knows I was the only one who voted against this bill in committee. And Representative Backer mentioned that there are many reports on EMF that say that it's a bad thing and there are others that say that the evidence is not conclusive. You can believe whichever report that closely agrees with your own position or opinion. I don't believe it's very good policy for the State of Connecticut to put things into law when we are not sure of the facts.

I'm also concerned about my constituency. If we are saying by legislation that there could be possible health implications with these power lines are they not just as important? Are the folks in southwest Connecticut more important than they are? Not as far as

I'm concerned. I'm also concerned about the cost that's going to be passed on to my constituents in the form of higher electricity costs. If siting of these power lines is not done in the most economically way possible they will surely pay more for power. And frankly, we have a lot of power lines up in my district and people live near them. And they're not being considered in this. If we're going to think of this as a health issue then why are not my constituents as important as everyone else's?

Additionally I heard at a public hearing that six children contracted a rare form of leukemia with the implication that it was because they lived close to power lines. What about the thousands or tens of thousands of people who live near power lines who live long and healthy lives who don't get sick? Do we just ignore that? Nobody wants to see anyone, especially children, get sick if it can be avoided. But to me it's a very thin line that can be used to stop the economically siting of these lines for the wrong reasons.

Finally, it's clear to me that the economic vitality of this State is closely related to our southwestern corner neighbors and their ability to have enough power for economic growth. And for these reasons I'll continue to oppose the bill. Thank you Madam

Speaker.

SPEAKER LYONS:

Thank you sir. Representative Gail Hamm.

REP. HAMM: (34th)

Thank you Madam Speaker. I rise in support of the amendment as well. I want to thank the working group. We certainly all had different points of view, it was a respectful discussion. And I think we all worked together to try to reach a consensus and balance the interests. The most important part of the bill for my constituents is the residential area. And a presumption that undergrounding would occur in residential, suburban, subdivision kinds of homes.

And the reason, and the most important reason, is EMF. It's true that the scientific literature is divided but it is also true that there is a large and growing body of evidence that has definitely linked to childhood leukemia to the high density levels, which 345K lines could very well offer.

The families who are living and facing the prospect of having those overhead right in their backyards are just quite frankly terrified. We haven't been able to assure them with any scientific anything that they don't need to be frightened. This is a balanced, it really is making an effort to say we're not sure but because we're

not sure and because we know that it's really about trying to value the kids that in those areas we're going to have a buffer zone and we're going to presume it goes underground. If you can prove to us that you can't do it from an engineering technology point of view or that it in somehow harms the grid, the reliance on electricity. Then that's a decision that the Siting Council can make. It's a balanced kind of bill and I urge its support. Thank you Madam Speaker.

SPEAKER LYONS:

Thank you very much. Representative Mary Mushinsky.

REP. MUSHINSKY: (85th)

Thank you Madam Speaker. I have a couple of questions for the proponent of the amendment.

SPEAKER LYONS:

Please frame your question.

REP. MUSHINSKY: (85th)

Thank you Madam Speaker. Through you in the discussion of buffers that might be necessary for undergrounding the lines was the discussion of distance mentioned, the spacing between the lines and the depth at which the lines ought to be buried to provide sufficient safety to the exposure to children. Through you Madam Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Thank you Mr. Speaker through you to Representative Mushinsky. I think precisely why this bill has created very solid direction for the laundry list of sensitive locations we have chosen and the way we've established our buffers here saying at least the existing width. Is precisely why Representative Mushinsky's question is difficult to answer.

One is, no one knows what a safe level is, that has not been determined. It has not been determined anywhere. I mean there are some certainly very strong guidelines, yet the body of evidence out there suggests that they are only guidelines that no one knows if they actually cause these illnesses or not. I think that in deliberation the committee decided that we would err on the side of caution. However, we cannot nor do we know how to engineer the various mitigation practices that might reduce EMF on sites.

In other words we don't know how deep to bury it, maybe the soil has something to do with that. We don't know how to change the face splitting in a certain area to reduce EMF. That has been left to the Siting Council with specific directions to use the best management practices for EMF. So the answer to Representative

Mushinsky's question is no, we have not contemplated nor have we dictated it. Thank you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Mushinsky.

REP. MUSHINSKY: (85th)

Through you Mr. Speaker on more question. Is it always true that the buried lines will follow current rights of way or might it be the case that it would pass underground in a new area that did not have a right of way marked?

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. I would offer no guarantee that it would follow existing right of ways. If a certain, again you get into the engineering of something I have no idea what kind of ledge, wetlands, other sensitive environmental habitats that might be underground that could be passed easily overhead but by undergrounding might cause significant environmental problems or obstructions to technology. So I wouldn't offer any guarantee that it would stay on the right of way paths as defined today.

But I think the technically feasible and infeasible language in the bill would speak to how that was done.

Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Mushinsky.

REP. MUSHINSKY: (85th)

Thank you Representative Backer. I did want to comment - and I am supporting the amendment - however, I have one reservation, it's a scientific reservation and I'm going to pay close attention to what the Siting Council does to this. My understanding from the technical experts that when you go from overhead and great distance to underground it can't be an out of sight out of mind situation. We made that mistake with hazardous waste. We used to put it underground and then we'd forget about it and it caused many problems for the communities. So when these lines change from overhead to underground it's important that they're buried deep enough, they have a protective casing to reduce exposure.

Because someone can walk right over the line once it's underground. And that we not forget they're their and put a playing field over them or some other facility where children might be playing. So that is my concern to not trade one problem for another problem. And since it's not specified in the bill how deep these lines should be or whether they are playing fields or other

child friendly facilities are precluded from being located over or near the buried line. It's not stated. I think the safe thing to do would be to bring it to the Siting Council. I will support the bill, the amendment which replaces the bill. And also bring this to the attention of the Siting Council. Thank you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Adinolfi.

REP. ADINOLFI: (103rd)

I rise in support of the amended bill. Over the last fifteen months there have been many meetings and public hearings and Siting Council meetings including Phase I and I've attended a good number of these things. And one thing you do when you go to these meetings is you learn, you learn something. What I did learn, I've heard some of the concerns here tonight, is that the cost will be spread out over the life cycle of the new lines - which I believe is something like 40 years. So it's not an immediate cost it will be spread out, it could be over 40 years, it could even come out cheaper.

We also learned at these meetings that if they do go underground and where they do go underground they probably and most likely will not go where the lines are now. They will find new routes. The most economical way to go underground is under streets, not under existing

terrain where they might have to go through wetlands and blast and so on. They're going to avoid that and they will go under existing streets which will make the undergrounding much easier and take care of the concerns of the people that are concerned about the environment and what it would do to the terrain that they're going through now.

I don't want to repeat everything that everyone said tonight I have no intention of doing that. I want to just thank the committee, the working committee, the Energy and Technology Committee, the working group did a great job. And of all the words I heard tonight the most words that stick in my mind the best is that we're erring on the side of caution. There have been links although the links have been small. Our own State Department of Health has said that there are links to childhood leukemia. They haven't made links to brain cancer and stuff like some people think.

But the links have been established to childhood leukemia. I think erring on the side of caution is the most important thing that we can do tonight. I want to thank everybody that contributed to this. I intend to support the bill and the amendment first and I urge all my colleagues to do the same. Thank you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Boucher.

REP. BOUCHER: (143rd)

Thank you Mr. Speaker. Mr. Speaker I rise in support of this bill. I also rise to give some recognition to many different groups, a lot of grassroots organizations and individual home owners that in Phase I of the project spent a great deal of time organizing and bringing this issue to a level that really got the attention of the Siting Council from the very beginning.

It was an incredibly difficult journey. It took a great deal of time and effort. And those very same grassroots organizations I think have been very helpful in helping the current group to understand the particulars and the concerns and so forth. So I do think we should recognize their efforts as well. Certainly Representative Fritz and so many others from the various members of both caucuses that have worked so hard on this particular bill.

The issues in the beginning were considered not important and now it's risen to the point where it is important. There has to be a balance between our need for energy, our reliability for energy but also for the care that we have over the residents and also the environment that is what we can serve the best of

Connecticut. Thank you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Collins.

REP. COLLINS: (117th)

Thank you Mr. Speaker. I rise in support of the amendment. There's probably no more important issue to my constituents in Milford, Orange and West Haven than this issue this year. This is what I've heard from everybody. I was at the public hearing in Milford that the Siting Counsel had. And there was not an expression of the 'nmby' syndrome, not my back yard.

The concern from everybody was that if the lines are going to be put in and they have to be put in that they should be underground. Everybody tells me you can't do it underground but that's what everybody wants. Representative Roy had a good point the day of the hearing he said I was watching the lunar landing on Mars and we can do that but we can't put a couple miles underground of electric wire. I find a problem with that. Let the engineers fix it, it's not my problem.

And let me be cynical. We talk about - Representative Ferrari was talking about southwest Connecticut their power needs, we all know they need some power down there. But the line doesn't go to Greenwich, it doesn't go to Westport, it doesn't go to

Fairfield, it doesn't go to Trumbull, it goes to Norwalk. Ironically the lines going across Long Island Sound are from Norwalk.

I don't know how much of this power is for Connecticut and how much is for New York. I'm cynical I think it's for New York, let them pay for that I have no problem with that. I think the amendment is good.

DEP. SPEAKER HYSLOP:

Representative Nardello.

REP. NARDELLO: (89th)

Thank you Mr. Speaker. I rise to support the amendment. I just have three comments to make. First I want to commend the process. I think that our Majority Leader, Representative Fritz, members on the Republican side of the aisle and a number of people came together both in the Senate and in the House to really draft a bill that was difficult.

Because these bills tend to be very technical in nature and every word is important, so again I commend the process. I also want to for the House to just remind them that the protections that we have put in place in this bill will apply to all projects going forward so thereby if the lines come to any other town in the State of Connecticut everything that we put in this bill will be also in your town be considered. Again those

protections apply throughout the State.

And third for me, I think it's extremely important that we pay attention to how the costs are going to be recovered recognizing that there would be cost recovery. But it should be done prudently. That we always look at cost, that they should be prudent in nature and that language was incorporated into the bill so that we can be sure that rate payers' dollars and people's dollars are spent very carefully.

So for all of those reasons and because I think ultimately we will be erring on the side of caution and protecting individuals in the State of Connecticut. I thank the people in my district that brought this to my attention. I am supporting this and I urge the Chamber's support.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. If I could a few questions to the proponent of the amendment.

DEP. SPEAKER HYSLOP:

Representative Backer, proceed sir.

REP. MINER: (66th)

Thank you Mr. Speaker. In terms of what's referred to between lines 53 and 55 assessment of impact. Could

the proponent explain how that assessment would be done. I'm assuming - I may be incorrect - that the impact would have to be assessed for above ground and below ground. Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. As I have stated several times through the length of this debate is that the impact to human health cannot be determined here in this room today. And that there are many experts on both sides of the issue who have come up with various numbers. I understand the Representative's question that the assessment is silent in a number of place. The language in lines 54 and 55 is silent on the type of assessment of electromagnetic fields. I would suggest that the whole breadth of controversy around those two issues, around electromagnetic fields, around installation and construction practices would be included in the assessment of impact.

In fact that's part of the intent of this is to take a very thorough look about all these concerning electromagnetic fields and produce, that will be produced by the lines. Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. So, in the process of determining by the Siting Council whether the line would be above ground or below ground an assessment would occur? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. This is actually information that the applicant would submit in this section of the bill to the Siting Council as has been so many exhibits going forward when they submit their application Mr. Speaker, through you.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. So in theory we're going to have the public utility providing some data about an assessment that we're not sure anybody has done? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. I would find it to be

common practice in almost all applications before DPUC or the Department of Environmental Protection or Siting Council that the applicant submits supporting documentation for their position as they go forward. I would suggest that this is the requirement for that supporting documentation. Mr. Speaker through you.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. With regard to a discussion that was going on - I guess it was a couple of speakers ago - there was a question posed as to whether the Siting Council would have within its jurisdiction to require the utility to bury the power lines. For instance if it was in an area of open space with no residential construction. Is it likely that they would recommend burying the power lines there or would they probably go overhead? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. The list of extremely sensitive areas that would include the laundry list I continue to give tonight, is the list where that consideration would be given. However, if the open space

area were to have playgrounds or things that fit that list I would imagine the Siting Council would take it into consideration. Through you Mr. Speaker. In fact they'd be required to take it into consideration.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. And in terms of let's say of a subsequent development on that, could a municipality deny an application for a playground or something if it was located within a certain distance of a power if it had already been erected? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. That's an excellent question, I think it speaks to a number of planning and zoning and conservation development type things that we have done around the State. If it was within the right of way or perhaps the buffers that were defined by the Siting Council I would say that they would not be allowed to.

However, that said I think that we need to revisit this and not specifically on this bill. We've done it on

other things and other places to work with our towns to prevent schools from being built under the wires and right of ways, which have happened. In particular a very high profile one in this particular case, that we could go forward to work with the communities to be certain that those right of ways are protected and buffers are protected so we will not expose children to these types of EMFs.

So I think the answer is, the answer to your question about siting a school or a playground I think within the right of way it's obvious that they would not be allowed to do that. I think within the buffer zones established by Siting Council that's a question that would have to be determined at the local planning and zoning. Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. Then today through a question asked by Representative Farr or maybe a statement made with regard to the cost associated with this development. Does the cost sharing remain within the State of Connecticut or does it go beyond the State of Connecticut in terms of ratepayers outside the State of Connecticut into New England? Through you Mr.

Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. That's another excellent question. If we begin the building the transmission lines within the deadline of the Federal Energy Regulatory Commission has given us I think it was five years a year ago. The cost of the line - at least the plain vanilla version of the line, the standard industrial construction of the power lines - would be split up across New England and socialized. Connecticut's share of that would be 27%. If we however should miss that deadline we will pay 100% or probably $800 million rather than $200 million. Those are rough numbers, maybe it's $750 or $600 versus $200 or $175. But certainly 27% of this project will accrue to the ratepayers in Connecticut if we do it on time.

If we should not do it on time 100% of the plain vanilla construction will come to us. I think the question here is that the additional protection the additional construction standards will in all likelihood result from this bill will have to be dealt with at a different level.

And if FERC wants to redress those costs -

discussed this a little earlier in the rate issue - if FERC wants to reject those costs they will not be socialized. So the gold plating as Representative DelGobbo referred to it as will be borne by the rate payers of Connecticut and without a final -- apart from the Siting Council I can't tell you what that will be. I'm guessing 1% or 2% over the 45-year life of the line. But that's a pure guess Representative.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. If I can just touch on the assessment one more time. When the Siting Council gets the information from the Public Utility - I'm just kind of thinking this thing out - they should probably have to provide electromagnetic field data from a power line that would be let's say 150 to 250 feet away from an individual an then the same data for the same conduit that might run underneath a sidewalk or in a roadbed. Is that theoretically correct? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker to Representative Miner. Yes, I think it is. I think they're going to have

produce in terms of the impact of any electromagnetic field the most inclusive documents regardless of the installation that exists that they can get their hands on, so I think the answer is yes.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

So in theory if the two pieces of data, let's say the same, and the cost to bury the power line without any additional safeguards that might deflect the electromagnetic field downward were in place. The Siting Council probably wouldn't direct the power company to bury the power lines? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. The bill is really silent on cost. However, it's silent on costs in terms of how they would have to make their choices. Reliability, operability along with the technical feasible or infeasible language will dictate their decision. Now that said the bill is clearly encouraging Siting Council, ordering Siting Council not encouraging it, ordering them to look at best management of electromagnetic field technology. So the best management

for that might be any number of things that we've discussed previously in this debate. So without being able to have an exact situation I would tell Representative Miner that cost should not be a consideration. Best management of electromagnetic fields and practices should be.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. My last question in term of all the things being considered is aesthetics, would aesthetics be part of that calculation? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker. The answer is no, for or against.

DEP. SPEAKER HYSLOP:

Representative Miner.

REP. MINER: (66th)

Thank you Mr. Speaker. And I do thank you for your answers.

DEP. SPEAKER HYSLOP:

Will you remark further on House "A?" Will you

remark further on House "A?" If not we'll try your minds. All those in favor signify by saying aye.

REPRESENTATIVES:

Aye.

DEP. SPEAKER HYSLOP:

Those opposed? The ayes have it House "A" is adopted. Will you remark further on the bill as amended? Will you remark further on the bill as amended? Representative DelGobbo.

REP. DELGOBBO: (70th)

Thank you Mr. Speaker for I guess purposes of concluding the debate. I think we heard a few points that are very well taken here. That this has been a very delicate balance in terms of trying to introduce the additional concerns that many residents of the State had and trying to do it in a legitimate way. But also understand what I mentioned earlier - I hope - that this bill still recognizes solidly the - not just the importance - but the critical importance of being able to move forward on a reasonable basis and have these transmission fixes take place within the State of Connecticut.

And I did have one final - as I was reviewing my notes - one final colloquy that I was hoping to have with the proponent of the amendment if I might. So Mr.

Speaker if I could propose a question through you to the proponent of the amendment? Or the bill as amended.

DEP. SPEAKER HYSLOP:

Proceed.

REP. DELGOBBO: (70th)

Mr. Speaker the section that we had discussed earlier regarding reliability and how that would be factored when determining whether or not an applicant had met certain provisions under I believe it's in lines 512 through 522 as an example - I believe it's also interrelated I other areas of the bill. But when we're talking about reliability for purposes of legislative intent is it your understanding that in addition what we mentioned earlier that we are understanding a) Reliability represents issues such as the failure rate of a particular type line if it's underground. Not just whether that will be in service or not and over what periods of time but what is the record of that type of technology under ground? Through you, does that represent - to your understanding - does that represent one element of reliability? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Through you Mr. Speaker to Representative DelGobbo.

I think the answer to that is yes. Obviously reliability speaks to the functionality of the cable and that would certainly lead one to the conclusion that the types of technology needs to be bedded, that it needs to work, obviously the technical and infeasible language in this bill speaks to that. That the reliability of a particular cable or a particular installation is certainly pertinent to this and that if you have the history of one type of cable - let's say an oil filled cable - that might typically fail every one or two years certainly that would not meet the reliability standard.

If you had a solid pordielectric type cable perhaps that might. Not being an engineer or an expert on these things I would say we can't choose it but certainly reliability of the underground transmission would have to do with the installation and the success rate of the type of equipment and cables used. Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative DelGobbo.

REP. DELGOBBO: (70th)

Thank you Mr. Speaker. And also the second part and final part of this question is that, so we in addition to what we had discussed earlier for purposes of intent regarding the general ISO parameters,

reliability and a specific operability or the fail rate of certain types of technology if it's underground and over what distances. In addition there is it would appear to me from the testimony and I had heard that sometimes there are issues of reliability just in the fact that we're interconnecting this system to something else already existing. In other words there may be periods of where it's growing overgrown.

You know the regular overhead transmission lines now we're going to be burying it and then it might be coming back up overhead again in another section. That general dynamic is in itself an issue of reliability and how an entire system will operate in a reliable fashion. Through you Mr. Speaker for purpose of legislative intent, is that also the proponent of the amendment's understanding that those issues are also to be appropriately addressed by the Siting Council under this bill? Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative Backer.

REP. BACKER: (121st)

Thank you Mr. Speaker and through you. I think the phenomena, the various phenomena, various installation things that might become problematic one that Representative DelGobbo is speaking about now might be

porpoising, going in and out of the ground at such a rate that it may affect the ability for the cable to be reliable.

That's certainly a feasibility issue around installation. So yes, I think reliability speaks to the way the cable is installed. Certainly if it is unreliable by porpoising here and there then that is not what we want with any kind of installation and we want reliability. But with all that said you know we are speaking to the Siting Council, we are giving to them some guidelines and some actually mandates on how to do this. We're going to have to rely on expertise in technology that might exist in the Siting Council, it might also exist in the application submitted by the utilities or others. Certainly in the restructuring bill last year we created a municipal fund to help municipalities through application fees represent themselves at the Siting Council.

I think that may help them move forward on here. All that said, installation procedures and practices speak to reliability. If you can porpoise it up and down but then you can't interconnect to another part of the system because of whatever you might have, whatever technological problem that you might have, obviously that would not be reliable. And we want reliability to

speak to those things. We want this to work we want it to work in an efficient way.

We certainly are moving to an extraordinary height in terms of dealing with EMFs. But we also want the power to flow and flow in a way that it gets to people. Through you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Representative DelGobbo.

REP. DELGOBBO: (70th)

Thank you Mr. Speaker. And I thank the gentleman for his answer. Mr. Speaker in conclusion of my remarks on this, this has been a very difficult issue for all of use to get our arms around. And it's certainly been one in which I've learned a great deal about issues and elements of this system that I hadn't been and in that sense I think public policy in the State of Connecticut was made that much better than it was prior to the enactment of this legislation and I would urge adoption. Thank you Mr. Speaker.

DEP. SPEAKER HYSLOP:

Will you remark further on the bill as amended? Will you remark further on the bill as amended? If not, staff and guests to the well of the House, the machine will be open.

CLERK:

The House of Representatives is voting by roll call, members to the Chamber. The House is taking a roll call vote members to the Chamber please.

DEP. SPEAKER HYSLOP:

Have all members voted? If all members have voted please check the machine to make sure your vote is properly recorded. The machine will be locked and the Clerk will take a tally. The Clerk will announce the tally.

CLERK:

H.B. 5418 as amended by House "A."

Total Number Voting	149
Necessary for Passage	75
Those voting Yea	144
Those voting Nay	5
Those absent and not voting	2

DEP. SPEAKER HYSLOP:

The bill as amended passes. Any announcements or points of personal privileges? Representative Wallace.

REP. WALLACE: (109th)

Good evening Mr. Speaker.

DEP. SPEAKER HYSLOP:

Good evening.

REP. WALLACE: (109th)

I rise for a point of announcement.

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before us, and reserve the right to exercise dialogue at any other time, I would appreciate that.

So, having said that, the first hour is dedicated to legislators, agencies and municipalities. It is a lengthy list. We will begin with the list at the beginning of the second hour, which would be about quarter past twelve, we'll go into the public portion and alternate between the public portion and the agency list.

The first speaker is Senator Tom Gaffey.

SEN. GAFFFEY: Good morning, Senator, Madam Chair, members of the Committee. I want to thank you for having me before you today on a matter that is of a very great concern to my constituents in central Connecticut.

And that concern has to do with the Phase II application of the power utility companies to upgrade its transmission lines from the border of Haddam and Middletown through my district in Middletown and Middlefield and Meriden and Cheshire and also the districts of other representatives and senators -- I'm sure you are going to hear from today, all the way down to Fairfield County.

And I don't want to take a lot of time, because as a Chairman, I do appreciate your comments that the fact that we do often talk offline together about how we can deal with these very important issues. First of all, let me just say that I think that the Connecticut Siting Council has been very attentive to their duties.

They have gone a listing tour. I have testified at both the Wallingford hearing and at the Middlefield hearing and they have made themselves available to us as legislatures as much as any agency of the state of Connecticut in my time up here in 10 years that I have seen make available to legislators.

Their staff has been just been excellent at providing information and so they ought to be commended for that. They are doing their job, I

think, appropriately. And they have listened to the public. I am sure that Chairwoman Katz will tell you that today. They have heard the concerns -- the real concerns of people with regard to the proposal in front of them.

I -- just to be fair, I want to say that I gave -- I provided a very lengthy list of questions to the utilities themselves and they did respond to me.

And they responded to me I thought in a very thorough manner. However, we may take issue with the answers they did, I think, a pretty thorough job in responding to some very difficult questions.

The one point that I want to make today, and I know you have H.B. 5418 in front of you, which would preclude the siting of these transmission lines near areas where children typically are -- schools, license daycare, etc.

I do want to voice the concerns of my constituents that have stated to me that they believe and that I believe that, also, that residential areas where people live probably ought to be considered in the legislation to be as important in our care and concern for the public health, safety and welfare as schools and licensed day camp facilities for children.

As Chairman of the Education Committee, as you know, I am fully cognizant of how many hours children are in school, but also, I am fully cognizant that they spend more of their time outside playing at their own homes and neighborhoods than they do actually at school. So I am not detracting from the concerns addressed by the authors of the legislation, but I would also add that if we are going to go this route, then we should absolutely should add residential homes and areas where they are located.

Just very, very quickly. I just want to make a point as to something that I have said over and over again in front of the Siting Council, and that is, we have a duty as lawmakers and they have a duty as public officials sitting on that council to

make certain that the decisions are guided by equity and consistency.

And the fact of the matter is, that on the docket of the Bethel-Norwalk line, that docket was reopened, new evidence was allowed to come in and lines that were above ground, as a matter of fact, more than 22 miles of lines that were above ground in Bethel, Weston, Reading, Wilton and a little tiny bit of Norwalk were then allowed to go underground.

My district for the upgraded Phase II proposal has about, geez, just a little over five miles in my whole district. And we in central Connecticut, hold that we are at least one quarter, we should be more, but at least one quarter as much of value as the property values and concerns of the people in southwestern Connecticut that were successful in having what could only be termed as a settlement agreement between the utility and the folks that were concerned down in southwestern Connecticut allowed to enter into the record as evidence and then guide the decision of the council in allowing those lines to then subsequently be put underground.

That, to me, serves as the best evidence and testament that reliability, which you have to be concerned with as the Committee on Energy, of course, as we are all concerned with in Connecticut, that we have reliable transmission of power, but that reliability and environmentally safe underground transmission lines are mutually attainable propositions because it has actually been decided upon in another part of this state.

So, I would just simply respectfully ask that as we go forward on legislation through the session, that we are mindful of that and that if we ultimately act at the end of the session, which my constituents certainly are hopeful that we do, that we include those concerns in the legislation.

I want to thank you for your time.

SEN. PETERS: Thank you, Senator. Any questions for

Senator Gaffey? I would relate some significant points with respect to your district in the policy of overall, Senator taking notes. Thank you.

SEN. GAFFEY: Thank you, have a good day.

SEN. PETERS: You too. Senator Bill Aniskovich.

SEN. ANISKOVICH: Good morning, Senator. Senator Peters, Representative Backer, members of the Committee, I want to thank you for the opportunity to address you this morning on R.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINES SITING CRITERIA.

Just two nights ago, I had the opportunity to address the Connecticut Siting Council as well regarding the Health and Safety concerns raised by the proposal before the Siting Council regarding overhead transmission lines.

As you are aware, the three 345 KV Power Line has been proposed by the state's two major energy utilities and will effect two dozen communities along a 45-mile corridor between Middletown and Milford.

Needless to say, this issue has drawn enormous public concern in response. People are frightened. They are frightened for the health of their families and children, and they are worried about property values. Their way of life, will be, I think it is safe to say, forever altered, if the Siting Council approves the application by NU and UI as it now stands.

There were more than 200 people in attendance in Middletown Tuesday night. It was the seventh public hearing on the application. Sooner or later I think it is safe to say that all of our constituents will be affected by this issue in one way or another.

There is no question, and let me say this at the outset, that the State's power grid desperately needs to be upgraded. It is antiquated and it cannot meet the energy demands at peak times. Our

State's population growth, and our business capacity over time have outstripped the ability of the utilities to generate adequate power.

However, the fact that there is a pressing demand for power does not justify jeopardizing the public health. And there is an alternative, as you well know, to the overhead transmission line proposition, it is to bury transmission lines wherever and whenever possible.

This bill would restrict, in addition to that proposition of burying lines, this bill would restrict certain overhead lines to be located within 250 feet of schools and daycare facilities and playgrounds.

That would effectively restrict the ability of the utilities to construct overhead lines in much of the state.

I would like to see the legislation go further and I would ask you to consider making it the proposition that the law requires that the utilities demonstrate at the outset why utility lines should not be buried, making it a preferred option to bury the line as opposed to building an above ground.

Now, the utilities have argued that there is no conclusive evidence that exposure to overhead power lines is linked to increase evidence of disease, particularly certain types of cancer.

However, the Siting Council, reacting to the overwhelming concern expressed by the public, has appropriately asked the Department of Public Health to issue an opinion with respect to the public health concerns of these overhead transmission lines. And I applaud the Siting Council for that request and I am certain that the Department will provide us with a useful tool in that regard.

Let me say that the utilities, in my opinion, have been responsible citizens. They have acted as good corporate citizens. They have acted as good corporate citizens in the past. They employ

thousands of people in good paying jobs and they have been philanthropic partners within the state and within their host communities. But their past acts of good citizenship do not outweigh the fact that, in this case, their proposal jeopardizes the public health.

And it is not sufficient to point to those past acts of good citizenship in order to justify what could be a real public health concern, in this case, if you are a homeowner or a resident or a person who grew up and started the family in one of the 24 towns along the existing right-of-way. You don't want to hear that it's okay because there is no conclusive evidence that these overhead transmission lines could cause a health problem. You want to be certain that your family and yourself are safe and I think that our obligation as a legislature is to respond to the opinion.

The opposition to this proposal has been clear and it has been, at times, loud, and I would ask you that in your deliberations on this bill.

I fully support 5418. In addition to my written testimony, I have submitted to the Committee, and I just want to conclude with this comment, language that I would ask you to consider. Kelly Lymm is here today and will probably testify before you on this -- it would propose for your consideration contour lines and an EMF disclosure statement with respect to residential properties in the area that is impacted by any of these proposals.

I would ask that you give that your very serious consideration when you are marking this bill up, and ultimately I hope moving something to the Senate and the House in this session.

Thank you for your time and consideration.

SEN. PETERS: Thank you Senator. Any questions for Senator Aniskovich? Thank you for taking the time, Senator.

SEN. ANISKOVICH: Thank you, Senator.

There are obviously other bills that we are hearing today, particularly, those relating to transmission lines siting issues and the issue that we have all lived with for several years.

I wanted to briefly get the Department's position on some broad questions. There are actually some softballs, I think, in terms of the way the Department -- HB5418

DONALD DOWNES: Well, it is the "briefly" part that's worrying me, sir.

REP. DELGOBBO: The Department's position on some broad policy issues that are at stake here. First of all, the underlying issue regarding the necessity for upgrading the transmission infrastructure in Connecticut.

Maybe I will start off the question this way. Just your comment on it in terms of is this important and why. But put it in the sense of, is this a necessary step, a very important step or a critical step if you were to give it a gauge of policy imperative?

DONALD DOWNES: Well, I guess I would take the most imperative of the group that you offered me here because at the end of the day, this is probably the single biggest problem we have here in Connecticut.

First off, from an electrical point of view, the service in that part of the state is primarily provided by 115 KV lines, the standard of the New England Power Pool is 345. We can neither move power into nor move power around in Fairfield County. This produces immediate financial effects.

All of you who are paying electric bills have noticed the new lines for federally mandated congestion charges. Most of that, the great majority of that, arises from the congestion costs involved in trying to move power around in Fairfield County.

REP. DELGOBBO: Mr. Chairman, just to clarify. On the -

- so far our experience -- I believe that has been designed about April but it being implemented, we'll say around June, in terms of its impact.

What is the assessment to Connecticut ratepayers on average per month, since its implementation?

DONALD DOWNES: Well, it very substantially, seasonally, let me try and answer your question in a slightly different way.

We expect that the cost for locational marginal pricing and line loss and congestion are probably going to be in the range of $125-$300 million on an annual basis, round numbers.

REP. DELGOBBO: And so about 100, we'll say, roughly, we will be very conservative -- about $100 million annually Connecticut consumers/ratepayers pay until there is the resolution of the congestion issue.

DONALD DOWNES: Right, because the charge is based on the amount of congestion that exists. So the only way to reduce the charge is actually to reduce the congestion.

REP. DELGOBBO: The next question is something that we are familiar with, but just, again, to put it on the record.

I know that with regards to the completion of the transition fix if you want to call it, however that takes place, there is a point in time that seems to be important. What is that point in time and why is that important to us?

DONALD DOWNES: Well, the Federal Energy Regulatory Commission back on December 20th of 2002 entered an order which covered a number of things. But speaking specifically to this issue, provided that the costs for the construction of the fixes necessary in Fairfield County, along with some other projects would, in fact, be socialized across the grid.

And what I mean by that is the costs for this which are estimated in the neighborhood of approximately

$1 billion dollars, will be spread out across ratepayers of all six New England states. Connecticut's share of this will be in proportion to our load, which is approximately 27 percent.

So, in round numbers, we are looking at paying one quarter of the bill, if you will.

REP. DELGOBBO: And if that project is not completed by that date, then?

DONALD DOWNES: Which is December 20th of 2007. That order requires that socialization occur as long as that project is, in fact, completed by the end of -- in effect the end of 2007.

REP. DELGOBBO: And what would be the impact?

DONALD DOWNES: It would be borne locally -- the billion dollars would be -- I'm sorry. I didn't mean to interrupt, sir.

REP. DELGOBBO: Right.

DONALD DOWNES: But I knew where you were going. My point is that, yes, in the absence of socialization, the entire bill would be paid by Connecticut ratepayers.

REP. DELGOBBO: And the term "gold plating" has come up in terms of --

DONALD DOWNES: Sure.

REP. DELGOBBO: -- this issue. It is sort of a term of art, not necessarily a technical term, generally. Generally meaning if Connecticut or anybody else necessitates a certain level of expenditure to do this transmission costs that are over and above reasonable and technically feasible terms, that these additional costs would be potentially borne just by Connecticut.

Could you describe -- and we've heard about this in theory. And some of us connect with more or less in terms of it's maybe real, it could be real. My understanding is that those issues have already

begun to be brought up just regarding the Phase I application. Could you let us know where that stands?

DONALD DOWNES: Surely. The standard that is applied by pretty much all regulatory utility agencies across the country, whether they are State or Federal, is the idea that the public should be asked to pay for the reasonable cost of the least expensive effective alternative.

Now, translating this down into Connecticut's situation. The big debate here is whether over-heading or undergrounding is the way to go and how does that effect the financial equation.

The reality is that it isn't as simple as undergrounding. It is always more expensive and overhead is always less expensive. To the contrary, overhead, for example, in a place like Norwalk could be an extremely expensive proposition because the rights of way involved in overhead lines are quite wide. These may be several hundred feet wide.

We would literally be in the position of having to condemn hundreds of millions of dollars worth of property; houses, businesses, factories, you name it, in order to acquire the very wide rights of way that were necessary to --

REP. DELGOBBO: If I can just interrupt, Mr. Chairman. I apologize.

DONALD DOWNES: Surely.

REP. DELGOBBO: Because I appreciate where you are elaborating on that. The specific, the narrower part of the question is, is it your assessment that that judgment is in fact in play by the regional regulators that some of the decisions that Connecticut is making may have resulted in what is known as "gold plating" of a requirement? Therefore, is Connecticut -- are Connecticut ratepayers potentially subject to additional costs as a result of the way we've determined we want these lines to be built?

DONALD DOWNES: Yes. And, in short, FERC will basically disallow the costs that they believe are over and above the necessary and reasonable costs for the construction of the line.

REP. DELGOBBO: Mr. Chairman, I thank you. I was just sort of getting back on the record issues that we have all lived with, but.

DONALD DOWNES: That's very fine.

REP. DELGOBBO: That was, thank you, Mr. Chairman.

DONALD DOWNES: I got away easier than I thought I might.

SEN. PETERS: And I thank you, Representative DelGobbo, because all this ties into some very significant issues that we are dealing with today and I appreciate your testimony. Any other questions for Chairman Downes? Representative Nardello.

DONALD DOWNES: Good morning, Madam.

REP. NARDELLO: Can you also confirm whether or not there has been suits filed by the attorney generals of the other New England states in order to stop the socialization across all of New England?

DONALD DOWNES: I have anecdotal evidence. I can't say that I have actually read the pleadings, but yes. I believe -- in fact, I know for a fact that Central Maine Power just filed with FERC the other day -- challenging FERCs decision on socialization, asking them to reconsider.

So I have no doubt there will be a variety of challenges to socialization.

REP. NARDELLO: Well, I guess my next question for potential for Connecticut is there is a huge potential for Connecticut in terms of the costs. Can you hazard a guess as to the success or the potential success of this?

DONALD DOWNES: Oh, my personal opinion is that I think

socialization is going to survive these challenges quite well.

Frankly, the New England Power Pool for oh, some 30 years or so before this became an issue that people wanted to re-examine, had, in fact, been socializing pretty much all pooled transmission facilities, meaning the underlying parts of the basic power grid.

This area that we are talking about here -- the Phases I and II in Fairfield are part of that scheme. And so under the old rules, they would have been socialized anyway.

FERC, moreover, has made it pretty clear that they view socialization as being a necessary adjunct to the idea of building a single region-wide grid.

So the short answer is I think the odds that socialization will be upheld and will resist the attacks are very strong.

REP. NARDELLO: On the federal level, these are the questions that we need to have answered for our deliberations.

I also know that in the energy bill that failed there was language that said that if there was an egregious delay in citing of transmission facilities, then FERC would come in and take over.

What I need clarified for me is that does that mean that they come in and take over and the Siting can they then decide what goes underground and overground, what exactly, and I understand by the way that that's being placed in other bills, although we don't have a major energy bill.

Can you confirm that? Those are the things that I am hearing from -- and those are all things that are going to impact us.

DONALD DOWNES: Well, it's hard to tell how deep scrutiny that FERC will give to this. But one of the things that I think you can draw from the language of the energy bill that did not pass, for

example, had to do with the Islander East line. And it kind of gives you a little bit of insight into what FERC's thinking is because the legislation basically said that they were going to appoint a federal master -- a federal judge and he was going to make the determination of whether or not this line should be built. The standard that he was going to use would be the provisions of the National Gas Act.

Now, the National Gas Act, as the title implies, has nothing to do with environmental standards or social issues or quality of life or any other such thing it has to do with -- the free flow of gas and interstate commerce.

So in other words, I think the bill is pretty clearly leaving the impression that they view the energy issues as being pre-imminent and are prepared to run over some of the environmental and other concerns here as being secondary.

Am I reaching your point, madam?

REP. NARDELLO: Yes. I am raising these issues because if we as a state lose control over this, which I am very concerned about --

DONALD DOWNES: Oh, you bet.

REP. NARDELLO: -- that we may end up in a worse proposition because I support all the environmental concerns. These are very real to me.

But I really -- that's what I need your expertise for in terms of if the federal government should step in, what are the dangers here? And I think the Committee needs to think about this because if we lose our own control, I think we are going to be in a much worse place.

DONALD DOWNES: I think the federal government is determined to move forward on stitching together large regions. They are determined to build necessary facilities. I think that they are likely to move into this on a very comprehensive basis.

I think we will have very little to say about it. And this is showing up in lots of different forms. Not only do we see it in places like the Federal Energy Bill, but on another front, as I have been advising the leadership of this Committee for some time, we are in negotiations over issues like LICAP.

And one of the great fears we have is that the federal government looks at things like the stalemate over trans-energy and the moratorium in general and the arguments of Phases I and II and some of the other facilities, and they begin to draw the conclusion that, perhaps, Connecticut is not willing to address these things at all and maybe somebody else needs to step in and make them do it.

When and if they decide to do that, they will probably move in on a very comprehensive basis and we won't have a lot to say, I'm afraid.

This is probably the most pressing issue from my point of view, is finding some kind of a workable mechanism to resolve these. CEAB and the provisions of 6508, I think, were one of the attempts to try and find a workable solution already.

SEN. PETERS: Thank you Representative Nardello. You raised some very significant issues for this Committee. Representative Duff?

REP. DUFF: Thank you, Madam Chair. Good morning.

DONALD DOWNES: Good morning, sir.

REP. DUFF: Real quick. Maybe this is more when the Siting Council comes up. But moving lines here, there, over a few miles or -- that's something that the Siting Council can address. That's within their jurisdiction, isn't it?

They don't have to follow the line that is the proposed line. They can -- if they say, for instance, we feel that school is not the right place to put a line next to, they have that

authority to move that around, don't they?

DONALD DOWNES: I believe that's the case, yes, sir.

REP. DUFF: And would it -- is it a policy maybe of the CEAB to consider that maybe in the future that, outside of legislation from this body, that a CEAB can almost in a policy way themselves say these are places we want, this is some kind of general boundaries for how we want to look at our power situation in the future without getting entangled in legislation that may or may not happen but that you could kind of do on a broad policy basis?

DONALD DOWNES: Yes, I -- that really is the heart of the concept.

Look, I need to say a couple of things. Number one, the DPUC is viciously neutral on Phases I and II. We do not care what the rate is billed by one company or another. We don't care what route it follows. We don't care whether it is over-ground or underground.

What we care about are two things. One, is it electrically sufficient and does it resolve the problem? And two, can the facilities be built and be built in some kind of a timely and cost efficient kind of a basis?

Now, at the end of the day, the idea behind the CEAB concept was to try and build up some standards that would drive planners toward producing projects that made sense and were acceptable, not only from a financial, but also from a social and an environmental and property value and other points of view.

Number two, please keep in mind the world is constantly changing. You have a bill before you that talks about things like playgrounds and similar kinds of facilities. Well, folks, these move around every 15 minutes. This is a dangerous way to try and deal with a long-term problem by locking yourself into certain sacred items. One way or the other, each one of these becomes a case-by-case kind of an analysis.

And I counsel you strongly to consider some flexibility in this matter because what the world looks like today may be very different than what the world looks like five years from now or 10 years from now and the statute will be on the books for, I suspect, quite a long time.

REP. DUFF: Thank you, sir.

DONALD DOWNES: Yes, sir.

SEN. PETERS: Chairman Downes, I know that you care about all of these things.

DONALD DOWNES: I hope I am letting that show.

SEN. PETERS: You have a statutory authority to have a specific purview over the areas that you recognized as areas --

DONALD DOWNES: Yes, ma'am.

SEN. PETERS: -- so. Representative Megna.

REP. MEGNA: Thank you Chairman, hello Commissioner.

Commissioner, what will the net effect of Phase I and Phase II have on the electric customers of Connecticut in terms of price when it is completed? I know there is hope that congestion will be relieved, but there will also be other increases as a result. What will the net effect be?

DONALD DOWNES: I'm letting my mental calculator run for a minute here.

Look, this is a little bit difficult to estimate. Let me try it with you this way. It is our belief that Phases I and II or the electrical equivalent of them, whatever it is that gets approved, such drive the congestion numbers in particular to a very small fraction of what they are today.

REP. MEGNA: So just --

DONALD DOWNES: It will never be zero. There is always

going to be congestion in the system.

But we can, perhaps, drive this down to the point where it is a five percent or ten percent number instead of --

REP. MEGNA: Of the $300 million or $125 million or $300 million?

DONALD DOWNES: I think we could probably distinguish something in the range of 80 or 90 percent of that -- round numbers. That's just a guess. I'm not --

REP. MEGNA: No, I understand. But at the same time, what will the Phase I and II?

DONALD DOWNES: The capital costs?

REP. MEGNA: Yes.

DONALD DOWNES: Try it this way. Let's assume the net cost of this line is $1 billion and let's also assume for argument's sake that Connecticut's share is $250 million of that, roughly one-quarter.

REP. MEGNA: Right.

DONALD DOWNES: This would be amortized over the life of the line, so that would probably be --

(GAP IN TESTIMONY -- CHANGED TO TAPE 1A.)

DONALD DOWNES: -- doesn't take into consideration any rate of return.

REP. MEGNA: That's just the capital cost?

DONALD DOWNES: Well, my initial $1 billion was the actual physical construction cost. There is obviously an ongoing -- there's obviously an ongoing component to this, since people will have to pay to use the line and move their power.

Honestly, Bob I haven't tried to calculate it out that far.

REP. MEGNA: Yes, I was just.

DONALD DOWNES: Certain -- let me try it with you this way though. Certainly, the savings on the congestion side will far outweigh the transmission --

REP. MEGNA: Over time.

DONALD DOWNES: -- costs and the capital costs. I'm trying to go --

REP. MEGNA: Is that part of the reason why in the de-regulation bill we had where we wanted you to go out and look for a temporary emergency backup generation to help with the congestion over the next four years?

DONALD DOWNES: That's right. Because the congestion cost is actually occasioned by the interaction between the generation and the transmission.

REP. MEGNA: Right.

DONALD DOWNES: And so, number one, we have an absolute shortage of just plain old megawatts. I mean, we just need more power to run more air conditioners.

But the other piece of it is that we need to maintain the proper charge and characteristics on the grid itself.

So the long and short of it is that the 300 megawatt RFP that ISO put up, for example, would provide enough power, not only to meet the absolute requirement of demand, but would also operate the reduced congestion costs to some degree.

REP. MEGNA: Until we make transmission infrastructure improvements?

DONALD DOWNES: That's right.

REP. MEGNA: Okay.

SEN. PETERS: Representative Megna, can I just remind the Committee that we have got 15 more minutes to the -- and then we go on to the public and we have

people waiting to testify.

REP. MEGNA: No problem. Thank you very much Commissioner.

DONALD DOWNES: Thank you, sir.

SEN. PETERS: Any other questions? Mr. Chairman, thank you.

DONALD DOWNES: As always, I appreciate it.

SEN. PETERS: Attorney General Blumenthal.

RICHARD BLUMENTHAL: Good afternoon. Thank you Madam Chairman and members of the Committee. Mindful of the comment that you just made, I am going to be brief and simply say that I am here to support H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA.

You are familiar, I am sure, with the specific provisions, which essentially prohibit the siting of transmission lines within certain distances depending on the power of the voltage of licensed day care facilities, schools, youth camps, public playgrounds, other places where children are likely to be.

And as much as anything, I am here to support the concept of taking care where these facilities are sited so as to take account of children, their health, safety, as well as the general public policies that are served by this kind of proposal.

I am here also to urge that, as much as possible of these lines should be undergrounded. Obviously, there are cost factors, but we have been successful so far and I have been privileged to be involved in this process, through citizens groups and environmental advocates in the first leg of the line in producing a solution that I think incorporated and managed to meet many of the needs and concerns on both sides -- the utilities and the health advocates and environmentalists, as well as citizens.

So I would suggest that this bill provides a very significant opportunity to bring everyone together to assure that as much as possible these lines are put underground and that we avoid the potentially disastrous health consequence, particularly to our children, as well as the environmental impacts that otherwise would result.

May I suggest also that we face a fundamental issue as to the whole regulatory process that is applied to these decisions. Certainly, during the process on the first leg, the question was raised whether the Siting Council process is sufficient to meet many of the competing demands, as well as needs, environmentally and health-wise. And I think that this legislature, whether in this session or some future opportunity, will have that question before this process on the 345 KV line is a real test of the process, as well as the result.

And I recognize that we need better transmission, that it has to be done in a cost-effective way, that there is strong, well-justified sentiment for placing these lines underground wherever possible. Indeed, in the long run, it may save money -- more money to do so.

But I would urge the Committee as it considers the bill that is before it, to also have in mind some of these broader, larger issues that are so important to the future of our state.

If I can take a moment and answer the question about the so-called socialization costs. There have been no lawsuits to in effect negate or derail the spreading of the cost over the entire New England ISO area. There has been talk about such potential action, particularly, I am told from Maine, but there have been no actions filed yet.

So if we meet the target dates, the cost should be spread over the entire region. But, obviously, 2007 is a very important date.

Thank you.

SEN. PETERS: Thank you, Mr. Blumenthal. It is

certainly our hope that we meet those target dates. Representative Nardello followed by Rep. Duff.

REP. NARDELLO: Just a quick question. I am concerned about those dates as well. If the federal government were to step in and declare an egregious delay, as again, that was the language that was used, what avenue would you have to fight that?

I mean, I just want to get a sense of what happens then because I am concerned. So, what do we do as a state?

RICHARD BLUMENTHAL: If the federal government takes steps that delay us --

REP. NARDELLO: If the government steps in and takes over the siting process, that's what I am concerned about.

RICHARD BLUMENTHAL: Well, we have arguments we can make. As you may know, we have sued on occasion against the federal government, including the pieces that we think that are prevalent in the FERC process to protect our interests.

But I have to be honest that any lawsuit in this area is an uphill battle, simply because of the deference that ordinarily is given to regulatory agencies in the federal courts and because the unique, very complex and difficult hurdles that we face in the energy area.

But we would have arguments to make and they would be arguments not just against FERC, but against ISO.

SEN. PETERS: In a -- just a quick comment. Shame on us with the window of opportunity we have here if we can't get together as a state, residents, industry and policymakers to resolve this, then we all suffer the consequences. Representative Duff.

REP. DUFF: Thank you Madam Chair. Good afternoon, Attorney General.

I want to ask a question as I had asked to the

Chairman with regard to is this something that maybe should be considered by the Connecticut Energy Advisory Board instead of legislative action considering the fact that we have issues with FERC and that would be an uphill battle if they did usurp some of our power.

I just want to get your thoughts on that as well.

RICHARD BLUMENTHAL: Well, it would be something appropriate to take up with them. I'm not sure what effect it would have -- whether it could accomplish -- how much it could accomplish, but it certainly would be appropriate.

REP. DUFF: Thank you.

SEN. PETERS: Thank you. Further questions? Thank you.

RICHARD BLUMENTHAL: Thank you very much. I want to thank the leaders whom you will hear from after I because they really played a terrific role, both on the first and the second leg of these transmission lines. So I appreciate this opportunity to be with you and I look forward to hearing and reading the testimony that is offered later.

Thank you very much, Madam Chairman. Thank you.

SEN. PETERS: Chairman Katz. Good afternoon, Chairman.

PAM KATZ: Good afternoon, Senator Peters, Representative Backer, members of the Energy and Technology Committee. My name is Pam Katz. I am Chairman of the Connecticut Siting Council. In fact, I am celebrating my one-year anniversary in that position. It seems like just 20 minutes under water.

I am here to testify today on Raised House Bill No. 5419, AN ACT CONCERNING COMPENSATION FOR SITING COUNCIL MEMBERS. This Act, if enacted by you, will provide compensation for the many long hours the members are serving in connection with their duties.

But more important, I feel, it will help retain

highly skilled and capable members during a time when the Siting Council can ill afford to lose the wealth of experience that it possesses.

On an average day of our council member attending a docket, will proceed with leaving from their home and office around 12:30 or 1:00 p.m. and having an afternoon hearing, a full review, an afternoon hearing, an evening hearing and sometimes not getting home until close to midnight.

This type of schedule occurs eight or nine times a month. Public Act 88-161 about 16 years ago, increased our compensation up to $150.00. Frankly, the increase in the Council's workload since 1988 has been dramatic. And this is especially true in the past few years and especially the past year. In fact, the nature of the challenges before the Council and the work tempo has demanded that the Council members give significantly increasing number of hours.

For example, F/Y 2000/2001, we had 19 public meetings. We have increased this up to 45. In fact, we just finished an eight-night listening tour -- I call it eight crazy nights, where we, on the current docket for the transmission line, we -- even though we are only statutorily required to have one in each county, we actually went and had eight different ones to hear from the public.

In addition to that, we do petitions, certificates, modifications, power-sharing and development plans. I have provided with you some bar graphs that show this point.

The combination of these factors is reaching the level where service to the council is becoming a far greater sacrifice for our members. Simply put, I am just increasingly concerned about retaining highly skilled and experienced people.

Right now, it is important to note that council members are only compensated the per diem for the time spent in public hearings, executive sessions and council business. We are not compensated for the hours that it takes to read, review and analyze

dockets and petitions and related material.

That type of material for the Phase I transmission line ended up being a four foot high stack.

As an example, I have with me a relatively simple telecommunications tower application that we just got to replace an existing lattice tower with a new mono-pole. It was received Thursday. It is 100 pages in length, has drawings, engineering analysis, and so forth.

This is a small portion to what the actual amount of paper that will end up being before the Council actually renders a decision on this telecommunications tower.

I believe the proposed increase in the council per diem is justified and appropriate. I think it is in the best interest of the State and the citizens to raise the compensation level above $150.00 and to remove the cap.

I thank you for your support.

I would also like to just briefly offer testimony on a technical change, which is H.B. 5422, ON THE STATUS OF THE SITING COUNCIL WITH ITS RELATIONSHIP WITH THE DPUC. The current statute places the council within the DPUC and this is codified in various budget documents.

Given the Council receives allotments from special fund revenues and is assigned agency codes and core Connecticut coding, it really has to be as a technical change put into there that the Council is a stand-alone agency.

And the history is that the legislature really intended to have the Siting Council to be independent of the DPUC and to be in there for administrative purposes only. So I ask that you consider making that technical change.

Thank you very much and I appreciate the opportunity to testify.

SEN. PETERS: Well, we are certainly glad you came up for air.

You said 16 years it's been since an increase to the per diem rate?

PAM KATZ: Yes.

SEN. PETERS: Those work compensations are something that every legislator in this building can identify with and we appreciate your testimony. Questions? Representative Nardello.

REP. NARDELLO: Just one quick question, Pam. Could you just briefly tell me the issues you consider when you are determining undergrounding versus overgrounding -- just sort of the broad basic categories to set the stage for the rest of the hearing.

PAM KATZ: Well, first, let me just preface it that we do every application on a case-by-case basis. We look at issues such as environmental impacts, because it is a certificate of environmental compatibility. We look at that. We look at EMS. We look at aesthetics, visibility issues. Those are the types of issues -- impact on wetlands, things like that. Those are the types of issues that we look at in general.

REP. NARDELLO: And is that how you determine what you would recommend for over-ground versus underground to the Attorney General? How do you make those recommendations? You do make recommendations on what should go over and what should go underground?

PAM KATZ: Yes.

SEN. PETERS: Is that it Representative or are you waiting for --

REP. NARDELLO: Is that all the criteria?

PAM KATZ: Off the top of my head, things like that. Impacts on residential communities, things like that. But we look at that mainly through issues such as visibility.

SEN. PETERS: Senator McDonald.

SEN. McDONALD: Thank you Madam Chairman. I have just a couple of questions regarding your testimony on 5419. That proposal is to go from $150.00 to $275.00.

PAM KATZ: Correct.

SEN. McDONALD: Sorry. How was that determined?

PAM KATZ: We looked at different -- we tried -- first let me just preface it that we tried to look at similar state boards which have a per diem and there is nothing similar to the Siting Council.

SEN. McDONALD: Just among equals?

PAM KATZ: Most other boards don't put in a 10-hour day as part of a per diem. But we looked at basically the range of other boards and we tried to stay within that general range.

SEN. McDONALD: Do you have a compilation of what all of those other boards and commissions?

PAM KATZ: We can get that for you.

SEN. McDONALD: Okay. Are there -- is it a review of all boards and commissions?

PAM KATZ: With a per diem.

SEN. McDONALD: So it doesn't include those that have no compensation at all?

PAM KATZ: No. It would just be the ones -- well, what would you like for it to?

SEN. McDONALD: Well, I'm just trying to get a sense of what the rationale is for almost a 100 percent increase in the per diem rate and whether that is just to bring yourself up to what you consider a peer group or above a peer group or whether it has an intrinsic evaluation for the amount of time that is put in? Are you trying to keep up with the

Joneses or do it just separate and apart from that relating to the actual time spent by members on the Committee?

PAM KATZ: Yes, we didn't do any fancy calculations figuring out so many dollars per hour. We were just basically -- a couple of things -- we think it could easily be another 16 years before we get another increase, so we just want to sort of increase it up to the range that we feel is appropriate for the level of expertise and time the members put in.

SEN. McDONALD: Thank you.

SEN. PETERS: Representative Backer and then Representative Duff.

REP. BACKER: Just quickly. I think that today when people were speaking and people I have met who have attended any number of the hearings that you just had, I have had many compliments back about the Siting Council and how people are being received, the endless patience, the endless material they need to read through, which might only be rivaled by what you have to read through on this Committee.

But I -- my sense is that there is an increase in per diem necessary to keep people very highly skilled people. You can't afford to lose your livelihood to do something to benefit the State. What that number is, I don't know. But I think that you guys are doing an outstanding job in evaluating things.

I may not always agree with the decision that you come to, but certainly you do an outstanding job in evaluation those and dealing with the public. I just wanted to congratulate you for the work you are doing. These are very difficult things and there is a lot at stake for everybody. So we appreciate your work and I think it should reflect in how we compensate, or at least can you compensate for that work -- how we held out the people who are doing this.

PAM KATZ: Thank you, Representative.

SEN. PETERS: Can I just add to that? Representative Duff, I know that the council is dealing with the storage issue with respect to Milestone in my town. And from both or all parties they have expressed one thing in common and that is the respect and the intelligence that the Siting Council exhibits in dealing with this issue. So, my compliments to you as well on behalf of that issue.

PAM KATZ: Thank you.

SEN. PETERS: Representative Duff?

REP. DUFF: Thank you, Madam Chair. Good afternoon. I just want to ask real quickly the per diems that you received, they don't come out of the treasury, the come out of?

PAM KATZ: We are off-budget.

REP. DUFF: Your off -- they come from the applicants?

PAM KATZ: Users pay for the -- so, for example, the electric industry and the telecommunications basically pay our fees.

REP. DUFF: Okay. And I would just like to echo what Representative Backer said. Since you have been under water for 20 minutes over the last year, it has been a breath of fresh air and I wanted to say that publicly.

You have come down to Norwalk many times. I want to thank you for the listening tour that you did for Phase II because I know you didn't have to do that. And just that it has really been great having you out there and the experts you are hiring have the RFP out for and I think that has helped open up the process quite a bit.

I personally would not like to see members leave because there is a great deal of expertise that is involved in that. So I am supportive of this measure and just wanted to let you know that.

Thank you very much.

PAM KATZ: Thank you Representative.

SEN. PETERS: Thank you Representative. Representative Megna.

REP. MEGNA: Thank you Chairman. Hello. I would like to echo what they are saying. You do a great job and I am all for the 5419.

I was just curious though, legislatures, I think when we get out of office we have to wait three years or so before we can lobby. Is there any statutory restriction to Siting Council members like accepting employment with utilities or consulting work or anything like that?

PAM KATZ: I think we have a one-year.

REP. MEGNA: A one-year after the term is up?

PAM KATZ: I don't know. I think it is one year.

REP. MEGNA: Okay.

PAM KATZ: But I haven't looked into it, frankly.

REP. MEGNA: Okay, thank you very much. Thank you Chairman.

SEN. PETERS: Thank you.

PAM KATZ: Thank you.

SEN. PETERS: We are going to take one more and then start with the public and that would be First Selectwoman Maryann Board from Durham. I believe we have shuffled the chairs on the deck a little bit on you, madam, and thank you for your indulgence.

MARYANN BOARD: Thank you. Greetings from the Town of Durham, distinguished members of the Energy and Technology Committee. I am Maryann Board, the First Selectwoman of the Town of Durham and I am present today to testify in favor of Bill No. 5418.

I speak in support of the ACT CONCERNING ELECTRIC TRANSMISSION LINES SITING CRITERIA and applaud Representative Klarides and Senator Joseph Crisco for their effort to address the health concerns resulting from siting transmission lines in close proximity to schools, daycare and locations where children gather.

I would, however, recommend language such as residential neighborhoods be added to the bill. As you may know, there is a Northeast Utilities, United Illuminating proposal before the Connecticut Siting Council to upgrade existing 115 kilovolt transmission lines in the Town of Durham to 345 kilovolt transmission lines.

The existing right-of-way cuts through the middle of just such a residential neighborhood. In this neighborhood, there are 100 homes and approximately 250 children, who will be exposed to these high levels of electromagnetic fields.

The projected levels of EMF in the NUUI application for our community are well above the limits seen in studies focusing on childhood leukemia. We must make certain that the levels of EMF are within acceptable standards.

We know the present proposal is not within acceptable standards.

Therefore, I request that when Bill No. 5418 becomes law, and I hope and believe that it will, that it applies to pending as well as future applications before the Connecticut Siting Council.

At a public hearing held by the Connecticut Siting Council February 24th for the Towns of Durham, Haddam, Middlefield and Middletown, alarming statements were made about potential health risks, especially regarding childhood leukemia.

Although some say there are no conclusive findings regarding EMF as yet, there are extensive studies, which I believe will provide more than sufficient information to support stronger efforts to protect our children from their effects.

The EMF levels projected for our community are the highest level, the highest net change and the closest in proximity to homes in the entire project.

There are other states who have set limits of acceptability regarding electromagnetic fields. Shouldn't we?

I thank you for the opportunity to share our communities' concerns and for your interest in and efforts to address them. Thank you.

SEN. PETERS: Thank you, Madam. A question -- what would be the Town's position if they have to take property in order to accommodate this?

MARYANN BOARD: I have had some of our residents say take mine. But our right-of-way is wide enough presently for the existing lines and there were studies done about undergrounding in our community, but they were dismissed and are not part of the present application.

The undergrounding option, I am told, would go through the streets, so it wouldn't require taking of properties.

SEN. PETERS: That we are aware of at this present time?

MARYANN BOARD: Right. And there are other options, which we believe can be pursued that would not require going through the existing right-of-way.

Some of the right-of-way, there are places where the right-of-way is three feet from a child's bedroom.

SEN. PETERS: Questions? Thank you. Jim LaChance. Good afternoon, sir.

JIM LaCHANCE: Good afternoon. I would like to thank the members of the Energy and Technology Committee for giving me the opportunity to testify on Bill 5420, AN ACT CONCERNING ENERGY SECURITY.

SEN. PETERS: It does my heart good anyway to see on the news that our workers are down south somewhere or up in Canada somewhere and really appreciate it.

JIM LaCHANCE: We think we are one of the best.

SEN. PETERS: I would agree. Questions? Thank you very much. Oh, I'm sorry. Representative Miller.

REP. MILLER: Thank you, Madam Chairman. Good afternoon. Does the Homeland Security Act enter into this at all to give you some kind of a privacy? You are concerned about the Freedom of Information Act.

JIM LaCHANCE: There is some relief from it with the Department of Homeland Security. But really a lot of the pressure I get is requests from state and local law enforcement to help us out. In other words, out substations do drive-bys or whatever. They wanted to identify the most critical ones. And we want to identify them, but that is where we start to get a little nervous about -- without some protection from Freedom of Information.

REP. MILLER: Thank you. Thank you Madam Chair.

SEN. PETERS: Thank you, sir. Senator Joe Crisco and Representative Themis Klarides. Good afternoon Senator and Representative.

SEN. CRISCO: Ha, ha the beauty and the beast.

SEN. PETERS: You are the reason why we are all here. Thank you.

REP. KLARIDES: Well, thank you very much Senator Peters and Representative Backer and members of the Energy & Technology Committee. Thank you for hearing us and having this great public hearing. And I know it is a long day. Representative DelGobbo joked yesterday that you were packing your overnight bags for today because you thought it might go very long.

As important as it is for us to be here and express

our opinions and do these bills, it is so much more important for you to hear everybody else in this room.

And I just would like to say quickly that the people from our area, we have our grassroots organization, which I know all of you have heard from and they have had all their friends email you. If one more person says to me -- if I get one more email from somebody from your district. But they -- I would like to really tip my hat to them. It is because of people like that that we get things done that bring it to our attention and tell us how important it is. So I would like to thank all of them for the work that they have done.

This legislation before you, 5418, would provide that a public service company will be prohibited from constructing or modifying an existing overhead electrical transmission line if the right-of-way or easement of the line is within 100 feet of such institutions for a 50 to 133 kilovolt line, 150 feet for 220 to 230 line, 250 feet for a 345 to 495 line, or within 300 feet for 500 to 550 line.

We understand that electricity is a very important part of our daily life. And we know that the reason for this is because we use so much electricity. And I would also like to say, to thank the Siting Council for all the great work that they have done and this is obviously not an easy job for them.

It is interesting that they are up here today asking for an increase in their per diem, because if anybody deserves it, I think they do.

Currently, the proposed overhead line route for Woodbridge, which is Senator Crisco and my district, would require the line to pass through or very near to campuses of Trinity Evangelical Church, Congregation B'nai Jacob, the Jewish Community Center, Ezrah Elementary, Gan Hayeled Nursery School and Beecher Elementary School.

At present, we understand there is no definitive link between childhood leukemia and EMF. However,

as with smoking, all the gasoline additives, anything -- we could list a number of things. When we first started out, there was never a definitive link between things, but there was certainly a cause and effect, which is what we have with the EMF.

And until this relationship is clearly understood, I think we should avoid placing those power lines in these residential where there are -- where there is a large concentration of children. Because we know that because children are children -- they are developing. I mean, none of us want to be in this area, obviously. I don't think one person in this room says, okay, put the line over my house. But we also know that kids developing, they are much more susceptible to this kind of thing.

The EMF readings on this section of the line are of serious concern. For example, at B'nai Jacob Campus, the 345 kilovolt line would emit an average load of 25.3 milligauss and a peak load of 96.5 milligauss. The average acceptable milligauss from the research that we have gotten is under 10. I believe it is three or four -- something like that.

So it is just amazing to me that the average here is going to be 25 and the highest could be 96.5 is just -- it baffles my mind.

In the interest of families with children who face these problems and these health risks from the potential exposure to EMF, I hope this Committee will certainly consider this and consider it seriously.

I thank you for the opportunity to be here and consider our comments. And now I pass the microphone over to my cohort, Senator Joseph Crisco.

SEN. CRISCO: Thank you Representative Klarides, Madam Chairman, members of the Committee. I greatly appreciate the responsibility you have taken on with regards to looking at this issue.

The issue goes beyond transmission lines and the

use of energy. We all accept the fact that energy is crucial for planning the future and that there are certain things that you have to do and the Siting Council.

But I ask, as we both stated to the Siting Council, this is an issue of legacy. We hope that your decision will impact what every society strides to do, and that is to make life better for each and every generation.

Unfortunately, the children of Woodbridge and the surrounding towns have experienced a considerable amount of environmental challenges to their health, whether it be mold, asbestos, improper indoor air quality. And we ask that you take this into serious consideration when you evaluate this bill. We ask that your legacy be that you have, not only protected, but enhanced the quality of the children of the area and we appreciate your consideration.

Any questions, we will gladly answer, but that's the important thing. I think it's not -- you know, we have a tendency here to react instead to, instead of planning as we should. I think this is a crucial step in planning to protect the health of the children in the area. Thank you.

SEN. PETERS: We appreciate your testimony, Senator. Questions? I'm sorry. Representative Backer?

REP. BACKER: I just want to ask the Senator and Representative when you explained how much EMFs the lines would fit. Is that what reaches the site or is that what the line emits from itself at the source or is that what would reach a home or a school or whatever?

REP. KLARIDES: Reaches.

REP. BACKER: Okay, thank you.

REP. KLARIDES: They know over there.

SEN. PETERS: Representative DelGobbo.

REP. DELGOBBO: Thank you. Just a quick comment. I'm

sure you are right as you mentioned, there are some people I have a feeling we will be able to get that answer from later on.

I just wanted to comment broadly for those of us working on this to both Representative Klarides and Senator Crisco that obviously this is a very challenging issue for us to deal with, an important one for your constituents and for all the citizens of Connecticut.

As you can imagine, knowing this issue, that we had a number of different proposals on transmission issues that we were asked to consider. It was this particular vehicle that was chosen as kind of a new insight that we might consider further. I want to acknowledge that and let you know that we are taking that seriously on our part.

Hopefully, as you already heard some of the testimony before, this is, like many decisions we have in the legislature, it is unfortunately not just as easy as running out the door, pushing the button and saying, oh, well, that's a no-brainer. These are challenging issues that we are going to deal with and we are going to deal with it seriously.

Thank you very much.

SEN. CRISCO: We respect that. We feel that, in this case, it is our opinion that you do have options and we appreciate that very much.

SEN. PETERS: Yes, it is interesting Joe and Themis. I was telling Kevin that 12 years ago when I came on to this Committee, one of the first issues I dealt with were issues around EMS and we created the standards that we have now and the Siting Council.

It is amazing in the waning moments of my career that I have come full circle in terms of dealing with this again.

But we appreciate your bringing this forward. Thank you.

SEN. CRISCO: Well, thank you. And let us state that the people we have spoken to, we are not talking about mass hysteria. We are talking about -- obviously, all parents are concerned, but some very knowledgeable people, some very knowledgeable physicians who we respect their opinions.

And so, Senator Peters, while we hate to see you go, we hope your legacy will be that of helping the children.

SEN. PETERS: You're a politician, thank you. But I am glad you are my friends.

REP. KLARIDES: Thank you.

SEN. PETERS: Thank you. Robert Carberry, followed by Senator Win Smith.

ROBERT CARBERRY: Good afternoon Senator Peters and members of the Committee. My name is Robert Carberry and with me is Frank Piro. We both represent the Connecticut Light & Power Company. I am here to testify on H.B. No. 5418 that proposes to mandate minimum distances between new overhead electric transmission lines in selected facilities, distances which are far in excess of the requirements of the National Electrical Safety Code.

I have worked myself in transmission line and substation engineering positions at Northeast Utilities for 30 years. I have submitted written testimony to you in opposition to this bill and would like to make some additional remarks before receiving your questions.

The generation, delivery and use of electricity produced electric and magnetic fields. Scientific research over the past 25 years has led to a public concern for health defects of exposures to magnetic fields.

Raised Bill No. 5418 is clearly premised on this health concern, but limits its focus to electric transmission lines. You should be aware that people in Connecticut are commonly exposed to

magnetic fields with similar levels and characteristics to transmission lines when riding an electric train, when using some electric blankets or when using many appliances such as hairdryers, electric shavers, microwave ovens, electric ranges and other electrically powered devices.

You oppose this bill because of its singular and unwarranted focus on transmission lines, but also because its provisions are unsupported by science and because its provisions are inconsistent with recommendations of the legislatively created Connecticut Interagency Task Force studying electric and magnetic fields. The electric utility industry and CL&P in particular have supported and followed scientific research developments on this magnetic fields issue since the mid-1970s, as have I.

In this 30-year period, NU has consistently placed its reliance for science review, interpretation and advice on this topic in the hands of scientific panels, public health organizations and governmental bodies who have conducted or sponsored peer group reviews of the hundreds of relevant research reports.

From 1977 through 2002, there were at least 113 such reviews published around the world. Half of these reviews have been published in the past 10 years, and that includes several of these performed at the request of the Connecticut General Assembly.

Many of these are completed by a very prestigious national or international organization. Some examples are the National Academy of Sciences, the World Health Organization and the National Institute of Environmental Health Science.

A few example conclusions and spokeperson statements from these reviews have been there is still no scientific evidence that shows harmful effects of low level electromagnetic fields on humans. Another: Science can't prove that anything is safe. But so far we have failed to find a hazard. And another: It now appears even

less likely that magnetic fields in the normal domestic or occupational environment produce important health effects including cancer. And finally: The probability that extremely low frequency electric and magnetic field exposure is truly a health hazard, is currently small. The weak epidemiology associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm.

This last statement in particular appears in the review published by the National Institute of Environmental Health Sciences. This is a federal government agency within the National Institute of Health. That statement was made at the conclusion of a six-year federal research program which began in 1992 and that report was in 1999.

That agency stated its opinion at the time that scientific evidence was insufficient to warrant aggressive regulatory concern. The five reports to the General Assembly that were prepared by the Connecticut Interagency Task Force from 1992 through 1998 carried recommendations that were completely in accord with this conclusion.

I have with me copies of the 1998 Task Force Report for those of you who may not have easy access to it, as well as the 1992 report that was prepared for the Legislature by the Connecticut Academy of Science and Engineering. I would be pleased to provide those to you.

I can also give you access to a June 2002 question and answer document prepared by the National Institute of Environmental Health Sciences. For those of you who don't like reading about science or reading science documents, this is the most easily readable document you will ever find and it will answer many more of your questions.

That concludes my remarks. I am available for questions.

SEN. PETERS: Thank you, sir. Would you leave a copy of that with the Committee?

(GAP IN TESTIMONY--CHANGED TO TAPE 1B.)

SEN. PETERS: Representative DelGobbo.

REP. DELGOBBO: Thank you Madame Chair. First of all, I did get a copy of this. (MICROPHONE NOT ON.)

ROBERT CARBERRY: You can go to sleep faster if you read the real scientific reports.

REP. DELGOBBO: Yes. And I don't know whether it is you or this gentleman, who is better able to answer the questions. Not related to -- excuse me. Not relating to trying to get a debate on the specific effects of EMF, but the overall policy implementation.

In other words, we've heard from the Chairman of DPUC about the policy imperative. The very critical need to deal with this infrastructure issue -- to move forward. Obviously you, and our other utility in the State, are the ones that have to get this done. And you have the burden of being the applicants.

A broad question is that you have an application before the Siting Council and I'm going to give you the opportunity to briefly describe it, because I saw it in a video that UI did at one of the hearings, I think, in Wallingford, that what went into your consideration of why you sited this way and looked at alternatives.

And more importantly, the flexibility going forward on how this application is considered by the Siting Council in terms of the willingness of the applicant to continue to consider other alternative ways of siting this line.

So just a broad question for you to sort of enlighten us as a Committee on that.

ROBERT CARBERRY: Sure, let me try. Let me, first of all, make clear that I am currently at the company serving as a Project Director of the first project, the Bethel to Norwalk Transmission Line Project.

So I know that project inside and out. And I know the second project a lot less well.

That project has proposed approximately sixty to seventy miles of transmission from a point in Norwalk to a point in Middletown.

Obviously, a criterion for the company is to try to make use of existing transmission right-of-ways, wherever possible, in proposing such a project. And trying to minimize any widening of such right-of-ways, because any widening costs money and often causes disruption to neighboring properties. So it's an important criteria to try to avoid that.

There are some underground sections proposed for that project, principally because that very disruption. The widening of narrow right-of-ways would be quite significant and quite costly and, in fact, in those situations, I believe, the underground is actually cost-competitive or even best for those portions of the right-of-way.

Elsewhere that's not the case. There are also some very significant limitations in electrical engineering to what you can do with underground cables. Many people just assume that they are the same as overhead lines in a power system, but they are not.

One of the important distinctions is that because they are below ground and their heat does not get away very well, you almost always need two or three underground cables to match the capability of an overhead line. So that adds to the cost problem.

But secondly and more important, underground cables have an electrical characteristic that makes them about the equivalent of 24 miles of an overhead line. Every mile of an underground line is like equivalent to 24 miles of an overhead line. And you quickly get into some electrical system problems if you try to put too much underground at high voltages like 345 kV into a power system.

So those are some considerations, which limit, even if cost is no object, consideration for

underground. That's a couple of the factors.

By the way, as far as the Siting Council is concerned, an application is made to the Siting Council and many alternatives are evaluated. They are evaluated either by the applicant in that proposal, but also during the Siting Council proceedings. Ultimately, the applicant can only bill what the Siting Council certifies. So we're very flexible to go with whatever they can certify.

REP. DELGOBBO: Thank you. Thank you Madam Chair.

SEN. PETERS: Thank you. Just real quick, since you brought up the cost factor, sir. Given the same set of circumstances, in terms of locating is there an average number in terms of differential between underground and overhead?

ROBERT CARBERRY: An average cost difference? If an overhead line can be built on an existing right-of-way, so there is no additional right-of-way costs, you might expect that difference to be typically four to five or six to one, more expensive for an underground line.

SEN. PETERS: And who bears those costs?

ROBERT CARBERRY: Ultimately the ratepayers who are consuming electricity. I had the discussion with Don Downs before about how much of that might be socialized, but ultimately the ratepayers.

SEN. PETERS: So it's not borne on the industry? Because this is a pass-through that ultimately the ratepayers pay for? So, therefore, the cost factor is not a consideration with respect to the position that the industry would take with respect to whether wires should go underground or not?

ROBERT CARBERRY: No, we're obviously trying to keep service at the lowest reasonable cost. But when there is a better circumstance that costs more, we obviously go there.

SEN. PETERS: Thank you. Representative Duff.

REP. DUFF: Thank you Madam Chair. Good afternoon. I just want to ask a quick question, because we're going -- we've heard a little bit about cause and effect today of EMFs. And granted, I guess, the research says that there is nothing direct.

What would you say to indirect adverse affects, because of having power lines close to someone's bedroom or schools? Is there some sort of cause and effect? It may not be something direct, but it may be something that we see down the road.

Have there been studies about that at all? Or maybe more long-terms affects than short-term? Is there a position that NU has on that at all?

ROBERT CARBERRY: If I understand your question correctly, the studies that have been done effectively can be called long-term, because they tend to be epidemiology studies, which are studies of disease incidents in populations. They generally capture large periods of time and they look for associations.

When you hear in the newspaper that something has been associated with something else, or there is a link with something else, they're talking about a statistical association.

And such studies, however, never prove cause and effect by themselves, they simply indicate an association. Let me give you an example. If you were to study the coincidence of alcohol consumption and lung cancer, you might find that there's an association that occurs there.

People who consume more alcohol also have higher incidence rates of lung cancer. And if you did that for a large population of a large number of years, you would be pretty certain of that.

If you concluded that alcohol consumption caused lung cancer, you would be neglecting a confounding variable that many people who consume large amounts of alcohol are also cigarette smokers and that the real cause of the condition might be cigarette smoke.

So that is a fundamental weakness of epidemiology. And it's even more of a problem when you are looking at very, very low risk. Diseases like childhood leukemia are extraordinarily low in risk in the population, like one in twenty thousand. It's very, very difficult to do studies like this, and that's why any suggestion of a link is even weaker in scientific minds.

Is that what you're getting at?

REP. DUFF: Yes, basically. And I thank you for that. I just want to make a comment to what you said in the beginning is that obviously we have -- there are EMFs are just as high in electric train travel and other places, and we shouldn't be complacent. And though we may have some type of EMFs with that, as well, we should also look into those.

We shouldn't just say that well, just because it is on trains, so it's okay for power lines. We need to be vigilant anytime we have EMFs or anything that we may think may cause some types of disease. Not actually just go after one entity, but look at that from a society point of view.

But that -- I just wanted to comment. Thank you very much.

ROBERT CARBERRY: Just an important supplement to that is that exposure assessment is a key aspect to these studies. What is your exposure? Are you a two? Are you a three? Are you a four?

And generally those assessments are done with some spot measurement or some brief measurement perhaps in your home, but most people don't spend all their time there. And they get quite a variety of exposure, a very, very wide variety of exposure. And it's very hard to then say that you're a two and you're a three or you're a four.

SEN. PETERS: Unless you have a winter like we've had this winter, and we've all spent more time in our homes. Thank you. Representative Nardello.

REP. NARDELLO: Just a brief question. We have other testimony in front of us that actually comes from many children's environmental groups, particularly at Yale. And they, of course, take a different position than you do. And in this world we all have different positions.

But, I guess, my concern here is that there are people that feel differently on things. And maybe in terms of taking back to your company, if there is questionability, if there are two different positions on a particular issue. We're looking at risks to children and risks around school in areas that we're all concerned about as a society. You, as a company, may want to go back and reevaluate how you could possibly work within the framework to come to a place where the people in this room can be comfortable and you can be comfortable? Because I really believe that we can get there.

And I do think there are different points of view on this. So I'm just asking you to consider, again, the death and breath of the concern that is expressed in the room. And the fact that there is testimony that probably looks at this issue a little differently than you do. You both have respective points of view, and I just ask that you give consideration to that. And you could feel free to comment on that.

ROBERT CARBERRY: Thank you, we will. It reminds me to make one thing very clear, that I am not a scientist. And you are probably going to hear from people who may be medical doctors or scientists. And every panel -- we rely, as I said, on panels of experts and their publications that they produce and we're not trying to overrule them or get our own panel -- we do not do that.

We rely on the consensus of the scientific community. There is never unanimity in any of that. Any panel has someone who will agree with someone who will sit here and say something different. This is a controversial issue and that's what you will find.

REP. NARDELLO: And my point is exactly that. That

maybe we should err on the side of caution and find that middle of the road.

ROBERT CARBERRY: That's one of the reasons that the Siting Council has a Best Management Practice Policy. And why there has been a lot of support for research and education and free measurements over the years, so those are the elements of current policy and it always can be improved.

SEN. PETERS: Yes, Representative -- please.

REP. MAZUREK: Thank you. Gentlemen, thank you for coming today and giving us your position. I had just a quick question and it has to do with your savings concerning the difficulty in burying a cable underneath the ground.

Can you give us an idea as to how difficult it is, in comparison to burying it let's say at the bottom of Long Island Sound, is it easier to put it there?

ROBERT CARBERRY: I would say generally it's easier to do something in the bottom of Long Island Sound, because you can do it from a boat and there is really nothing in the way. You're not digging through a street and dealing with traffic, for example.

Having to excavate soil and bring it away and bring it back, it is a much more time-consuming process. For example, on the Bethel to Norwalk Project, we have approximately ten or twelve miles of overhead line to build and about twenty miles of underground. The underground is going to take a good eighteen months to do, because of that time process.

I believe the Cross-Sound Cable was probably put in within a couple of weeks. So it's quite a difference.

REP. MAZUREK: From the standpoint of technology, not much of a difference between burying it in the sand of Long Island Sound and burying it in the street?

ROBERT CARBERRY: It is different. It is different.

When you have obtained the cable for something like the sound crossing, you can have it manufactured in the factory and installed on a barge for maybe a length of twelve or fifteen miles, so that it has no splices in it whatsoever. And it's fundamentally direct buried or laid right on the surface of the sound. It obviously has to have some protection from the marine environment.

And an underground cable in streets, there is no such thing as opening a trench for twelve or fifteen miles. So one generally builds vaults or manholes and duct systems between the two manholes, and then hauls very large reels of cable to a location and pulls them through. Because the cables are so thick, the reels can hold about eighteen hundred to two thousand feet of cable. And so there is vaults about that location -- there's pulling operations to pull them in and then there are splices.

The splices are probably the most reliability weak aspect of these kinds of systems, so the technical differences would say it's actually easier to do a submarine type cable crossing, then it would be to do on land.

REP. MAZUREK: So this burial probably would be a half a mile at a time or something like that for a couple thousand foot cable?

ROBERT CARBERRY: On the on-land type of project?

REP. MAZUREK: Yes.

ROBERT CARBERRY: It generally proceeds at a pace of about a couple hundred feet a day, and once you put in a couple thousand feet, you can have somebody start the cable pulling operation. But it marches along until you've done whatever you have to do.

REP. MAZUREK: Okay, good. Thank you. I appreciate it. Thank you Madam Chair.

SEN. PETERS: Thank you Representative Mazurek. Thank you gentlemen.

ROBERT CARBERRY: Thank you.

SEN. PETERS: I appreciate your testimony. Majority Leader Jim Amann. And Senator Smith -- did you? Welcome gentlemen.

REP. AMANN: It's the day for in-tandem testimony, I guess.

SEN. PETERS: Well, we appreciate that you're both very busy and taking the time to testify.

SEN. SMITH: Thank you Senator Peters, Ranking Member DelGobbo and the rest of the Energy Technology Committee for giving us this chance to speak on some of the bills that are being considered here before you.

In particular, we're here on the Klarides-Crisco Bill. I was very glad to hear Representative DelGobbo talk about the fact that this is being raised as a vehicle for consideration of a variety of other thoughts and ideas that have been proposed to your Committee on the substance of their bill.

We are in accord with that. We think that there is a lot of material out there. You heard some discussion about there is no consensus in the scientific community and perhaps there is not.

I like the idea of erring on the side of caution. And I've spent some time reading some of the very dry material on both sides of the issue. I think that when there is as much at stake as there may be on this issue, that maybe we should step in and as a matter of public policy make a determination.

If not a mandate, then at least a preference for keeping these things out of certain areas. Or in the alternative, some of the ideas that we've had is with respect to the burial of these lines. Burial being in our estimation the appropriate way for these things to be strong.

We'd love to see a policy decision that it would be mandated as such. A preference even given to the Siting Council would be a better situation than the

one that we've got today.

We think that over time it's become very difficult to figure out exactly what the position of the industry is. Initially they couldn't do any burying, then they could do some, then they could do more.

Now today I heard about a cost-benefit analysis as to whether or not they can bury things. In Phase II, they suddenly discovered they could in fact bury twenty more miles when it became cost-prohibitive, if not impossible, to bury the first twenty miles of that line.

I suspect if they were to be required, or anybody in the future were to be required to bury these lines, they would figure out a way to do exactly that.

As well, I hope that you all will consider some reforms to the Siting Council system. Having been subjected in some fairly painful fights to what's going on there at the Siting Council, the legislature probably should come to the recognition that that process needs changing, if not outright overhaul.

It is not a fair forum. The utility companies have a built in rate base and almost unlimited resources with which to make their arguments and to press their applications. Opponents to those applications do not have those kinds of resources nor access to the experts that can be built into a rate base.

Whether that comes in the form of an Office of Environmental Advocate, which I think is a good idea and worthy of consideration, or having decisions come before the legislature for legislative override or something of that nature.

I would hope that this Committee would look at the Siting Council process and rethink some of the glaring difficulties that are now presented.

REP. AMANN: Well, good afternoon. Thank you Senator Smith. Great to see you Senator Peters and

Representative DelGobbo and the distinguished members of this wonderful Committee. I just want to add to what Senator Smith just stated. Basically I am here today to offer my support of H.B. 5418, AN ACT CONCERNING ELECTRICAL TRANSMISSION LINE SITING CRITERIA.

For over two decades there has been heated debate over the potential danger of electromagnetic forces, EMF, that emanate from overhead power lines. Also, the debate, as all of you I'm sure are well aware of, has been conflicting.

The risks are believed to be relatively low, however, there are some scientists that have found an association between childhood cancer and power lines, as well as similar exposures risk among occupation exposed workers.

So as you know much better than I, and Senator Sullivan you've been dealing with this for a long time, what is the truth? Do they affect or do they not?

In actuality for every established published study claiming a relationship between cancer and overhead power lines, one or more alternative studies have been released, which refute any potential dangers.

Yet given the conflicting scientific reference regarding health risk from electromagnetic fields, the question remains, how should we proceed when locating high voltage lines in our communities?

I believe we should always come down on the side of caution. We must take measures to protect our children from health hazards. And to me that means that these power lines must be located away from such areas as playgrounds, schools, daycare and related facilities.

As you know, you will be hearing from Mayor Richetelli and Alderman Slossberg from our community pretty soon. They will tell you about an instance that occurred of a line already existing that actually fell in someone's backyard. A woman and her husband saw the line and they had children.

So it is above line. It happened. So just talking about the EMF, just a simple danger of weather condition related or wear and tear or whatever that they can be potentially very dangerous.

This just happened, Gayle -- a month ago? Mayor?

GAYLE SLOSSBERG: Yes.

SEN. SMITH: Approximately a month ago. So those are serious things we must consider.

I was out with two doctors the other day, just socially and no they didn't bring up med mal, because I told them I wouldn't go out to dinner with them. They are friends of mine, one of the surgeons operated on me.

So this subject came up. They are two of the best doctors at Yale New Haven and the other one also does Saint Raphael's. So I asked them, what do you think?

And they looked at each other and they debated there for twenty minutes. They said we don't know. We don't know -- we're not experts in this, but we've talked to experts and we really don't know. And they said, it's just like car cell phones that we're all so pleased with, we don't know. And they said 20 years now it might be a serious thing, we don't know.

So if those are the answers of people that are in the field that take care of children and us, and the people that are trying to protect children and our health and welfare, we just have to be going on the side of precaution, and we hope that you will pass this bill.

Thank you very much for your time and if you have any questions, we'd love to try to help you.

SEN. PETERS: Thank you for your comments. Just a quick statement to Senator Smith. Representative Duff and Representative DelGobbo spent many hours last year working on a bill that we passed regarding the Energy Advisory Board, which challenges the

processes that Siting Council uses and hoping to work together to recognize what it is we need to do to move the process forward and that it's more open.

So we're looking forward to that getting off the ground and dealing with the very issues that you've expressed concerns, Senator. Representative Nardello.

REP. NARDELLO: Just one question and Senator Smith, I'm just asking this actually from the legal perspective, because I'm not a lawyer, but something has occurred to me.

You know I'm very sympathetic to this issue, but what hasn't been raised yet in this hearing is if we were to pass this legislation, okay, it would have a reach-back proposal to a project that is already in process.

I know that from a legal perspective that presents many challenges. Can you just comment on that, because that's a concern of mine as to how we address that issue? That's why I said, there might be a better way to do this. We can bring everybody together and get the issue resolved. Because the reach-back issue -- I need your legal perspective on that.

SEN. SMITH: Thank you Representative. I'm not an expert in constitutional law, or in that area, but retroactivity does raise many difficult issues. And to the extent there are retroactive provisions, I think you're going to have look at them with your attorney on your Committee to see if that is something that will still be applicable to an application at this stage of consideration.

And the retroactivity, maybe to the extent that the application has not yet been finalized or is still subject to modification or other things, could still be fairly enacted, I think. But the further along in the process you get, the more difficult it is to reach back.

The alternative, of course, to something like that would be to do something like we did with the Cross Sound Cable, which is to put a moratorium in place until we can pull all the parties together, as you were suggesting, and come to some kind of a consensus on things and then begin to move forward yet again.

I think the moratorium would probably -- would be implemented in this context. Moratoriums, I think the legislature is fairly cautious about playing with them or implementing them, so if you could do something more targeted, I think that would probably be better.

REP. DUFF: Any other questions? No. Thank you Representative, Thank you Senator. Representative Miller.

: There's always one in the mix.

REP. MILLER: Thank you. These two handsome men from Milford. I was just going to inquire, nobody has been talking about underground lines that may provide some security against terrorists. And I just wanted to know how you felt about that?

SEN. SMITH: I think you could make an argument that underground lines are less subject to any kind of disruption, intentional or otherwise.

There was a discussion earlier about how you would fix an underground versus fixing an overhead line. Underground lines are inherently less likely to be broken, eroded, weathered, driven into, blown up or anything of that nature. So I think things underground are probably a safer bet, whether it's voluntary or involuntarily.

If terrorists are going to be blowing something up -- I saw what the blackout did this summer and it strikes me as quite a disruptive way to do things, but there are probably bigger targets then transmission lines.

REP. AMANN: But a very good point, Representative Miller. And I think all of us, whether it be

terrorism, children's safety, health issues, burying them underground makes sense to almost everybody in this room. And certainly if there is a way that we can do that, whereas to bury as much as we can, would be preferred.

REP. MILLER: Thank you very much. Thank you Mr. Chairman -- Madam Chair.

REP. AMANN: Is one of the chairs going to excuse us or --

SEN. SMITH: Senator, are you done with us?

SEN. PETERS: Thank you. Thanks for taking the time. One of the prerogatives of the Chair is that you can shuffle things around a little bit when you see the situation merits it. And I notice that we have two small children in the audience and I would ask Lynn Stanwood to come up please.

LYNN STANWOOD: Hello Chairman Melodie Peters, Chairman Terry Backer and Committee members. Thank you for giving us this opportunity to speak on the Electrical Transmission Line Siting Criteria, Bill No. 5148. My name is Lynn Stanwood. I live at 67 Royal Oak Drive in Durham, Connecticut.

Residential neighborhoods must be included in this Energy Bill, simply due to the reason of reasonable doubt. We have 260 children in our neighborhood. Some of the homes are three feet from the right-of-way.

Is the scientific evidence beyond a reasonable doubt that EMFs do not cause leukemia in children? Is it beyond a reasonable doubt that the corona ions do not cause lung and mouth cancer?

Is it beyond a reasonable doubt that the lightning rod effect that the power lines towers will create will stay within the easement through the residential neighborhoods that NU and UI are going to install? Or that NU and UI are only going to install one 345-kilovolt line or three 345-kilovolt lines through residential neighborhoods? Or that the property value of homes in residential

neighborhoods will not decrease 20 percent or more in property value?

Is it beyond a reasonable doubt that the up front costs of undergrounding may be more expensive, but the upkeep much cheaper than regular overhead lines?

Is it beyond a reasonable doubt that there really is no limiting factor in undergrounding high-tension power lines other than huge up front corporate profits?

All power lines must be undergrounded especially in residential neighborhoods. Thank you.

SEN. PETERS: I thank you for your testimony. It's our collective opinion in our deliberations on this issue, once we focus in on it, that it does make more sense to broaden the standards and not exclude residential areas. And your testimony helps us with those deliberations.

Any questions? Thank you.

LYNN STANWOOD: Thank you very much.

SEN. PETERS: Your children are lovely.

LYNN STANWOOD: Thank you.

SEN. PETERS: First Selectman Mitch Goldblatt from Orange.

MITCH GOLDBLATT: I heard that. Chairman Peters, members of the Committee of Energy and Technology. My name is Mitch Goldblatt, First Selectman of the Town of Orange and Chairman of the South Central Regional Council of Governments, a regional agency made up 15 chief elected officials from the greater New Haven area.

I am here today to testify in favor of R.B. 5418 introduced by State Representative Themis Klarides and State Senator Joseph Crisco, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA.

At our South Central Regional Council of Governments' meeting yesterday the following motion was made by First Selectwoman Amey Marrella and adopted unanimously.

The members of the South Central Regional Counsel of Governments support R.B. 5418, including endorsing the amendments in sections d, e and f. This would mean burying high-voltage lines underground when they are close to private or public schools, licensed child daycare facilities, licensed youth camps or public playgrounds.

The actual distance from these areas will be determined by the amount of kilovolts. In the case of the most recent application for upgrades to existing power lines to 345 kilovolts by Connecticut Light and Power and United Illuminating, this would mean if the lines are within 600 feet of such facilities that the lines would have to be buried.

The safety of the families in our communities are dependent on this Committee's action. Please vote R.B. 5418 out of Committee and to the floor, for the good of the residents of the entire state.

As First Selectman of the Town of Orange, I have attended three public hearings conducted by the Connecticut Siting Council concerning these power lines. It is very evident that not only don't the residents of my town and towns surrounding me want overhead power lines increased in voltage, they are legitimately concerned for the health and safety of their children and support the lines going under existing streets and highways.

This bill will begin to protect our citizens going forward. This is a great first step. Please consider the future health of those citizens you represent and those not yet old enough to vote when you decide this matter.

If I have an extra minute here or less, I would also like to express my support for R.B. 5419, concerning the maximum daily compensation rate for members of Connecticut Siting Council.

I have observed the Siting Council on numerous occasions, since my tenure as First Selectman, having to do with both cellular towers and now the 345-kilovolt proposed lines. The Siting Council members have conducted themselves professionally and with courtesy, even when being yelled at by residents and others.

And I think that their proposal to you is well-founded and deserves your support. Thank you for your consideration of my testimony.

REP. DELGOBBO: Thank you sir. And we appreciate you taking the time to testify on behalf of all your residents of your community. Are there any questions of members? Thank you sir.

MITCH GOLDBLATT: Thank you.

REP. DELGOBBO: Our next speaker will be Dennis Hrabchak.

DENNIS HRABCHAK: Good afternoon. Thank you Ranking Member DelGobbo and other members of the Committee. My name is Dennis Hrabchak, I am Vice-President of Regulatory Policy for United Illuminating.

I am presenting UI's testimony in opposition to R.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA. The proposed legislation is unnecessary.

Today, under existing statutes, the Connecticut Siting Council cannot issue a certificate of environmental compatibility and public need for an overhead electric transmission line, unless the Council determines that "the location of the line will not pose an undue hazard to persons or property along the area traverse by the line".

Since the 80s, the Siting Council has included electric and magnetic fields as criteria for evaluating all electric transmission line applications and has been proactive in insuring that it has the information necessary to make the required statutory determination.

The Council keeps abreast of specific studies and articles on electric and magnetic fields. The Council has adopted Best Management Practices with respect to electric and magnetic fields.

Section N of the Council's guidelines for electric transmission lines requires that the certificate application include justification that the location of the proposed transmission line would not pose an undue safety or health hazard to persons or property along the area traverse by the proposed transmission line, including measurements of existing electric and magnetic fields at the boundaries of adjacent schools, daycare facilities, playgrounds and hospitals with extrapolating calculations of exposure levels during expected normal and peak normal line loading.

Two -- calculations of expected EMF levels at the above-listed locations that would occur during normal and peak normal operation of the transmission line. And three -- a statement describing consistency with the Council's Best Management Practices for electric and magnetic fields as amended.

Each Council opinion granting or denying an electric transmission line application and the Council's associated findings of fact explicitly discuss electric and magnetic fields. Thus, the Council already had a statutory responsibility, and the statutory authority to consider the issues of concern in this bill.

If the Siting Council determines that a specific proposed location for an electric transmission line would cause undue hazard to persons or property, the Council is required to reject the application.

There is no scientific basis for requiring that electric transmission lines be a specific minimum distance from any location. The level of electrical and magnetic fields at schools, daycare facilities, camps or playgrounds, or any other location, near a power line or other electrical source is simply not determined by distance.

No state or federal agency or legislative body anywhere in the country has developed or imposed health-based exposure standards with respect to electric and magnetic fields. This includes Connecticut's Interagency Task Force on Electric and Magnetic Fields.

The public health and safety is well protected by the Siting Council, continuing it's rigorous required consideration of electric and magnetic fields in the context of specific applications and specific locations, taking into account all information and literature to the date of the Council's evaluation of the application.

UI appreciates the opportunity to comment on this Bill. We share the concern for the public health and safety of the forum, which is the underlying intent of the bill. However, as outlined in this testimony, these concerns are already comprehensively addressed in the existing siting process.

May I answer any questions?

REP. DELGOBBO: Thank you sir. First of all, I apologize for the mispronunciation of your name earlier. And actually to both the applicants who are here today testifying on this bill, I just want to note that the Committee appreciates the particularly difficult circumstance we put you in as being an applicant for the Siting Council on these issues and then having you -- which has the certain sense of legal standards. And then have you come here before the legislature to expose yourself to us. But both goes with the territory, obviously.

Are there members with questions? Thank you. Thank you very much sir.

DENNIS HRABCHAK: Thank you.

REP. DELGOBBO: Our next speaker will be Mayor Richetelli.

JAMES RICHETELLI: Good afternoon Ranking Member DelGobbo and members of the Energy and Technology Committee. My name is James Richetelli Junior. I am the Mayor of the City of Milford, and I appreciate the opportunity to testify here today in support of H.B. 5418.

As you may know, Milford is one of the municipalities located in the path of the proposed 345-kilovolt loop from Middletown to Norwalk. If the project is approved, these high powered transmission lines will have an irreparable impact on the citizens, the residents and our environment in Milford.

This project includes a substation to be located in Milford. The City does not oppose or object to the substation, as it is proposed for a location in heavy industrial area. As suitable as that area of Milford may be for a substation, the location of the 345 aerial transmission lines is equally unsuitable. STARTHERE

As proposed, these 345 kV lines will run straight through several densely residentially populated neighborhoods. The residents of these neighborhoods are understandably concerned about health and safety implications.

In addition to the fear about the increased electric and magnetic fields, these residents are also concerned about the structures themselves. Many of the fall zones of these structures actually encroach on property lines and, in some cases, the actual homes themselves.

Majority Leader Amann eluded to an incident that happened in January, where one of the lines fell very close to a person's house. It actually hit a boat that was parked in the person's yard.

Further, the current proposal would locate the 345 kV transmission lines straight through the center of Eisenhower Park, which is Milford's largest open space and recreational parcel in our city. Allowing the lines to bisect this parcel limits

recreational use and impacts the open space character of this property.

If the 345 kV lines are installed through the center of the park as proposed, the City will be unable to provide the recreation and youth programs, including summer camps, swimming, skating rinks and the like, that it might if the lines were not located in this location.

Although there is concern about the aspects of the project that will be visible to the human eye, there is far more concern about the aspects of the projects, which will remain unseen.

The environmental implications of this project are far more serious than simple land use issues. If approved, the 345 kV lines will result in the exponential increase of electric and magnetic field levels in the areas around the lines.

In Milford, areas that will be impacted by the increase in EMF include recreational areas, ball fields, children's play areas, houses of worship and densely populated neighborhoods, including at least one subdivision comprised of approximately 400 homes with many children.

Residents are specifically concerned about the exponential EMF increase associated with the proposal. As an example, the calculated magnetic field of the existing transmission lines at Eisenhower Park is 2.6 milligauss. The Docket 272 before the Siting Council application materials indicate that the magnetic field at peak load in the same area will be increased to 30.7 milligauss once the 345 kV lines are installed.

The EMF studies and scientific conclusions are replete with ambivalence, caution and caveats. Not one of these studies can unequivocally confirm that EMF experienced at the anticipated levels will be safe. Further, there is no irrefutable or convincing proof that these exponentially higher EMF levels will not negatively affect the adults and children that live and recreate in the shadow of these transmission lines.

To that end, I would suggest that the proposed language be revised to change public playground to public recreation area. And I would also request that densely residential areas be included in the bill.

This is an issue in which risk is not acceptable, particularly when there are alternatives available.

Finally, this is an opportunity for the state of Connecticut to make our future and that of future generations better.

It is rare that we, in the present day, can bequeath a gift of such an enormous value to our children and our grandchildren. As a result, I support this bill with the hope that it will protect those individuals, those families and those communities that will be impacted, as well as insuring the health and safety of our community's future.

If these restrictions are implemented, it will have a resounding affect on the lives and the safety of our constituents and the constituents of the state of Connecticut.

I thank you for your time. And at this time, I would like to introduce Gayle Slossberg, who is the Minority Leader of the Board of Aldermen in the City of Milford.

GAYLE SLOSSBERG: Thank you Mayor Richetelli. Good afternoon Chairman Peters and members of the Committee. Thank you for the opportunity to speak to you today. My name is Gayle Slossberg. I am the Democratic Minority Leader for the Board of Aldermen in Milford. I am also the Speaker of the Houses' appointee to the Connecticut Energy Advisory Board.

I am here today to testify in favor of R.B. 5418 that establishes basic safety distance standards in relation to EMF and areas where people, especially children, congregate.

I support this bill, because I believe that taking into account all of the scientific data, including the inconclusive data, there is still enough evidence to suggest that there is some relationship between EMF and childhood leukemia.

Under those circumstances, we must err on the side of caution when siting electric transmission lines.

Our current siting criteria require an applicant to address the adverse impacts on public health and safety. However, there are no specific standards as to how to quantify those impacts.

Representative Nardello asked earlier today the question about retroactivity. And I don't have a specific answer for that either, however, this could be viewed as a clear clarification of the existing criteria that exists. Even Northeast Utilities had stated before that in the criteria there is language with regard to undue hazards. I believe that this bill clarifies and sets a clear standard, where there isn't one currently.

Now this Committee knows that there are some issues with regard to the siting criteria. And that's why you, in your wisdom, passed Public Act 3-140, which will cause the CEAB to establish preferential criteria.

And in response to your question, Representative Duff, earlier is this something that the CEAB is going to be taking up? I know I, for one member sitting on this Board, consider this to be a very significant issue in determining preferential criteria. But, again, the issue there is that the criteria that that Board is going to come up with, will not apply to this pending application.

There are a few proposals that we are allowed to issue. We are allowed to request proposals as of October 1st. And then it becomes mandatory, I believe it's December 1st of this year.

So what we're doing is working on preferential criteria to help this process along. But here you have something right in front of you. R.B. 5418

provides specific standards for Siting Council to follow when evaluating a proposed transmission line.

And by passing this bill, you will be taking one step forward toward developing a clearer more definitive standard by which all applications shall be evaluated in the future. And in so doing, you will be protecting our children from the harmful effects of EMF.

We know we need safe and reliable energy to live our lives, to conduct our businesses and to grow our economy in Connecticut. And Connecticut can not afford to make the siting process so burdensome that utilities cannot and will not invest in the infrastructure.

So we have to be sensitive to feasibility and cost issues. But this bill doesn't prohibit upgrades, it doesn't require any new technology, it doesn't even require that lines be placed under streets, although, I believe that is the direction that we should be moving in.

(GAP IN TESTIMONY -- CHANGED TO TAPE 2B)

GAYLE SLOSSBERG: And one of the things that this Committee, I think, needs to know is that in this application there is no cost comparison with regard to life cycle costs, undergrounding versus overhead.

We also know that coming in the future from R-TEPO III, that there are going to be additional transmission line upgrades. As well as in R-TEPO III, they identify numerous other transmission projects throughout New England.

So if the issue is, are other states in NEPOOL not going to support this because they're calling this gold plating, I would suggest that perhaps we need to join forces with some of the other states that have transmission projects being identified, so that we can work regionally and we can move forward with a policy that protects the safety and welfare

of all of the citizens, not just in Connecticut but in all of the New England area.

We are at an energy crossroads in Connecticut. We have severe transmission problems in Southwestern Connecticut that need to be addressed and Phase II will not be the last upgrade we will need.

We will not be the first state to establish these sorts of guidelines and make these sorts of boundaries. There are several states already that limit the proximity of lines to areas where children gather.

Although this is the Energy and Technology Committee, when we're talking about costs, we've got to remember everything is interrelated and the decisions we make in one area of our lives effect the decisions we make in other areas of our lives.

It would be irresponsible for us to try to decrease energy costs by taking the least cost method without recognizing that we may be increasing our health costs on the other side of the equation. Because we're always talking about rising health costs and we need to remember that these things are interrelated.

This bill is aimed at protecting children, who are the most susceptible to EMF effects. But I would also hope, as did the mayor, that this would protect any areas that are densely populated or where people regularly congregate, such as public recreation areas and residential areas.

Earlier Representative Nardello asked a question about FERC coming down and taking over, if we don't?

SEN. PETERS: Alderman, could you sort of summarize? I'm trying to -- I hope people would respect the three minute rule here, which has gone awry many times today.

GAYLE SLOSSBERG: I'd be happy to. This bill will move us in the right direction. And hopefully send a message to FERC, that actually Connecticut is doing

exactly what Connecticut is supposed to be doing, establishing clear criteria that makes it easier for us to move forward with power projects.

I will summate. Obviously, you are charged with many responsibilities and you need to allow for the provision of energy and to protect the health and the safety of the people.

I believe this bill allows for both in a balanced and reasonable way. I've also brought with me a resolution from my Board of Aldermen in support of R.B. 5418 that I hope that you will consider.

I thank you for your time.

SEN. PETERS: Thank you so much. Representative DelGobbo.

REP. DELGOBBO: Thank you Madam Chair. And thank you both for your testimony, it's not lost on us. Serving on this Committee -- and I just want to put this in context as a comment to say that although we are termed the Energy and Technology Committee, that we understand the broad range of that mandate.

And I just want you, and maybe carry back to the Council and the citizens, that that is a responsibility we've taken, not just these members, but members before us and would draw your attention to the existing framework of the statutes that the Siting Council has to consider.

Obviously, we're here today to figure out what ways we might need to mend it, but I don't want it left unsaid or not on the record, a range of issues.

Our charge isn't to just draw statutes and say, all right, build the power lines. But, in fact, under § 16-50p of the General Statutes, and excuse me Madam Chairman, a little bit of liberty, but we have very, very specific guidelines under which the Siting Council needs to consider. And it's not just a matter of cost, but they do include the nature of probable environmental impact, including specification of every significant adverse affect whether alone or cumulatively with other effects on

and in conflict with the policies of the State concerning the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, forest, parks, air, water purity and fish, agriculture and wildlife, etc.

I just want you to know that those are statutes that emanated from this Committee and that those are the things that we do broadly try to take into consideration.

Thank you Madam Chair.

SEN. PETERS: Thank you Representative, since I will rule on that myself. Questions? Representative Duff.

REP. DUFF: Thank you. Thank you both for coming today and sharing your testimony. Just with regard to reaching back. Those of us who have been involved in Phase I have asked that question many times and maybe you'll get a different answer than we got.

But it was, when we did the CEAB Bill last year, we found out it was difficult to reach back. It depends I guess where in the process it is. Phase II is in the beginning stages at this point, but there are issues, obviously, with reaching back.

Secondly, I just wanted to say to the Mayor and, specifically, to Gayle. Thank you for the work you've done on the CAB, you've worked real hard and all the work that the CAB has done so far, because I know that you're working very hard towards that energy policy in the state. Just try to do the best that you can and in a short amount of time, while all these applications are going through.

You've really gone head first to try to get your arms and hands around all this technical jargon that's been going through. But I just want to say thank you for that, because I know you've worked real hard on it.

You've been part of this even before Phase II came along, before it even affected your community. I

just wanted to put that on the record. Thank you Madam Chair.

GAYLE SLOSSBERG: Thank you. I appreciate that.

SEN. PETERS: You're welcome. Representative Nardello.

REP. NARDELLO: Very quickly. Could you provide the Committee with the information on the other states, if you haven't already done so? I was trying to look through my testimony to see if I had it and I don't see it here.

And just are any of those states in New England?

GAYLE SLOSSBERG: I don't believe that any of them are in New England, but I don't know that for sure. I will check that and make sure that that information is forwarded to you.

REP. NARDELLO: Thank you.

SEN. PETERS: Thank you Representative. That may be something that Kevin can get for us as well. Thanks, Kevin. Thank you.

GAYLE SLOSSBERG: Thank you very much.

SEN. PETERS: Thanks for your patience. Senator Fasano has been in and out of this room nine million times. Senator Fasano, please come forward. And he will be followed by First Selectwoman Amey Marrella.

SEN. FASANO: Senator Peters, thank you very much. Members of the Committee. My name is Len Fasano, State Senator for the 34th District, which includes the Town of Wallingford.

We had our public hearing a month or so ago and about 500 people showed up in concern about the power lines going up. And they say -- I know you've had some testimony about bill 5418 and I'd like to say I support that bill 5418.

However, I'd like to bring some other matters to your attention. Senator Gaffey, I think, did a

great job testifying in front of this Committee. His testimony was the fact about the health concerns and I think that's a major concern.

When I met with Pam Katz and let me tell you that Pam Katz -- Chairman Katz before the application I met a few times to talk about it, I think she's a terrific woman and she's done a great job with the Siting Council.

However, what became clear is that the health concerns are concerns that they take into account, but clearly there is not a finding on whether or not the power line on any given moment has a negative impact upon the health of the residents.

And although the statutes requires the Siting Council to look at those factors, it doesn't require particular findings. I don't think it's fair to say when the power lines go through the residences it's closer in some respects and further in others, but there is not a finding as the power line progresses that it is unsafe or proven to be safe.

The onus of the statute should be that -- Northeast Utilities in this case -- should have the obligation of bringing forth the evidence to show at each linear moment on this line, that the health concerns have been addressed and the information has been addressed.

The past has been for the Siting Council to recognize that the health concerns are at best controversial and not clear cut.

My understanding is, through Pam Katz, that on March 25th there is going to be a separate hearing on EMF -- issues of health concerns. That's what I heard Pam Katz tell me. And I think that's a terrific first step. I think that's meeting the obligation that the Siting Council has.

But even more than that, I think the statute should reflect that there has to be a particular finding on that result.

The next issue is property values. The Siting Council takes the view that property values are not relevant. I strongly disagree. I read the testimony that is cited in Phase I, where there was an expert that testified on property values. The claim was that there is no way of making a finite conclusion as to the adverse affect of towers on property values.

But what is clear, if you take a house and it's got a property -- and it has a tower in the backyard, that property is worth less than a property that doesn't have a tower in the backyard.

When the State condemns property, when the Town condemns property, there is a value given to the property that is taken by the State and there's also value given for the property that remains -- the remainderman. And when you take a look at the remainderman you're allowed to look at curbside appeal. That's part of the value that the State and Town looks at. There's no difference in this case.

When you put up a power line, you are taking a visual impact. That value is worth less on that piece of property. That not only translates to the property owner, but to the municipality. Because if the property is worth less, the appraisal or the assessment value is less, which means the grand list value goes down and the whole town pays for the less fair market value of the property throughout the area.

The Siting Council takes the view that those values should not be looked at. I totally disagree. I think that they are. I do a lot of zoning work as a lawyer and I will tell you that that has a dramatic impact on developments that I've been involved with, whether or not power lines are in the back.

In conclusion, I believe that we need to change the statutes as it pertains to Siting Councils to have them take into effect the real impact of the health issues, come to a conclusion, and property values.

I agree they are difficult. I agree they are tough sometimes to get your arms around, but I think that's the import of the Siting Council. And we've now seen it more of a factor because of the change of what's going on with the energy crisis that is being claimed in the southwest portion of the State of Connecticut. So we need to bring in a change. Well that spawns new legislation, which spawns new ideas.

So I look to this Commission to change the statutes to take into account all of those concerns that we've heard time and time again, not only in front of this Committee here today, but in front of the many public hearings throughout the state on Phase I and Phase II.

I want to thank this Committee for its time and its patience and I'll answer any questions that you may have.

SEN. PETERS: Len, thank you for your testimony. I was thinking about your comments about property values and the -- not the upward battle that this bill is going to have, however, it appears once the Committee takes some action on it, you know that there are a number of Committees that a bill has to make a stop at before it actually gets to the calendar.

So by adding other things, and we need to consider that in our deliberations, by adding property tax values and those kinds of things to a bill, in my opinion, it creates more stops and may weaken or lessen the chance of a bill getting through on the substance. So we're going to have to figure out how we do this as we look at the issue comprehensively.

SEN. FASANO: Senator Peters, being the first year rookie legislator, I am learning that very quickly that the more items that you add and the more stops you make, the less likely a bill passes to the floor. And I appreciate that comment.

And that's the reason why I do agree 5418, as drafted, is a very, very important bill. And I

leave it up to this Committee to believe that if this is more important to leave it as is, so it doesn't add other baggage, if you would, which may stall the good purpose that this was drafted, I understand that.

But I felt it was important to raise these concerns, but I certainly appreciate what the Chair is saying.

SEN. PETERS: And how lucky you are to have benefited from my wisdom before I leave. Any questions or comments?

SEN. FASANO: Thank you Chair.

SEN. PETERS: First Selectwoman Amey Marrella. Amey, I'm sorry that you were overlooked.

AMEY MARRELLA: Oh that's quite alright.

SEN. PETERS: Is it Amery or --

AMEY MARRELLA: My parents did that to me, it's A-M-E-Y. It's hard to read.

SEN. PETERS: I'm sorry. Thank you.

AMEY MARRELLA: Good afternoon and thank you for giving me the opportunity to speak in support of R.B. 5418 as drafted. My name is Amey Marrella. I am the First Selectman of Woodbridge.

I believe this health and safety legislation is vitally needed to help protect the children of Connecticut, not just Woodbridge, but all of Connecticut going forward. Others today will explain the health affects data, so I'd like to focus just on two issues.

First, I believe that this legislation as proposed should, and I'm going to speak optimistically here, when enacted by the full State Legislature, should go into effect immediately. Because it is aimed at protecting children from serious health concerns, the electrical transmission lines siting criteria

set forth in the bill should go into effect as soon as possible.

As drafted, the bill legislation can cover all applications that are pending before the Connecticut Siting Council. Why is that appropriate? Well two notes that I'd like to make.

The current state law already requires the Siting Council to take into account many siting limitations. This new bill simply amplifies one of those already existing limitations, which requires the Council to consider health impacts.

Specific guidance from the State Legislature will help the Siting Council carry out it's obligations. Further, the State Legislature stepped into a pending application in a far more significant way when it opposed a moratorium on the Phase I application before the Siting Council. That legislation suspended the proceeding and required the Council to conform to the decisions of the specially created working group.

The current bill is much more modest in scope. It imposes no delay and it sets forth limited and specific siting criteria.

My second point focuses on the costliness of the current process. Absent clear siting criteria regarding schools and other facilities where children congregate, municipalities and others must expend a great deal of money and enormous amounts of time to achieve common sense in the siting process.

Fundamental notions of safety provide that where there is a life-threatening risk, especially to children, prudent steps should be taken to avoid that risk. In the Phase I proceeding, the Town of Bethel expended some $250,000 to persuade the utilities and Siting Council to reroute the proposed transmission line away from the Bethel Educational Campus.

And I provided you some data to support that our finance director obtained from some of the towns

affected by Phase I. I would note that the numbers are even greater if you look at three of the other four towns involved and the data provided.

Please impose some sanity into the process so that towns and other parties need not expend tremendous amounts of money and efforts to persuade the utilities and Siting Councils to avoid schools, playgrounds, daycare facilities and camps, where children congregate.

Thank you for this opportunity and I would like to say that I respectfully urge you to vote this bill out of Committee and to the floor.

Lastly, if I could, I'd like to say one thing about R.B. 5419. I think it is in all of our interests, both now and going forward, that the Siting Council retain the best expertise it can have. And so I am very much in support of paying what is necessary to retain and bring new people in who have the expertise we all want on the Siting Council. Thank you.

SEN. PETERS: Thank you for your testimony. Questions? Appreciate it, thank you.

AMEY MARRELLA: Thank you.

SEN. PETERS: Susan Birkefiedler.

SUSAN BIRKEFIEDLER: Thank you Madam Chairwoman Peters and Representative DelGobbo and members of this Committee for allowing me to speak with regard to H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION SITING CRITERIA.

My name is Susan Birkefiedler. I'm the mother of three children ages 5, 7 and 11. I live in New Haven, Connecticut and my children attend school in Woodbridge, Connecticut, a school that is currently part of the Phase II application.

I've never before focused on power lines. The new proposal forced me to look at the data and consider what it would mean to have a power line at such close proximity to my children's school.

What I discovered was that power lines posed a serious health threat to children. In my community, more than 3,000 children spend most of their days in close proximity to these power lines. The current proposal would put a transmission line in such close proximity to my children's school that the radiation level would be 800 to 3,200 percent greater than what is considered safe.

While I am concerned about my community, Woodbridge only highlights the problem. I'm very concerned about other schools and other children in similarly situated schools and daycares.

The legislation before you today creates a safety zone similar to those in other states. The issues at stake, public health and safety, are of such consequence that a public policy must be legislated. It is unfair for each town to have to educate themselves and to fight to protect their children. Case-by-case decisions merely delay the process and do not provide consistent results.

This bill would give the energy providers direction and also comfort to parents. I ask you to support the bill and ensure that it is enacted with respect to the Phase II application presently before the Connecticut Siting Council.

The completed project will be in place for more than 50 years. We do need power. We also need protection for our children. Please support bill 5418 and create a safety zone for all of Connecticut's children.

Thank you.

SEN. PETERS: Susan, your passion and sensitivity to this is duly noted.

SUSAN BIRKEFIEDLER: Thank you.

SEN. PETERS: I'm a nana, so I worry about my grandchildren. Questions? Thank you very much.

SUSAN BIRKEFIEDLER: Thank you.

SEN. PETERS: Is Representative Fritz here?

ERIN BEAUREGARD: Good afternoon Senator Peters and members of the Energy and Technology Committee.

SEN. PETERS: Is your mic on?

ERIN BEAUREGARD: Good afternoon, my name is Erin Beauregard, I am an Assistant to State Representative Mary Fritz. She is sorry she can't be here, but she has asked me to read a statement on her behalf.

I am in support of R.B. 5418. I inherently believe that the conditions spelled out clearly addresses the needs of the communities reflected in this Raised Bill. Of course, we all know that this will be addressing Phase II of the expansion of the transmission lines throughout so many of our towns in Fairfield County, New Haven County and Middlesex County.

Earlier, I had submitted a Raised Bill, excuse me. Earlier, I had submitted a request for a Raised Bill to this Committee, although technically I had not missed the Raised Committee Bill deadline, the Committee had already voted on the agenda the day before. So to still be able to address my concerns and the concerns of my constituents, I respectfully request that R.B. 5418 be amended. I am also respectfully requesting that after this hearing there be a meeting to put together a master bill, which will address the needs of all of the legislatures and their constituents who are part of Phase II.

My first amendment would respectfully request that any community, which is part of Phase II of the expansion of the electric transmission lines, which already have 345 kV line in the area, that no duplication of 345 kV line be allowed in the same area. Moving from 115 kV to 345 kV is one thing, going from 345 kV to 690 kV is way over the top.

My second amendment would respectfully request that the Connecticut Siting Council shall require of the

applicants of Phase II known as Docket 272, alternative routes for every community, which is part of Phase II, with emphasis and full discovery on placing transmission lines underground or underroad.

My last request for an amendment is to respectfully request that the Connecticut Siting Council, in fact, mandate the Connecticut Siting Council to give weight to the arguments and testimony provided regarding health concerns and economic concerns in this expansion of electric transmission lines known as Phase II Docket 272.

In conclusion, please let me state the facts. Wallingford has the longest mileage of the expansion of transmission lines in Phase II, therefore, I very strongly recommend that Wallingford deserves major consideration in any and all deliberation.

Additionally, in an interrogatory from the Attorney General's office regarding the expense of putting lines underground in the Devon to Norwalk areas, it was determined that, in fact, it was no more expensive.

So this argument of $1 million versus $3 million is suspect. So please, for the benefit of all of us in Phase II, please amend R.B. 5418 to include my amendments. Thank you.

And I'll be happy to take any questions back to the Representative.

SEN. PETERS: Thank you. Questions? Thank you.

ERIN BEAUREGARD: Thank you.

SEN. PETERS: Representative Adinolfi, I'm sorry, I didn't see your name out on the margin, so --

REP. ADINOLFI: Thank you Madam Chairman, members of the Committee. As you know my name is Al Adinolfi and I represent Cheshire, Hamden and Wallingford, three towns which will see about 20 miles of this power line going through it.

I'm here to support H.B. 5418. This particular bill will restrict the distance to the edge of the easement and the right-of-way for the installation of overhead power lines within the proximity of schools, licensed daycares, accredited preschools, public playgrounds or religious institutions.

I would also recommend that you modify this bill to include hospitals, nursing homes and elderly housing.

There is a potential health risk associated with this kind of transmission line that we are talking about today. The National Institute of Environmental Health Sciences have reported that there is an association between the exposure of electromagnetic fields (EMF) and an increased risk of chronic lymphocytic leukemia and brain cancer.

With these kinds of potential risks, it only makes sense that we strictly limit the location of these power lines near where our communities' children spend a great deal of their time at school or play.

Also, according to the U.S. Food and Drug Administration, the FDA, interference by EMF may affect various medical devices, including cardiac pacemakers and implantable defibrillators. Inconsistent heart rates in association with EMF exposure have been reported.

According to the Connecticut Department of Health, and I brought the same report that Representative DelGobbo referred to before, a link has been established between EMF and childhood leukemia. Although the studies are still ongoing in many places around the world, we would be remiss if we did not proceed cautiously and not put the health and welfare of our children at risk.

It says right here in the report we referred to before, that the possibility for carcinogenic to humans based on fairly consistent statistical association between the doubling of risk of childhood leukemia, magnetic field and exposure above four milligauss. It's here. It's pretty

conclusive. And this was done in 1998. The publication here came out in 2002. In today's technology, the information pertaining to this just changes every day. There's more and more evidence with the possibility of health effects.

An unusually large number of cancers, miscarriages or other adverse affects that occur in one area over one period of time is referred to as a cluster. Clusters could provide early warnings about certain health risks. Exposure to cancer clusters have been found near power stations and at several other locations, including one in Guilford. In Guilford, Connecticut, there is a cluster that has been determined near the power station there.

In Cheshire, right now, the State Department of Health is carrying on a study to see why there is a high rate of cancer in Cheshire. They haven't made a determination that it's associated with the power lines yet or that they will. But there is this study going on right now at the moment.

There also has been reported that -- it also has been stated that for every report stating the existence of health hazards that there is another report that states there is not a hazard.

Even the remote possibility of a health hazard should be given prime consideration. The health of my constituency is more important then any additional monetary costs associated with installing this 345 kV line underground.

I urge the committee to err on the side of caution and to support this legislation. Thank you and I'll be happy to answer any questions you may have.

SEN. PETERS: Thank you Representative. Any questions? Thank you so much. Dr. Carl Baum. Good afternoon, sir.

DR. CARL BAUM: Thank you Senator Peters and members of the Committee for allowing me to speak on the subject of H.B. 5418, the Klarides-Crisco bill concerning electric transmission lines siting criteria.

My name is Carl Baum, I am a resident of Woodbridge, Connecticut and have two small children who attend schools in the vicinity of the power lines in question.

As a pediatrician and medical toxicologist, I have a professional interest in the interaction between children and any potential hazard in their environment from biological agents to chemicals to radiation.

The risk of a particular hazard may vary according to multiple factors and risk assessment must take into account critical differences between children and adults. For example, children have rapidly dividing cells and are, therefore, unusually sensitive to certain hazards.

The typical child has many more years of life ahead then the average adult, a fact that is important in cases of hazards that occur over long periods of time.

In my role as Director of the Center for Children's Environmental Toxicology at Yale New Haven Children's Hospital, I provide information regarding environmental hazards to children. It is my duty to provide information that is evidence based. In other words, I review the available medical literature on a subject in order to provide a balanced opinion and to allow health care professionals, public officials and parents an opportunity to make appropriate risk benefit decisions for the children in their care.

Having reviewed the medical literature on the subject of power lines and the electromagnetic fields they generate, I believe the following are true.

The medical literature does support an association between electromagnetic fields and childhood leukemia that is unlikely due to chance. The exact cause and effect relationship between the two however has yet to be determined.

Furthermore, the National Institutes of Health have concluded that exposure of children to electromagnetic fields cannot be considered safe.

I believe the Energy Committee has the responsibility to consider all scientific evidence on the effects of electromagnetic fields. In the face of uncertainty about health hazards to children, it seems prudent to choose alternate routes for power lines in order to mitigate the intensity of the electromagnetic fields in areas where children spend significant time.

The children of Connecticut demand better, safer options and I urge you to support H.B. 5418. I thank you for your time and for your consideration.

SEN. PETERS: Thank you for your testimony, doctor. Representative DelGobbo.

REP. DELGOBBO: Thank you Madam Chair. Sir, thank you for your testimony here today. And I'm going to start off by saying I am not a scientist, a medical doctor, epidemiologist, anything remotely near qualified to truly understand these issues, and I appreciate the chance that you had to give to us on this subject.

I was thinking about, and I've obviously gotten a number of emails on this subject of EMF and the impact and the validity or not of the impact. And broadly speaking, I was thinking of issues like, I remember as a kid hearing about the debates that there were about fluoridation of water. And you know that's a toxic element that we in fact introduced into our public water supply, just in terms of reference point. And a lot of literature went back and forth on the instances of cancer in relation to that and particularly with regards to children.

Could you -- and I'm sure you must be somewhat familiar with that sort of range of thinking. Could you give us a relative sense in terms of how we weigh the effects of EMF and what literature there is on that versus as an example, fluoridation of water? I mean, is there a correlation? Could

you say there is stronger scientific evidence out there demonstrating that there are negative effects to fluoridation or other elements in our water?

DR. CARL BAUM: Well fluoridation of water is a good example. I mean if you take any drug, any substance in sufficient quantities, it could potentially kill you and fluoride can actually kill you in sufficient quantities. But it does have the known benefit in small amounts and properly dispensed amounts to improve the structure of teeth and to reduce the risk of dental cavities and associated health risks. So we have to always weigh the benefit and risk of any intervention and we have to consider dose, in particular, with children.

REP. DELGOBBO: I do appreciate it. As I was thinking about that though, it is just that balance. We sit there and on the one hand we introduce, you know, whether its fluoride or chlorine in the water systems.

Or whether we -- and it was brought up before, the impact of cellular systems in our society and what that health impact it's going to have.

I'm just trying to get a -- we're going to weigh to some degree, even though that we are not experts, we are going to try, in introducing this topic of EMF into the statutory framework, we're going to weigh to some degree, the -- in interjecting the policy period if we have to deal with the energy issues, which is also a public safety issue -- a public health issue versus specific causes.

And so I'm going to ask you to elaborate broadly. Would you accept the premise that in a lot of ways, in a lot of the things that you deal with in looking at toxicology in relation to children that we have many things in our everyday life that represent hazards to us in and of themselves. Or it might even be surprising to the public at large that this was in their water, this was in the air that they breathe, this was in the environment in their homes. And yet we accept that we do have to live everyday, we have to turn on the switch to

have the power and we have to turn on the faucet to have our water and those sorts of things.

Give us sort of a way we can better evaluate these things.

DR. CARL BAUM: Well this is a difficult issue in part, because we don't know the exact cause and effect relationship. This is where we can make an association. There is epidemiology literature, meaning literature data that looks at large numbers of children and large numbers of examples, and we try to have a best guess on whether this is a risk or not. Again, in the absence of a known cause and effect relationship, it may be that we simply haven't chanced upon the cause and effect relationship.

Using, again, your example of fluoride. That in a sense is a different problem because we know why fluoride can kill you and therefore, we can adjust the dose accordingly and come up with something that, in fact, protects our teeth and our dental health.

Again, when we don't have the cause and effect relationship, we have to look at large numbers of data and things can get muddy. But our best guess, looking at the literature, and again, this is the intent of evidence-based medicine, that we look at large numbers of studies and try to decide if there is any effect at all. And there appears to be, approximately as other people have mentioned, a doubling of risk of childhood leukemia in this example where power lines are present and sufficiently high power.

REP. DELGOBBO: (MICROPHONE NOT ON.) What I am trying to get at is its relative assessment. You have a broad range of things that are in our everyday life. Is it not in some respects the truth that we are exposed to many different things in and around us at every moment, whether it's the EMF generated lights in this room to the air and water and pesticides in our lawn to keep it green and all these things, and yet we still want to continue functioning as a society. If we have balance --

DR. CARL BAUM: Well clearly, we're all dependent on power and we have to ensure the security of the power grid and people have mentioned, I think Representative Miller -- I think there was a mention of terrorism and the potential risk thereof, insuring the safety of the power grid. So we're all dependent on that and we need to make sure it works.

But we often don't have an understanding -- at least we don't yet have an understanding of how it affects us. So we have to use very broad and maybe very fuzzy data that give us an indication that there may be a problem. We don't always know the mechanism. Is there biologic plausibility? That's the term that we use to decide is there a known cellular mechanism by which this may happen?

The best guess is that because children have rapidly dividing cells, as I mentioned and others have mentioned, that children may be perhaps more susceptible to these magnetic fields. And that is the best guess of a mechanism. So in the absence of the true understanding of the mechanism, we have to go with evidence that is from the epidemiology literature that shows us that there is an approximate doubling of risk in this particular case.

I'm not sure if I'm answering your question, I'm not sure if I can answer your question. You're asking a good question, but it's ultimately -- it's a matter of risk and benefit and how do we function in a society while protecting our youngest members.

REP. DELGOBBO: And sir, I thank you. And I know that was sort of a broad and particularly challenging question. But hopefully as we're considering this, we're kind of being aware that those are judgments either purposely or not that are involved in our everyday life that are around us. And I think you did a very fair job at trying to focus us on specific on EMF. I appreciate your thoughts.

DR. CARL BAUM: Thank you.

SEN. PETERS: Doctor, while you're there.

DR. CARL BAUM: Sure.

SEN. PETERS: I was interested in the dialogue on the fluoride as an example. And I happened to notice that they're putting out pediatric toothpaste without fluoride. And is that to counterbalance what you say is the exposure that we have in our drinking waters, etc.?

DR. CARL BAUM: Well, if you -- it depends on your source of water. You have to look at fluoride coming from your well, if there is any fluoride or from a public water supply. The general recommendation is that if you have no fluoride in your water, say you get it from a well, then you should provide your children with age appropriate -- meaning dose appropriate fluoride supplements.

The issue with toothpaste was a hotly debated topic not so long ago. The concern there is that a young child may consume a large amount of toothpaste if unsupervised and that's why a lot of these toothpastes have been issued without fluoride in them.

It's not to say that fluoride is dangerous, because we do have to consider dose at all times. And realize that yes, there is a benefit to fluoride in normal dentition.

SEN. PETERS: Thank you. I have grandchildren that stay with me. Senator Herlihy.

SEN. HERLIHY: Thank you Chairman. Doctor, thank you for your testimony. We're all talking about our grandkids. I've got kids myself, three of them and I'm a former school teacher. So I am certainly sensitive to the issue of the safety of children. I recognize and appreciate the merit of this bill before us.

I have to assume that the distances from the schools are not necessarily magical or based on scientific methodology, but rather rough estimates. And I did not hear all of the testimony earlier,

but I do have to throw in one irony. When you are talking about a 345-kilovolt line being 600 feet from a school let's say, the irony in my view is that someone could be selling drugs 100 feet closer than that power line and not be subject to the State's minimum mandatories. So I think that that is something that ought to be weighed as we take a look at these distances, certainly.

The other issue, doctor, is if the issue of public safety and the health of these children becomes so compelling as public policymakers, I think it would be very difficult for us to suggest that the dangers are so significant that children in a particular portion of our state, because obviously the power lines that are going to be built will be built in the southwest portion of the state in terms of at least the near future.

Well, there are many other power lines that have already been built throughout the state of Connecticut. So from a public policy standpoint, it might be difficult for us to suggest that we maintain a higher level of safety for those that are going to be impacted perhaps in the near future, because wouldn't a stronger more compelling public --

(GAP IN TESTIMONY -- CHANGED TO TAPE 3A)

SEN. HERLIHY: -- suggest that if there are any existing lines in place within these distances, they're going to have to be moved. Because from a public policy standpoint, why should children in a portion of the state be any safer then every child in the state of Connecticut?

DR. CARL BAUM: Are you referring to existing 115 lines or 345 lines?

SEN. HERLIHY: It doesn't matter.

DR. CARL BAUM: Well, my understanding of the data is that there is a threshold effect with power lines in terms of voltage. And that you see the effect, again, according to epidemiology literature, above a certain power level.

So I guess a lot of the answer to your question would depend on what is the line that is in place, what is the power level there?

SEN. HERLIHY: I guess, to be more direct, are there power lines that meet the voltage levels in the bill before us that already exist in other parts of Connecticut that are within the distances that you are suggesting are safe in this legislation?

DR. CARL BAUM: To be honest, I don't know.

SEN. HERLIHY: Wouldn't you have to assume that there are? And wouldn't that be the driving force behind this legislation itself?

DR. CARL BAUM: I would assume that there are, but I don't really know the arrangement of power lines in the state, other than the local ones.

SEN. HERLIHY: Well I'm making an assumption here. I'm assuming that lines are currently within these distances and so those that are proponents of this legislation are trying to ensure that the Siting Council, who has allowed lines like these in this legislation be built within the distances in this legislation. They are going to ensure that in terms of the communities that they represent, and a certain portion of the state of Connecticut, those that will be impacted by the lines that are about to be built, that no lines will be built within these distances here.

So the point I'm trying to make is it's already present in places in Connecticut. So if the public safety issue for children is so compelling, the question as a policymaker is shouldn't we be protecting all kids, not just the kids moving forward?

DR. CARL BAUM: I think we should. We should make every effort to protect all children. I think that's our duty as parents, grandparents, physicians and so forth.

SEN. HERLIHY: And then that brings into question the issue of cost-benefit. Is this something that is going to add dramatically to the costs associated with fulfilling these restrictions?

DR. CARL BAUM: I agree with you. I think it does figure into the cost benefit, but I think when it comes to children, we have to argue in their favor.

SEN. HERLIHY: No question. And perhaps that would apply to all children in the state, even those that are currently subject to power lines within these distances.

DR. CARL BAUM: Right. And I think the important thing here also is that my understanding, from an engineering point of view, there are alternatives that are in place in southwestern Connecticut, burying the lines for example or rerouting them.

SEN. HERLIHY: Right. Thank you.

SEN. PETERS: Any further questions from the Committee? Thank you, doctor.

DR. CARL BAUM: Thank you very much.

SEN. PETERS: James Sipperly with Mayor Domenique Thornton. Is the Mayor with you, Mr. Sipperly?

JAMES SIPPERLY: No, I'm sorry, she could not make it today.

SEN. PETERS: Okay, thank you.

JAMES SIPPERLY: Chairman Senator Peters and members of the Energy and Technology Committee, good afternoon. My name is James Sipperly. I'm the Planning Environmental Specialist in the City of Middletown. Mayor Domenique S. Thornton could not be here this morning or this afternoon and asked me to deliver this testimony on her behalf.

The City of Middletown goes on record in support of H.B. 5418, proposed by Representative Themis Klarides and co-sponsored by Senator Joseph Crisco.

I would only ask that you consider a friendly amendment that would also prohibit overhead transmission lines and that they be underground if located in densely populated areas.

My constituents are specifically concerned with the power lines that will run through the Royal Oak subdivision on the Durham-Middletown line.

I have taken the liberty of reviewing the plans for the 345 kV transmission lines and I am requesting that the lines be placed underground for the short distance that they will travel through the subdivision.

Royal Oaks is a rather densely populated residential subdivision that includes over 100 single-family homes. A great concern has been expressed regarding the health risks that have been attributed to the electromagnetic emissions that are produced by transmission lines such as the ones in question.

There is conflicting information as to the real impact that the new transmission lines will have on the health of neighborhood residents, their children and their grandchildren for years to come.

On one side, we are being told that the emissions from the new power lines will have little to no effect. On the other side, we have been told that the taller poles will simply disburse the emissions over a larger area. It certainly does not appear that the case has been proven beyond a reasonable doubt and that only leads me to suggest that we err on the side of caution.

The City certainly understands the benefits that this project offers to both its residents and businesses. Maintaining a capable and reliable system for delivering power should always be a priority. However, it is often necessary to tailor such projects so as to reduce the negative effects on neighborhood settings.

In this case, putting the new 345 kV transmission lines underground for a distance of only one mile,

according to the maps given to me, will allow the project to proceed with minimum opposition from the public. While subterranean placement of the transmission lines will incur increased monetary costs, it does not appear that such a small modification of the original plan will place a significant burden on the completion of the project.

Thank you for your time and consideration.

Excuse me, would it be appropriate for me just to say one statement based on myself, or should I wait for another chance to speak?

SEN. PETERS: I'm going to make you sit.

JAMES SIPPERLY: Okay. All right, thank you.

SEN. PETERS: You have been very patient with us, please go ahead.

JAMES SIPPERLY: I had the opportunity to be in Washington, D.C. in the past five days to talk to U.S. Senators and Representatives, both from Connecticut, Mass and Rhode Island, regarding environmental and agricultural issues and we talked about appropriations, budgets and bills, particularly the Farm Bill.

And many of them talked to me about the process of getting a bill approved. As all of you know, there are good bills, there are not so good bills, and there are bad bills. And, unfortunately, bad bills do get approved based on a lot of different reasons. And I think if you cast your vote on this bill, I think you can be assured that this is not only a good bill, but it's a great bill, because it does one simple thing. It really protects the health, welfare and safety of children in Connecticut and residents in Connecticut.

So thank you.

SEN. PETERS: If there is any questions and thank you for your statement. Questions? Thank you very much.

JAMES SIPPERLY: Thanks.

SEN. PETERS: Dr. Rabinowitz, Dr. Bell, Dr. Gerber and Dr. Humphrey, are you all testifying together?

: No, we have separate statements.

SEN. PETERS: You have separate statements? Okay. Why don't you all come up anyway?

DR. PETER RABINOWITZ: Well thank you Chair Peters and distinguished members of the Energy and Technology Committee for allowing me and I guess us to speak in support of H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA.

My name is Peter Rabinowitz. I'm an Assistant Professor of Medicine at the Yale University School of Medicine and I'm Director of Clinical Services at the Yale Occupational Environmental Medicine Program. So my routine clinical work involves evaluating and treating patients who are concerned about exposures in their environment or their work that could be hazardous.

I want to make sure that the Committee is aware of some updated recommendations and assessments by major national and international scientific bodies regarding EMF and health. And I know you've heard from the Utilities Committee regarding one of these reports.

I want you to be aware that the World Health Organization's International Agency for Research and Cancer or IARC, that's basically the preeminent international body assessing cancer risk, in 2002 has designated electromagnetic fields as potential carcinogens and it takes a fair amount of evidence to get to that point with IARC.

Also, I want you to just be aware of some other facts that are in that NIAHS report that the utility company recommended to you and gave a quote from.

I want you to be sure that you know that in their assessment, they basically concluded that because of the concern regarding childhood leukemia, that you've heard a lot about today, they concluded that ELF and EMF exposure cannot be recognized as entirely safe. And so that's really their bottom line.

And it terms of the recommendation which is also in that NIAHS report, they call as a recommendation for continued emphasis on educating both the public and the regulated communities on means aimed at reducing exposures to EMF. And that's a quote. So educating both the public and the regulated community on means aimed at reducing exposures.

And so the fact that the Phase II application of the utilities actually by their own estimates would massively increase exposures for children along the power line, really goes against the recommendations of the NIAHS report, which, again, is really saying try to find the means to reduce exposures to EMF for the population.

So what is reducing exposures mean? You should know that estimates are for background EMF exposures in the population -- we are talking about levels less than 1 milligauss for the vast majority of the population.

And when it comes to the sort of unsafe level that you've heard discussed of three or four milligauss, we're only talking about a couple of percent of the population that seems to have exposures in that range.

And so one reason that it's been somewhat difficult to study in terms of children is that there is only a small proportion that is being exposed at that level.

But the current application of the power companies, because of the proximity of lines to schools that they have in their current application, would create a large number of kids who are now being exposed at those levels that are so rare on the general population.

And in terms of -- you've also heard that while there is a lot of EMF at different places, if you go to the supermarket and throughout your daily life, you do have different EMF exposures. But they've found in terms of school exposures that if you have a school next to a power line, that the amount of EMF that kids get from going to that school is the overwhelming and very, very significant factor in their daily exposures to EMF.

So we really are talking about putting kids at risk to levels that have been associated with the doubling of leukemia risk.

So I just want to conclude by really saying that what the power companies have proposed in their current application really flies in the face of what current public health recommendations are. And I just really urge the legislature to do the right thing and protect the children of this state by not allowing the power companies to increase EMF exposures near schools and playgrounds, but instead aid in the process of educating the regulated community about means to reduce exposures. Thank you.

SEN. PETERS: Thank you, doctor. Representative DelGobbo.

REP. DELGOBBO: Thank you. Thank you sir. Again, with the same preamble that I'm not a doctor or expert on this. I'm beginning to -- I'm trying to think in my mind in terms of validating the correlation, the broad one, and I don't think I'm going to -- I'm not going to try and dispute that. And I don't think I do, that there are issues of health concern regarding EMF broadly.

And then there are issues of how we should judge, for example, this type of exposure -- electric power lines versus any other things that are in our daily life, whether it's cell phone use, the computer in our house and things of that sort.

Does the research look specifically at, as an example, the different frequency ranges of that

electromagnetic field that's generated and specifically at what points, or whether it makes a difference of those types or at what frequency?

For example, power lines transmit at a certain frequency range, cell phones at a different one. Can you validate and correlate that it is this specific type of emission or whether or not it's just a broad statement that EMF fields generally represent hazard?

DR. PETER RABINOWITZ: Well the studies of children and leukemia deal with power line EMF exposures. So we're talking about the frequency that is in electrical transmission lines. So it's a whole different scientific topic about cell phones.

Another difference between cell phone use and power line exposure is that we tend to treat risks that are voluntary in this country differently then ones that are sort of imposed on populations. Especially populations like children, that really don't have any say in it.

And so this is an example of an exposure that is being proposed by the power companies on a population of children that simply has no say about it.

REP. DELGOBBO: MICROPHONE NOT ON.) The milligauss measurements in terms of what will emanate from the power lines. Is that a measurement of magnetic field or the electric field that's generated?

DR. PETER RABINOWITZ: That's a measurement of the magnetic field.

REP. DELGOBBO: And that specifically is where the research has been done, within that framework?

DR. PETER RABINOWITZ: Right. So we're talking about studies of kids and then went as the utilities had mentioned, they went into homes and did spot measurements. They've put monitors on kids and looked at 24-hour measurements less commonly. But we're talking about measuring magnetic fields. And, again, those studies have been somewhat

difficult to do, because you just don't get as many kids exposed at the levels that are being proposed in Connecticut right now.

REP. DELGOBBO: You, having looked through the research, could you enlighten me and the others on just on comparative purposes, for example, if you have a kid sitting at a computer for multiple hours playing a computer game, Nintendo or whatever, or a teenager on their cell phone or having an infant in an electric blanket, for example. What kind of exposure levels are they exposed too?

DR. PETER RABINOWITZ: And you'll hear people say, well computers do give off EMF, hairdryers give off EMF, distance is actually very important in terms of EMF fields and when you take a computer screen there is an EMF field associated with it. But if you go only a few centimeters away from the screen, that field has dropped off to almost background levels.

So you're not talking about the same type of large standing field that you have with kids with power lines.

REP. DELGOBBO: And if you could elaborate more on other things, other backgrounds.

DR. PETER RABINOWITZ: There are other things, for instance, going into the supermarket in the frozen food section, there are some EMF exposures because of all the coils for the refrigeration. We're talking about exposures of seconds or minutes compared to hours and hours on a daily basis for eight to ten more years that you have when you have a school that is right next to a power line.

REP. DELGOBBO: And how would I -- and I understand that each of those instances, whether it's playing for a few hours at the computer or stopping at the store for once a week, or any of the general activities of life. I mean, you could measure them and say well that exposure in itself is very limited and maybe only marginally more than normal background.

DR. PETER RABINOWITZ: Right.

REP. DELGOBBO: But when you take those in the aggregate of the kinds of exposure people deal with when they go from point A to point B and activity A to activity B, explain -- not explain, just try and describe that and how we should consider that.

DR. PETER RABINOWITZ: Okay. Well, in my understanding, again, when they put on these 24-hour monitors on kids and let them go to bed and go to school and go to the supermarket and they look, again, the vast majority of the population comes in at less then one milligauss. So you are talking about a whole different situation when you have kids sitting all day long in fields that are ten -- twenty milligauss and then go out on the playground where it is 96 milligauss and you just have a whole different order of magnitude of exposure in those compared to the general population.

And you are really way beyond the level that has been associated in these studies with a doubling of the cancer risk.

And I just want to say one thing about cause and effect. I want to let my colleagues talk more about associations, but in public health, we often make good public health decisions without knowing everything about a scientific mechanism. It's been true with HIV, it's been true with SARS. Even before we could characterize the SARS virus, we knew some risk factors that could be taken to try to reduce the spread of it and we took those measures. And that's just what you have to do in public health is deal with uncertainty and make reasonable decisions.

REP. DELGOBBO: I guess what sort of just struck me, how should we consider either the public decisions that were made absent having any awareness of this? In other words, these lines run in other parts of the state already, and, for example, we have employees -- electrical workers who work on these type of systems on an everyday basis.

DR. PETER RABINOWITZ: Right.

REP. DELGOBBO: How should we consider, given what you just stated, that issue?

DR. PETER RABINOWITZ: I think that unifying -- I'm sorry.

REP. DELGOBBO: How that plays up to the overall policy issues we're going to have to deal with here?

DR. PETER RABINOWITZ: I just think the unifying theme is that we all need to try to find ways to reduce exposures. Whether you are an utility lineman, whether you are in some other setting, so whether you are an existing school, as you mentioned before, one thing that you do is you try to assess the exposure. If it looks like it is at a level that's concerning, you see if there are reasonable things you can do to reduce those exposures.

I think across the board you can see what is reasonable to do and that's what the NIAH has recommended that the public and the regulative community do, is try to find ways to reduce those exposures and certainly not go ahead and increase massively these exposures to a group of children.

REP. DELGOBBO: Thank you sir.

REP. BACKER: Senator Herlihy.

SEN. HERLIHY: Thank you Chairman. Doctor, thank you for being here, I appreciate your testimony. As a follow up to a question that I asked Dr. Baum and as Representative DelGobbo just mentioned, there are power lines that currently exist in the state of Connecticut that are within these distances.

Opinion question, doctor. Are the health impacts so grave that the lines that currently exist should be moved back to these thresholds?

DR. PETER RABINOWITZ: Well, I would really -- just as you say, you are not a scientist, we assumably are not policy people here and realize all the complexities of public policy. If I was the Public Health Official or a school administrator at a school where there was a power line right next to

it, I guess the first thing I would do would be to try find some way to assess the exposures in the school, actually go out and measure them. If they were coming in at alarmingly high levels, I would think about are there some reasonable things to do to improve the situation? I would not try to ignore it. I would say, you know, is this a risk that we can do something about?

REP. HERLIHY: Thank you.

DR. PETER RABINOWITZ: Thank you.

REP. BACKER: Thank you, doctor. Anything else? Sorry I asked you to leave before I saw his hand. I apologize.

REP. MAZUREK: That's all right. Just a quick question for you. My golf partner wears a magnet on his back. Is the same type of field that we're talking about produced or a different field?

DR. PETER RABINOWITZ: I don't believe it is the same quality fields.

REP. MAZUREK: It can't be measured the same way or compared then or anything with the field produced by an electric wire?

DR. PETER RABINOWITZ: I'd have to check about exactly which device and what kind of field and so I would -- but it's simply different then sort of being in a -- when you have a magnetic field, when you're near a power line, you're basically -- you're entire body is sort of encased in a standing magnetic field. It is different in that way.

REP. MAZUREK: Sure. He swears by it, that it helps his back for his golf game, I'm just curious --

DR. PETER RABINOWITZ: Magnetic fields are being alleged to have definite affects on tissue and things like that. And there may be, at times, some beneficial applications of them that we're going to discover that the fact that they do have effects on tissue is more concerning given the fact that there since has been association with cancer.

REP. MAZUREK: Well, that's what I'm thinking of is that if you could wear one and say it's a benefit, then I would imagine that too much of a good thing could be a detriment to the body.

DR. PETER RABINOWITZ: It certainly supports the idea that these are causing some sort of physical effects.

REP. MAZUREK: Okay, fine. Thank you.

DR. LENNY BELL: Good afternoon. Just checking to see whether it was morning or afternoon still.

REP. BACKER: Well, it will be early evening before we leave. You can leave in a few minutes.

DR. LEONARD BELL: Exactly. I understand that fortunately. Yes. Well, thank you Chairman Backer, Ranking Member DelGobbo and Committee members for allowing me to speak in support of H.B. 5418.

My name is Leonard Bell. I am a physician. I am also a Adjunct Assistant Professor of Medicine and Pathology at Yale. I'm a research scientist and a medical expert and also the Chief Executive Officer of a public traded pyrotech company.

I am responsible in my professional life for evaluating the safety and effectiveness -- the risk-benefit, as we would say, of drugs. I have substantial expertise in the interpretation of very large sets of clinical data with thousands and thousands of patients.

I also, therefore, have a clear understanding of the federal regulatory criteria required to establish safety and effectiveness.

As we turn to the current topic under H.B. 5418, which concerns electric transmission lines siting criteria, there have been well over 50 individual clinical studies of electromagnetic fields or EMF and human health.

In the morass of clinical science over the last quarter century, there have been many different health effects that have been studied. It is a very confusing morass of scientific and clinical data.

However, amongst all these individual clinical studies, the one health problem that consistently drops out every time has been associated with EMF exposure is acute childhood leukemia, which is, as I am sure you starting to understand, a rare and usually fatal childhood disease.

When clinical scientists are trying to study such rare events, it becomes very difficult. The reason for it is that you can't really tell the effect of an intervention if the actual disease doesn't come that frequently. And what they tend to do then is amalgamate many studies together to a very large group of data.

That type of statistical analysis, which has led to drug approvals in the United States and led to change in labels of drugs in the United States is called a meta-analysis.

It's been very, very important to clarifying over the last three years the role of EMF either in causing or quite frankly not causing a variety of diseases.

There have been at least major scientific meta-analyses that have been performed examining specifically, prospectively asking the question whether EMF is associated or not associated with childhood leukemia.

Each of these studies has shown similar results. At exposure levels ranging from two to three to four milligauss and above there is a dose-dependent effect, such that the higher the level of EMF the risk of leukemia in children doubles. These findings have been described uniformly by each of the seven independent government scientific panels in the United States and elsewhere as unlikely due to chance.

Well, this is typical scientific understatement. In fact, one study, with over 13,000 subjects concluded the likelihood that EMF is associated with childhood leukemia is 99.8 percent. That's what we scientists call unlikely due to chance.

In my regular life, I'd say far more likely than not. So to understand from a scientific point of view the lack of -- you know, it's unlikely to be due to chance, which is a fair assessment.

But to understand the quantification is 99.8 percent likely to be associated with childhood cancer.

Well, based on these very large studies, the likelihood then that EMF is truly associated with cancer, these are in tens of thousands of patients, therefore it is very, very high, which really supports as been said before the 1999 U.S. National Institutes of Health conclusion that EMF cannot be considered safe for humans.

Well, something that cannot be considered safe for humans, as someone who focuses his entire professional career on developing drugs that will be safe and effective, is very worrisome, of course, to go out of your way to expose someone to something that can't be considered safe for humans.

Well, since there is no empowering legislation currently in the state of Connecticut, the legislature currently allows for increases in high voltage power lines which will cause children -- and I say "cause" here very clearly (the power companies themselves are provided the data to say so minimally), it will cause an 800 to 3,200 percent increase in the EMF levels measured by milligauss in particular children sitting right near those power lines -- an 800 to 3,200 percent increase to children and that's from the power companies.

That's a level 800 to 3,000 percent greater than the level that's already been shown to have a 99.8 percent likelihood to double the chance of childhood leukemia. It does not just increase the

level, but increasing above the level that doubles childhood cancer.

Well, the federal governments considered the affect of child health earlier. In 1997, Presidential Executive Order 13045, explicitly requires that each agency "shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." Understanding as has been described before, the considerable sensitivity and susceptibility of children who frequently function -- for finding toxic substances.

Similar to the World Health Organization and the Presidential Order that we just quoted above, the Connecticut State Department of Public Health implicitly advocates the policy of prudent avoidance as of last month for EMF exposure.

The Department recommends "there is uncertainty that some people may want to reduce", answering your questions, "their exposure to EMF."

The Department further cautions, "if the power lines are less than 300 feet away from the home, you may want to consider obtaining EMF measurements in the yard. Deciding where to live rests upon a number of considerations that varies with each individual. EMF exposure is one of many factors in this decision."

As a society, we are obligated to protect our citizens from hazards. We each have particular responsibility to protect our children from such hazards. Further, by virtue of the State mandate for education for children, that you require children appropriately to be educated in this state, you have a particular obligation to protect the children you require to be educated, not to suffer from harmful hazards while they are being educated.

I urge you then to act now to protect the health of all the children in the State by enacting bill 5418. Thank you. I'd welcome any comments or any

other questions that's been asked earlier or new questions even.

REP. BACKER: Okay, thank you. I have -- just something strikes me as you were testifying. And I guess I make this almost as a general announcement for anyone who is going to come up and speak later.

I'm kind of interested if there is a shielding mechanism for EMF and if you can bury it and block it and then maybe you can shield it another way. So I'm curious. Of all the arguments that come before us, this is the most compelling to me, property values and all that other stuff, this is the most compelling.

And so, as we move forward in this, I'll ask you now and anyone else clearly if you have an answer to this, is there a way to shield it? If you can shield it by putting it underground, you must be able to shield it another way.

DR. LEONARD BELL: There are shielding technologies that are under development and have been studied in other states, I believe. Certainly, like all things in public health, as we know quite well, each of us as adults, there are many things just not to do. And this isn't one of them. As we said, there is a clear unequivocal benefit to the power grid, but it really focuses on the location.

And carrying on real estate, as we all know, there are three rules of real estate -- that's location, location, location. And certainly as regards to EMF exposure to children, at the end of the day, that's the most powerful answer to that. It's not that location, not that location, not that location -- throughout the state.

REP. BACKER: Representative DelGobbo.

REP. DELGOBBO: Thank you Mr. Chairman. In terms of your testimony that there is a demonstrated correlation between incidents of childhood leukemia and EMF fields, is there an incidence -- does that represent a factor of if the normal incidence is

one in 10,000 children that it now becomes one in 5,000?

DR. LEONARD BELL: That's a very good question and that really is the issue with childhood leukemia. The very good news about all of what we're discussing today, in my opinion, is that childhood leukemia is a rare disease. Unfortunately, for each of us who have had family members or know people who have had leukemia -- childhood leukemia -- it's not rare enough.

So the reality is, it's probably somewhere between the two to ten per hundred thousand people lower than age 19 who are afflicted with childhood leukemia. Now the unfortunate thing is that with EMF it's been well demonstrated that the likelihood -- the significant likelihood of having childhood leukemia goes up the higher the dose. So at two milligauss it is significantly elevated, at three milligauss it's even further and at four milligauss it doubles.

So there are many people that have actually advocated that power line related EMF, which is ubiquous in the United States and which is appropriate to sustain our technology and our industry that we have, is a background piece that's actually contributing to the background level of childhood leukemia.

And, in fact, it's only then when you start to see that what half to one percent of the country that's located close to power lines, you could just see the alarming rate of AOL, for example, for acute lymphocytic leukemia.

REP. DELGOBBO: And I certainly appreciate the fact that if it's one in ten thousand or a hundred thousand, it doesn't make you feel any better if you are the one.

DR. LEONARD BELL: That's the problem. And as a parent, obviously, I'm always alarmed, as all of us would be, by its so-called cancer clusters. The reality is that they are clusters and no one really knows whether that person got it because they were near

something or not. But nonetheless when there are schools and there are three kids who have had brain cancer, you start to wonder.

REP. DELGOBBO: Well I mean -- and I appreciate that. And you spoke about your meta-analysis in terms of how you synthesize all this. I'm trying to understand that myself and it's the same, perhaps, decision, conscious or unconscious.

Again, we got on the issue of fluoride earlier. You know that substance and I understand proper dosage, but that it may cause cancer in only one out of every hundred thousand young kids who use it, but yet that's something that's happening.

And trying to give a relative census. In your profession, obviously, you try to have medications that are safe.

DR. LEONARD BELL: That are totally safe, yes. Well that's the objective.

REP. DELGOBBO: But yet as I always see on these commercials, get Elblamo but it might cause all kinds of things.

DR. LEONARD BELL: It's actually -- the objective is to be totally safe, but it's never true.

REP. DELGOBBO: Right. That's something you live with specifically in your -- you and coming together with something that works for this thing may have these other side effects. It may only happen in one of every 5,00 patients, but they are real.

Yet that is something that you deal with and you prescribe.

DR. LEONARD BELL: Fortunately, my job of developing drugs like that is easier -- is somewhat more difficult than the one here. The reason for it is that I am constantly faced with the objective of showing there's a benefit of reducing death, for example, or heart attacks, as opposed to the risk that someone may feel a little nausea at some time. That's the relative difference between the risk and

the benefit. Dead, alive, heart attack -- no heart attack, a little nausea something like that.

REP. DELGOBBO: Right.

DR. LEONARD BELL: And, you know, you make the argument well it's better to not have a heart attack, better to be alive and so forth and it's usually a persuasive argument.

In this setting here though, actually you can draw the line like that. But in this setting here, it's not an either or. We can have our power, right? I can actually continue my manufacturing in the state of Connecticut and the growth of jobs as a CEO of a publicly traded growing company. I can have that. So I don't have to choose whether I want that or not. Like I can have that and still reduce EMF exposure to the canaries to the children. I don't have to decide which one I want. I'm lucky. That's why this is an easier one. I wouldn't want to pick which one.

And fortunately I don't have to, nor do I think does the legislature. Because you maintain the power and increase the power so my company and other companies can grow and create jobs and the state of Connecticut can prosper. We can do that easily in a way that doesn't provide a doubling of the leukemia risk of children. I don't have to pick which one, that's what makes it easy.

REP. DELGOBBO: Boy, I wish it was as easy as you said, sir.

DR. LEONARD BELL: No, but it's not an either or, right? You have an alternative to relocate or change locations or put them underground. It's not like you have to force them to go only one pipe one way.

If you did, I think it would be a tough decision. I agree.

REP. DELGOBBO: Well, thank you for your comments, sir.

REP. BACKER: Anyone else have a question or a comment? Representative.

REP. MAZUREK: Thanks Mr. Chairman. Just a quick one and I wanted to clarify maybe what Terry was asking and I didn't quite understand the answer. We can eliminate the danger by burying the electric line?

DR. LEONARD BELL: The most potent way is to remove the distance from humans. That's the most effective, scientifically proven way. There are other experimental ways that are being examined, but the most unequivocally clear way as was said by Dr. Rabinowitz earlier is distance.

REP. MAZUREK: Okay and that to me means just relocate the above ground power lines to some other route that's away from children? Are you advocating that versus burying?

DR. LEONARD BELL: You know fortunately, I actually learned early in my life that I speak to what I know. And just as firmly I say what I don't know. So the answer is for -- the only ones that I can actually see that should be held out are children, because they are the only ones that all the data shows have an increased adverse event risk unequivocally as opposed to all the other data.

And the only clear way to be definitive about that is not to locate power lines within a zone around children. There may be other ways that might be -- if you had a moratorium to sort that out and so forth, but then there would be risk, in my view and probably your view as well, to the power grid. How long can you take to figure it out?

REP. MAZUREK: Okay. Thanks. I guess I'm still confused as to whether we can eliminate the danger by burying the lines versus rerouting them, but --

DR. LEONARD BELL: I think there is a relative likelihood of eliminating the danger. One is a sure thing.

REP. MAZUREK: Yes, okay. Thanks.

DR. LEONARD BELL: That's the way I would look at it.

REP. BACKER: Senator Herlihy.

SEN. HERLIHY: Doctor, sorry to keep you.

DR. LEONARD BELL: No, no problem.

SEN. HERLIHY: Thank you. You appear to be very experienced with this issue and I'm just curious. We have a number of attorney generals in this region, so I'm not going to specify any particular one, but some would argue that have capitalized on any and every public safety threat that exists.

Are you aware of any attorney generals for any state in the country that has taken some action with regard to the threat of safety to children? Question A. Question B, are you aware of any other states that have implemented laws of this type?

DR. LEONARD BELL: The answer to the first question is that I am aware having talked to internationally recognized experts who don't live in the state of Connecticut and who are the authors of several papers that have been quoted by every scientific panel, that there is litigation in the state of Vermont where, my understanding is that the fundamental basis is the claim that the power companies have misrepresented and defrauded the state in their filings with the councils there.

And I understand that the actual --

SEN. HERLIHY: Is it public safety related?

DR. LEONARD BELL: Yes, it's actually exactly this issue.

SEN. HERLIHY: Okay.

DR. LEONARD BELL: It's actually the issue that's claimed is that the parent companies have misrepresented the risk to children. And what they got themselves in a position now in the state of Vermont is the investigators or scientists who did all the research who are being misquoted by the power companies are testifying saying you know "don't misquote me."

Now I don't know the role of the attorney general in the State of Vermont in that case. I do know that it's an ongoing process, because I talked to o_e _ _he ind_viduals _h_ is _ s_i_ying.

SEN. HERLIHY: If t's the state of Vermont, I assume that it's being handled by the attorney general. Is it --

DR. LEONARD BELL: No I don't know that. It may very well be at the level that we're talking about. You know, Siting Council or evidentiary hearings. I'm not familiar with exactly what level, other than the fact that it's being contested based upon the veracity of the filings.

SEN. HERLIHY: But the Plaintiff or the Complainant is the State of Vermont not an individual?

DR. LEONARD BELL: I believe that's true.

SEN. HERLIHY: Okay.

DR. LEONARD BELL: And second, I understand that there is legislation in the state of California that mandates certain distances as well. There are several other states that have less powerful legislation. But the state of California has had it for some time now.

SEN. HERLIHY: Thank you.

DR. LEONARD BELL: Thank you.

SEN. HERLIHY: Thanks Chairman.

REP. BACKER: Any further questions or comments? Thank you.

DR. LEONARD BELL: Thank you.

REP. BACKER: Alan Gerber.

DR. JEFF HUMPHREY: Actually may I speak first? I have been waiting, my name is Dr. Jeff Humphrey. I

joined the group that came up earlier. Just briefly.

REP. BACKER: Okay, I guess. It doesn't matter to me.

DR. JEFF HUMPHREY: So.

REP. BACKER: You guys aren't going to fist fight back there?

DR. JEFF HUMPHREY: Thank you for the opportunity to speak. I am in strong support of this bill as well. I am an oncologist, a physician and a medical research scientist. And currently I develop cancer drugs for Pfizer Oncology.

I'd like to simply add my voice in support of the physicians that you heard earlier and also add kind of my own personal experience with having counseled families, friends and associates who have loved ones who are dying of incurable cancers and being in the situation of trying to help families with children with leukemia who are searching for experimental drugs.

So the only message that I'd like to give is that placing children in danger, without their consent, risks causing a child who would otherwise grown uneventfully into adulthood, to suffer and possibly die -- possibly suffer and possibly die from leukemia. And putting even one child in risk of that kind of scenario or one family in that kind of a scenario, I think is unacceptable.

And that's really all that I have to say. I thank you.

REP. BACKER: Okay. I was going to ask if they have any questions or comments for you, but I guess not. Thank you very much.

Okay, where was I? Is Alan Gerber here? Okay. Now that we got that straightened out.

DR. ALAN GERBER: Hi, good afternoon. My name is Alan Gerber, I am a Woodbridge resident and my three

young children attend school near the power lines.

I just wanted to share with you my education about this issue as a member of the public who became interested in this because of a private concern, that is this power line application and its proximity to my children's school.

Over time, as I have become better educated about the various safety risks, I became increasingly concerned on two levels, both the risks and also the way in which the public might not be adequately informed by the communications that were coming forward from the utility companies.

When I first heard about the utility company plans, I vaguely remembered reading the claims of adverse health affects had been discredited. But fortunately I have a Ph.D. in economics from MIT. I'm currently a professor of political science at Yale and I teach statistics there to the graduate students and my research involves quantitative analysis.

And given that I regularly evaluate technical material, I was fortunately in the position to take a look at what the statistics and epidemiology shows for myself and I didn't really have to rely upon things I was reading in places like the newspapers and the statements that were coming forth from interested parties.

I just want to say that what I found surprised me quite a bit, study after study associates childhood leukemia with elevated levels of electromagnetic fields. I do a lot of quantitative analysis. I've performed statistical literature reviews similar to these meta-analyses that we have been describing and so I was able to review the various meta-analyses in the area of EMFs and childhood leukemia.

Meta-analysis is just a very standard statistical technique for gathering up all the possible information that's available and all of the individual studies and through pooling all the data

together permitting you to see relationships that might be obscured in individual studies.

The three major meta-analyses in this area all demonstrate a strong association of two, three, four milligauss of exposure and childhood leukemia. As Dr. Bell explained, these studies also showed the response relationship. It is rather striking that after all the studies that have been done, we have come down I think to solid evidence of a strong and robust association of exposure to elevated levels of electromagnetic fields and childhood leukemia.

One recent meta-analysis reported in the British Journal of Cancer based on nine previous studies found that exposures in the range of four milligauss --

(GAP IN TESTIMONY -- CHANGED TO TAPE 3B)

DR. ALAN GERBER: -- risk of leukemia. Another study published in Bio-electromagnetics reviewed the results of 19 previous analyses. Again, showing a statistically significant association between elevated levels of electromagnetic fields and childhood leukemia.

The existing evidence shows this clear positive association. And while, as you have heard already, there is scientific uncertainty regarding the precise mechanisms and sources of the link, the robust association of EMFs and childhood leukemia in the epidemiological literature is clearly beyond question. Yet in a February 7th article in the New Haven Register, the United Illuminating spokeswoman said that in the 30 years of scientific research, no correlation has been found between EMFs and human health issues.

This is an irresponsible and absurd public statement. I have not seen a correction or a retraction of this statement. But I really do wonder what's going on here? I mean, what is going on here?

In their filings they review studies. In their public statements they are trying to convince the public of things which appear to be based on a simple reading of the evidence, factually incorrect.

The utility company plan runs new high power lines over parks, playgrounds, camps and schoolyards. Based on utility company filings, it is very plausible that during typical school days many children will receive average EMF exposures at levels associated with elevated risk.

As citizens we turn to our representatives to protect the health of the state's children. I urge you to regulate the behavior of those who have demonstrated through their words and plans and actions that they unfortunately can not be trusted to regulate themselves.

REP. BACKER: I take it you concluded. Does anybody have any questions? I wasn't sure if you were just pausing for a minute.

DR. ALAN GERBER: No, no, that's plenty.

REP. BACKER: Any questions or comments? We will ask utilities about that statement. It's easily for you to say they are easily read.

DR. ALAN GERBER: Give me the abstracts.

REP. BACKER: Obviously, we will ask them.

DR. ALAN GERBER: Sure.

REP. BACKER: If there is somebody who is responsible for dissemination of bad information, it won't rest very well here.

DR. ALAN GERBER: Good.

REP. BACKER: Thank you.

SEN. PETERS: Shelley Kreiger.

SHELLEY KREIGER: Thank you Chairperson Peters and Chairperson Backer and esteemed members of the Committee for allowing me to speak with regard to H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINES SITING CRITERIA.

My name is Shelley Kreiger and I serve as Head of School for Ezra Academy on the B'nai Jacob Campus. Ezra Academy is an independent day school with accreditation from the Connecticut Association of Independent Schools and the Solomon Schechter Day School Association.

For more than 30 years, Ezra Academy has been a special guest at B'nai Jacob. There is a unique familial relationship between our two institutions.

Ezra Academy has approximately 215 students who are on campus for more than eight to ten hours daily. Our school day is from 8:00 to 3:10, but we have a breakfast club at 7:00 a.m. for early arrivers, as well as after school clubs, activities and sports.

The proposed power line is within 30 to 50 feet of our classrooms above our outdoor basketball court, soccer fields and adjacent to our playground.

Many of our parents have expressed their concern to me regarding the health and safety of their children in regards specifically to the proposed power line upgrade. I take their concerns seriously.

I know personally what it is like to have a child who dies from a childhood cancer. One of my children was one of the statistics that you are hearing about all day today.

But I must also echo other parental concerns. I'd like to share with you an additional concern about which you may not be aware. This is a letter I received from a parent, her name is Darcey McGraw and her daughter Anna Altmann is a student at Ezra Academy. She is hearing impaired. In order to function in a mainstream school environment, she must wear hearing aides. As a child with a disability, she has the right to be in a mainstream

school and it has been our goal, according to Darcey McGraw, to keep Anna in a mainstream environment.

As a Jewish family, it is also important to us that Anna receive a Jewish education. And Ezra is a wonderful school for her. The concern that medical devices such as hearing aides can be affected by electromagnetic interference has recently become a public issue.

The federal government has looked into this problem. In fact, the FDA has released a draft report suggesting the minimum distance that should be maintained between transmitters of various power outputs and medical devices with various amounts of shielding.

Legislative interest in this issue appears to have precipitated action in the industry to address the MI problems. For example, the Cellular Telecommunications Industry Association, the CTIA, and the Health Industry Manufacturers Association have jointly funded a center for the study of wireless electromagnetic compatibility at the University of Oklahoma to study medical device interference.

Obviously, as has been discussed here today, there is a serious potential risk of exposing our children to carcinogens simply by the proximity of the proposed power lines to the school.

In my family's case, there is also the additional danger that my child's hearing aides without which she can not function, will be interfered with and possibly permanently damaged by exposure to the increased EMF to be generated by the proposed lines.

I have been told that digital hearing aides such as my daughter's will simply shut off when exposed to such high EMF levels. Hearing aides are very costly and replacements are not covered by health insurance. So replacing them is a significant matter.

Additionally, one of the possible hazards of exposure of hearing aides to electromagnetic interference is the generation of dangerously high noise levels in the aides themselves. The tones can reach 130 decibels, the sound of an airplane taking off as heard by a person standing on the runway.

Clearly, a child who has already sustained a severe hearing impairment can not be asked to face the risk of further damage to their hearing by exposure to such loud noises. It is simply unfair.

I know from my involvement in the hearing impaired community that my daughter is not the only hearing impaired child along the power lines. These children also deserve to be protected from the adverse effects of EMF.

Those are the kinds of parent concerns that I am hearing -- health concerns and hearing aide concerns. In addition to echoing those parental concerns, I must also share the concern for my staff and faculty, many of whom are at school working for the benefit of children in our community for upwards of 12 hours daily giving of their time and energy.

As a head of school, I am also concerned about the health of our school. We do not want any increased exposure either in the new proposed lines or in any existing lines.

Sometimes when we hear about statistical data, we forget that these statistics are real people. In the case of Bill 5418, the children we're talking about are real children, children who get sick, children who die, children who have hearing aides and who need access to education.

I have the blessing of hearing the happy, healthy voices of children every day in my life. I've chosen that. I hope you can hear their voices today and going forward as you make your decision.

Thank you.

SEN. PETERS: Thank you Shelley. You actually brought new issues into the debate and that's appreciated. Certainly, as a nurse, I can appreciate all health aspects of this. Questions? Representative DelGobbo.

REP. DELGOBBO: Thank you Madam Chair. You said the school is located within --

SHELLEY KREIGER: Thirty to fifty feet.

REP. DELGOBBO: Thirty to fifty feet and the school has been there for how long?

SHELLEY KREIGER: Thirty years.

REP. DELGOBBO: About thirty years. And --

SHELLEY KREIGER: Thirty-seven years.

REP. DELGOBBO: Thirty-seven years. So when the school moved to that location -- is this, and I don't know exactly where the proposal -- where along the line this proposal is and where your location is?

SHELLEY KREIGER: We're located in Woodbridge.

REP. DELGOBBO: You're the existing right-of-way? Where there is an existing 115 kV line?

SHELLEY KREIGER: Yes, but the school has regularly tested the electromagnetic field, the milligauss output from the electromagnetic field. I can tell you those readings, they are statistically below any of the levels that are cited in any of the reference material as to being cause for concern. Two-tenths of a percent in the parking lot, .36 percent by the gymnasium, .48 to the playground and we test those outputs regularly.

They don't come anywhere near the projected milligauss output from the lines that are being cited in the utilities' own report with the upgrade. I believe we are a very responsible institution. We have --

REP. DELGOBBO: I have no doubt of that by your presence here.

SHELLEY KREIGER: We have both independent testers come out, as well as the utility testers come out.

REP. DELGOBBO: How long -- how far back have you -- I mean obviously, I wouldn't say 37 years ago did anybody test for EMF? I wouldn't think so.

SHELLEY KREIGER: I don't know that. I've been at the school nine years. I have testing from nine years ago and I have testing from again as late as last summer.

REP. DELGOBBO: I was asking the questions because I was looking at one of the reports that was mentioned. I was sort of thinking, okay, what are the field strength of 115 kV line and actually your measurements seem to be substantially lower than what seems to be the standard.

SHELLEY KREIGER: Well. I have other measurements that are a little higher, but I -- and I certainly am far from an expert in this, if you ask me about reading programs in kindergarten through fifth grade, I'm okay, but milligauss, I've learned a lot this year.

I can only tell you that it depends on the load being sent down the line. The figures I gave you are when the utility company came out this summer to test for us, after the public hearings.

So I thought they were a little low also.

REP. DELGOBBO: Okay.

SHELLEY KREIGER: If there is more of a load of electricity being sent down the line, the electromagnetic field is greater coming out of the line. That's all I know.

REP. DELGOBBO: Generally speaking, that might have been a time when you would be expecting the highest load to be running through those lines, generally speaking. That's not necessarily true, but --

SHELLEY KREIGER: Right.

REP. DELGOBBO: I appreciate your testimony here today.

SEN. PETERS: Could I just ask the picture holders to just come into the circle here and walk around so that the Committee members can take a look at them? And are we looking at the school?

SHELLEY KREIGER: You're looking at the school and that the power lines are literally a stones throw or a basketball's throw or a soccer ball's kick. Thirty feet from a classroom, not 30 feet from outdoor space.

SEN. PETERS: Okay. And that's where the school buses pick up the kids and drop them off?

SHELLEY KREIGER: I don't know. They are not so well off to the side.

SEN. PETERS: How recent are these picture?

SHELLEY KREIGER: I can provide the Committee with an aerial photograph if that would be helpful. I can send it to you. We have an aerial photograph of the school and the power lines. Would you like that?

REP. MAZUREK: I'm curious how they can get up close to a classroom, within 30 feet is like here people sitting in the front row.

SHELLEY KREIGER: It's pretty close.

SEN. PETERS: Shelley, how recent are these pictures? 2004?

SHELLEY KREIGER: Within the past -- yes, this school year.

SEN. PETERS: Thank you. Any further questions? Thank you very much.

SHELLEY KREIGER: Thank you.

SEN. PETERS: Karen Libowitz.

KAREN LIBOWITZ: Thank you Senator Peters and members of the Committee for allowing me to speak with regard to H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINES SITING CRITERIA.

My name is Karen Libowitz and I'm a member of the Beecher Road School PTO and a parent of two children at the school. My children also attend Hebrew School three days a week under the power lines at Congregation B'nai Jacob.

I've come to you to ask that you support the proposed H.B. 5418 for the following reasons:

Beecher Road School is the only public elementary school in the Town of Woodbridge. We have 902 students attending school on the Beecher campus grades pre-K through sixth.

Our children also attend the Recreation Department activities and summer camp, the extended day program and the summer enrichment program all located on the Beecher campus.

Many of our children also attend activities, religious programs and camps at the Jewish Community Center Congregation B'nai Jacob and Trinity Evangelical Church. The lines cut right across areas where many of our children go to school and play.

Power companies in other states require a safety buffer of 1,200 feet between transmission lines and schools. The Beecher Road School campus would not be considered an acceptable distance in those states. Our situation highlights this problem.

We ask that you support this bill, because it employs a precautionary principle and insures that our children are safe. Any risk that could potentially harm even one child must be avoided. This bill insures uniform treatment for every child in the state of Connecticut. Please support power with the safety zone for our children.

Thank you for your time. Any questions?

SEN. PETERS: Questions?

REP. DELGOBBO: Yes, Madam Chair. You mentioned that there were other states that had framework that required 1,200 feet from the school?

KAREN LIBOWITZ: Yes.

REP. DELGOBBO: Do you know what those states are?

KAREN LIBOWITZ: Yes, we have Alabama, Tennessee, Virginia, Georgia, Kentucky, Mississippi and North Carolina.

SEN. PETERS: Could you submit that to us, please?

KAREN LIBOWITZ: Yes, actually Jody Ellant will be speaking shortly after I do and she has a lot more information on that too.

REP. DELGOBBO: Okay.

SEN. PETERS: Okay.

KAREN LIBOWITZ: I can submit this as well, if you'd like.

SEN. PETERS: If somebody could just submit their testimony because we don't have testimony.

JODY ELLANT: I do have mine, it has all that.

SEN. PETERS: And you are?

JODY ELLANT: Jody Ellant.

SEN. PETERS: Okay, thank you. Dr. Stephanie Green. Good afternoon.

DR. STEPHANIE GREEN: Good afternoon, not good evening yet. Thank you Senator Peters and members of the Committee for allowing me to speak with regard to H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINES SITING CRITERIA.

My name is Stephanie Green, I am a physician and a concerned mother of four children who attend a daycare facility, a private school, after school activities and summer camp in Woodbridge. I am here today in full support of this proposed bill.

I want to offer a historical perspective to the utilities' proposal. In the 2003 application filed, the utilities state "the results of the latest studies of childhood cancer do not provide sufficient convincing evidence to support the hypothesis that exposure to electric or magnetic fields or power lines near the home are a cause of leukemia."

Now flashback a little bit to 1959, when this following statement was made, and I quote "my contention would be that one should not feel under any compulsion to make a scientific judgment if the evidence does not warrant it. A person of true scientific discipline would never make a final judgment one way or the other on the type of the evidence presented." This statement was made by scientists hired by tobacco companies disputing a correlation between cancer and cigarettes.

The similarities between these two statements are instructive and alarming. Back in 1959, who would have ever thought that in the year 2004 smoking cigarettes in public would be virtually illegal in many cities? That it is illegal to advertise cigarettes on TV and to young people? That the attorney generals of many or most states have sued the cigarette companies for damages related to cancer and other ill health affects caused by cigarettes.

I've come before you today as a mother and a physician to ask that you legislate and support the proposed H.B. 5418 to protect the health and safety of the children in the state of Connecticut.

Furthermore, I ask that you support language in the proposed legislation to ensure that the proposed safety buffers are enacted with respect to the Phase II application presently before the Connecticut Siting Council.

Thank you.

SEN. PETERS: Questions? Thank you doctor. Is it Jody Ellant?

JODY ELLANT: Yes. Thank you Chair Peters and Chair Backer and members of the Committee for allowing me to speak with you with regard to H.B. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINES SITING CRITERIA.

My name is Jody Ellant and I live at 67 Deer Run Road in Woodbridge, Connecticut. I am the Co-Chairperson of Keep the Children Safe, a grassroots organization created to protect the children of the state of Connecticut from unprecedented exposure to electromagnetic radiation.

I am here to speak to you about corporate safety standards set by power companies in other states with respect to power transmission lines and schools.

In many states in our country, the issue of power transmission lines near schools and other childcare facilities does not occur, as there is ample land to locate power lines away from schools. In fact, when I call advocacy groups in some of the mid-western states, they expressed disbelief that power companies would even think of locating transmission lines near schools.

However, in other similarly densely populated states, power companies have self-regulated by making the ethical corporate decision not to site high voltage transmission lines near schools. Thus, power companies who operate in the states of Florida, Wisconsin, Alabama, Tennessee, Virginia, George, Kentucky, Mississippi and North Carolina, have specific guidelines not to site high voltage power transmission lines near schools.

The Tennessee Valley Authority, our country's largest power transmission company states that a desirable distance between transmission lines of similar voltage to the ones proposed by Connecticut

Light and Power and United Illuminating and schools in 1,200 feet.

A desirable distance between transmission lines and schools is 1,200 feet. Yet, here in Connecticut, Connecticut Light and Power and United Illuminating have been brazen in proposing that 450-kilovolt power transmission lines run directly over schools, playgrounds and daycare centers exposing the children of the state of Connecticut to EMF levels of between 25 and 96 milligauss.

In sharp contrast, the application filed by the power companies with the Connecticut Siting Council acknowledges that there is a statistical association between EMF and childhood leukemia with radiation levels of over four milligauss.

In fact, United Illuminating's 2002 Annual Report states and I quote "Litigation expenditures may also increase as a result of scientific investigations and speculation and debate concerning the possibility of harmful health affects of electric and magnetic fields."

The United Illuminating's misplaced concern about litigation costs underscores the problem. The United Illuminating has concerns about its bottom line, while we the parents are concerned with the health and safety of the children of the state of Connecticut.

In proposing the route of the 400-kilovolt transmission line be directly over school campuses, Connecticut Light and Power and United Illuminating are acting in blatant disregard of the most recent scientific findings by the federal government, the State of California and the World Health Organization.

As Connecticut Light and Power and United Illuminating have demonstrated unwillingness to meet the industry safety standards set by other power companies with respect to exposure of children of schools to electromagnetic radiation, I come before you today to ask you to legislate and support proposed H.B. 5418 to protect the health

and safety of the children of the state of Connecticut from Connecticut Light and Power and United Illuminating, who are operating without regard to the health implications of their actions.

Furthermore, I ask you to support language in the proposed legislation to ensure that the proposed safety buffers are enacted with respect to the Phase II application presently before the Connecticut Siting Council.

The children of the state of Connecticut need to be protected now from Connecticut Light and Power and United Illuminating's reckless disregard for their health and safety.

There are ways to bring power to Connecticut and safety to our children. We implore you to require the utilities to do so.

SEN. PETERS: Questions? Thank you very much. I thank you for your testimony. Lee Levison.

LEE LEVISON: Thank you. I'm the Head Master of the Kingswood Oxford School in West Hartford. I am here this afternoon as President of the Board of Directors of the Connecticut Association of Independent Schools.

The Connecticut Association of Independent Schools is an organization of 87 non-public non-profit accredited elementary and secondary schools throughout Connecticut.

We come today to ask you to support passage of H.B. 5418, which would require a minimum setback of all future high voltage aerial power lines to keep them a safe distance from public and private schools, playgrounds and other areas which attract numbers of children.

We know that the scientific research regarding the exact range of danger high EMF fields present to children is incomplete. However, since at least some of the nation's foremost experts believe there is a clear risk to children from close and

persistent exposure to the EMF fields generated by high voltage aerial transmission lines.

And since this possible risk can be easily, affordably and completely removed by a modest setback requirement of these lines, mandating setbacks not only is prudent government policy but really should be seen as part of the duty of care and protection that each of us owes to all children.

CIS urges your support of the proposed setback legislation. Thank you.

SEN. PETERS: Questions? Representative Mazurek.

REP. MAZUREK: Thanks. Just a quick question. You said all future high voltage lines. Did you mean all high voltage lines? And you would advocate any that are currently in operation within a school or nursery or area where there is a lot of children moving those lines now?

LEE LEVISON: Yes, I would amend that.

REP. MAZUREK: Okay, thank you.

SEN. PETERS: Thank you Representative. Representative Tercyak, did you have a question? No. Thank you sir.

LEE LEVISON: Thank you so much.

SEN. PETERS: Rabbi Eisenberg.

: Rabbi Eisenberg had to leave but he submitted his statement earlier.

SEN. PETERS: Okay, thank you very much. Please apologize to the Rabbi for us. These things are lengthy. Darcey McGraw?

: She had to leave.

SEN. PETER: Kelly Lymm.

KELLY LYMM: Senator Peters, Representative Backer and members of the Energy and Technology Committee. I'm kind of nervous, sorry.

REP. BACKER: Don't be nervous. Everybody here has to put their pants on one leg at a time. So don't worry about it. Well except maybe Bobby Jepson, he's got so much energy. But the rest of us is one leg at a time.

KELLY LYMM: Okay. My name is Kelly Lymm and I live in Middletown, Connecticut. I just kind of want to start out by saying that I don't live under the power lines, I live in Middletown, but I got involved because it's a really scary situation with these power lines. I just want you to know that I'm involved because I am just a concerned citizen and so that's where I'm coming from. And I am mom of a two and a half-year-old. So this is just from me.

I am in favor of the proposed bill and commend Senator Crisco and Representative Klarides for bringing this proposal here today for the protection of our children.

I have some statistics that they all went through as well. But I kind of did a different correlation of them. What I did is, the California EMF Risk Evaluation of policymakers and the public completed the study in June of 2002. There were three doctors that were highly credentialed that did it. There were 91 studies on EMFs with childhood leukemia, adult leukemia and adult brain cancer. The average of the confidence levels in which they had a degree of certainty that were some personal risk was as follows, and this is the average I took for them.

There was a 71 percent confidence level in the degree of certainty that there was an added risk because of EMF exposures for childhood leukemia, a 58 percent confidence level for adult leukemia and a 65 percent chance for brain cancer.

Just as a quick overall. These links need to be recognized, especially in a situation where the EMF

levels will be magnified to such high levels and in such densely populated areas.

Potential health risks to babies, children and pregnant women of the approximately 100 homes in the Royal Oaks Subdivision of Durham and the 250 children approximately are amplified because of these proposed overhead 345,000 volt electrical transmission lines.

These lines happen to be in the middle of the subdivision where the families live and the children play. The current Northeast Utilities application does not have EMF levels dissipate to safe levels until hundreds of feet beyond the existing right-of-way.

For the Royal Oak Subdivision, EMFs will be the highest of the entire project. For the 27 gigawatt case, the EMF level will be 58.4 at the right-of-way boundary, being as close as three feet from the right-of-way and will engulf EMF levels as high as 57 mG.

We don't know, we can't prove, but there are two children in Durham on this right-of-way that have leukemia. I can't necessarily say for certain that this correlation exists because they live on this power line. But it is an odd situation that you have two out of ten homes that have a leukemia situation happen.

These children do not have the ability to make choices today regarding where they live and their exposure to this potential hazards. Therefore, it is now our responsibility to make the right decision on their behalf.

Let's help these children grow up to be healthy and productive leaders and contributors to our community, versus the alternative, children who grow up and experience long-term adverse health conditions that prevent them from maximizing their abilities and contributions to society and place them into potential groups that add costs to our society, as well help to take care of them.

CRE, Communities for Responsible Energy in the Durham area and Middletown and Middlefield collected a thousand signatures in a short period of three weeks. That's a lot of signatures in approximately three weeks. And they are opposed to the overhead 345 electrical transmission line upgrade.

It is for these reasons that I have attached some language that may assist you in adding residential language to your proposed bill.

Now I'm not an attorney, I just did my research. I found some ordinances that were in place and they had what was considered a contour line and that may be of assistance to you.

The National Institute for Environmental Health Sciences as we heard, encourage a technology that lowers exposures to neighborhood distribution lines provided that they don't increase the risks for such of those from accidental electrocution or fire.

Well the proposed language that I have is not a technology and is simply a method. It still achieves the same result and more. Lowering exposures from neighborhood distribution lines and doing it in the most equitable way for your citizens.

And I think that's the objective, equitable ways.

SEN. PETERS: You mentioned some numbers -- mGs on the right-of-way.

KELLY LYMM: Yes.

SEN. PETERS: Could you repeat those please?

KELLY LYMM: Sure. For the 27 gigawatt case the EMF level will be 58.4 mGs at the right-of-way boundary. The abutting homes, being as close as three feet from the right-of-way, will be engulfed in EMF levels as high as 57 mGs.

Trish Bradley, who will also be speaking, speaks tremendously on this topic. She has passionately followed it for the last 18 months to almost two years of her life. And you really have to understand that she is an excellent person to talk to because she will give you all the facts.

SEN. PETERS: Who is promoting this language? This is about the third testimony that I have gotten this proposed language. You're promoting the language.

Thank you. Questions? I appreciate it, thank you.

KELLY LYMM: Thank you.

SEN. PETERS: Is it Walter Pietruska? I hope I pronounced your name correctly.

WALTER PIETRUSKA: You sure did.

SEN. PETERS: Thank you.

WALTER PIETRUSKA: Good afternoon Ms. Chairperson and members of the Energy and Technology Committee. My name is Walter Pietruska, I live at 58 Black Walnut Drive in Durham, Connecticut.

I am here to testify on Bill 5418. I support the suggested amendment that the previous speaker, Kelly Lymm just made.

CL&P has a 125-foot easement that runs through my property for transmission of electricity. This is the location on the proposed 345-kilovolt line that runs along the Durham-Middletown border.

There are nine swimming pools on the property adjacent to this Royal Oak easement and over 26 in the Royal Oak neighborhood. These pools are most used by children who will be swimming in a path of high levels of EMF radiation that was just previously testified to you.

For this reason I would like the language of this bill to be changed to include densely residential areas.

Attached to my 50 copies is a map of this neighborhood. I have highlighted the location of the proposed 345-kilovolt transmission lines in yellow and the pools in green.

(MICROPHONE NOT ON.)

SEN. PETERS: Any questions? Thank you very much.

: Dawn Lass Kopel.

DR. DAWN KOPEL: Hi.

SEN. PETERS: Dawn Lass Kopel, right?

DR. DAWN KOPEL: Dawn Weiner Kopel. My last name is Kopel.

SEN. PETERS: Okay.

DR. DAWN KOPEL: And I want to say thank you for allowing me the chance to speak today and also for allowing me the chance to speak at a different part of the list where you had anticipated my speaking.

I appeal to you today to vote yes or pass 5418. I am a physician of obstetrics and gynecology. I am also a mother and an Ezra parent. I am extremely concerned about the EMF emissions that would be present by the proposed placement of a 460-kilovolt transmission line.

The power lines would have us believe that currently there is merely a possible association between EMF and childhood leukemia. But as I have heard today and as everyone here has heard today from Doctors Rabinowitz, Bell and Professor Gerber, that this association is very unlikely due to chance.

I believe the placement of these lines would essentially create an unnecessary experiment on a grand scale using our children as the subjects. But unlike a well-designed scientific medical study that has to go before an internal review board, there will be no recourse to discontinue this study should this association become a recognized

statistically significant and proven cause and effect.

Such adverse effects would be irreversible and the relocation of the power lines at that time all the more difficult.

To put this in concrete terms and from my perspective as a gynecologist, I can give you an example.

Many of you may be aware of the Women's Health Initiative that was published just last year. This study is the association between hormone replacement therapy and adverse affects on women. And for many, many years these medications have been used to treat women with a loosely recognized association between hormone replacement therapy and breast cancer among other things.

However, we now know based on this study that the suspected association between hormone replacement therapy and breast cancer, as well as coronary artery disease, cerebral vascular disease, deep venous thrombosis and pulmonary embolus, which is large blood clots that can cause death. This became a statistically significant proven fact. And therefore, this portion of the study was discontinued to prevent further harm from being done to the subjects of the study.

We will not have this option should these transmission lines be placed. And I would like to appeal to you to prevent this from becoming a dangerous experiment. And I thank you for your time today.

SEN. PETERS: It just may be that my brain is not working as quickly as it was earlier in the day. Can you, doctor, go over the significance of this chart again that was just passed out?

DR. DAWN KOPEL: This chart that I have in front of me and I believe is the same one that you have right there, is merely to point out the exposure rates that will be existing should the power lines be placed with relationship to the specific sites.

SEN. PETERS: So it's a forecast?

DR. DAWN KOPEL: Yes, it shows existing exposure and forecasted exposure.

SEN. PETERS: And it's based on data that you collected?

: It's actually the utilities' own document. It is from Volume 6 of the application.

SEN. PETERS: Which utility?

: CL&P and UI. There are about six volumes of the Phase II application, and that's from volume 6.

DR. DAWN KOPEL: I have it right here Chairman Peters, if you would like to see it. I have the original pagination if you would like to see it.

SEN. PETERS: Actually, if you wouldn't mind hanging around for a few minutes, I'd take a look at it.

DR. DAWN KOPEL: Fine, I would be happy to do that.

SEN. PETERS: Questions? Thank you.

DR. DAWN KOPEL: Thank you.

SEN. PETERS: Diana McCain?

TRISH BRADLEY: She's not here. May I speak in her place?

SEN. PETERS: Who are you?

TRISH BRADLEY: Trish Bradley.

SEN. PETERS: You are actually the next one, so you may. You're the pretty lady in red that has the pool.

TRISH BRADLEY: I guess that's a matter of opinion.

: Whether you have a pool or not?

TRISH BRADLEY: I hate being in public anyway, so. Good afternoon members of the Energy and Technology

Committee. My name is Trish Bradley, 47 Ironwood Lane in Durham. My husband and I live in Royal Oak Park, a beautiful and peaceful family neighborhood.

Newly married and planning a large family, our home was to provide a safe and healthy environment in which to raise our children. Nineteen years and five children later, this proposal of an additional 345 kV strikes fear into my heart.

The two most important things to us, our children and our home are being threatened.

NU has identified Durham as one of the five densely populated pockets along the 69 mile route. One hundred families and approximately 250 children live in this neighborhood alone. There are many other neighborhoods along the route.

CL&P's easement cuts through the heart of this subdivision crossing streets and yards where children play. Sixteen hours or more a day are spent at home playing or sleeping especially in the early years of childhood development.

I have read hundreds of articles and studies on EMFs for the past year and a half trying to convince myself that it would be safe to remain in my home if this proposal were to be accepted.

The more I have read, the more desperate I have become to leave. The statistical evidence linking EMFs to childhood leukemia is astounding.

The EMF measurement under the existing one kV line on my property right now is approximately 5.5 mG. I have all the attachments with actual measurements from CL&P.

Inside -- at the right-of-way boundary it is only .7 milligauss. Inside my home the highest measurement was .4 milligauss. The Connecticut Department of Public Health states the typical levels found inside homes range from .1 to 4 milligauss. My home is typical.

NU's overall project EMF assessment states that the magnetic field will be lower along one or both right-of-way edges for five of eight overhead sections. What they failed to mention is cross section two representing Durham, Middletown and Middlefield will increase ten-fold, resulting in the highest EMF levels and the highest net change in EMF levels of the entire project.

It is indicated in the application that our EMF levels will measure 31.5 milligauss at the right-of-way boundary for the 15 gigawatt case and for the 27 gigawatt case --

(GAP IN TESTIMONY -- CHANGED TO TAPE 4A)

TRISH BRADLEY: -- at least 50 feet from the right-of-way boundary. This is not so.

Children's bedrooms in this neighborhood are as close as three feet to the right-of-way. My feet is 12 feet from the right-of-way. Consequently, my family will be engulfed in high EMF levels not considered to be typical.

NU will no longer be in their right-of-way. Lowering the towers in this area, which they had considered at one point, will not decrease the electromagnetic fields.

This is not the environment that we chose to live in 19 years ago. We are being forced to make a choice between gambling with our children's lives or leaving our home and enduring a financial devastating impact to protect the health and lives of our five children.

Members of the Energy & Technology Committee, I put my trust in you to protect my children and all the children of Connecticut. Do not allow one child's life to be included in the price of this upgrade. Please have Northeast Utilities seek more responsible alternatives for the safety of our children. If that means burying the lines, then bury the lines, not our children.

I support -- I am in full support of R.B. 5418. I,

however, strongly feel that residential areas where children spend 16 hours or more a day should somehow be included in this bill. Please work with the proposed language that was submitted by Kelly Lymm and try to establish some sort of magnetic field contour line in accordance with the typical EMF levels referenced by Connecticut Department of Public Health.

I also have a couple of extra comments, if you don't mind. When you were asking before about microwaves and computers, I had those all measured in my house. They actually put the meter right against the microwave and while it was running with it against the glass oven, it read approximately six milligauss.

When you stepped back approximately two, three feet away where you normally would stand while the microwave is in use, it dropped to .3 milligauss.

Sitting at the desk where my computer is, my computer read the same -- about six milligauss, but where I was sitting read .3 milligauss.

So that's one thing I wanted to touch on. And another one was oh, the undergrounding. Somebody asked about the undergrounding. The undergrounding, my understanding is the configuration of the cables are such that when twisted together -- they are twisted underground inside of -- they are encased and twisted together.

And the configuration of these lines is such that the electromagnetic fields actually cancel each other out. And this is all from NU's application -- the attachments that I have. If you look at the overall project EMF assessment page, there is one line underlined. After that it says, "The contribution of the HPFF, that's the high pressured fluid filled underground line to magnetic fields on streets above, would be less than three milligauss." That means directly above the buried cable, the electromagnetic field would be less than three milligauss.

At a distance of 20 feet, the magnetic field would diminish to .2 milligauss or less. So I think that answered the question about undergrounding.

I think I have one more thing I think. Maybe that's it.

I have -- can I ask if any of you have children and if you do, can you tell me what the price of one child would be when you're concerned about cost?

SEN. PETERS: It is not appropriate for you to be asking us questions.

TRISH BRADLEY: I'm sorry.

SEN. PETERS: You are here to testify.

TRISH BRADLEY: I'm sorry.

: It depends on what day.

SEN. PETERS: Representative Backer.

REP. BACKER: I am just being lazy so I don't have to go back and look it up. What's the distance through that -- the Royal Oak neighborhood -- what's the overall?

TRISH BRADLEY: The overall distance is three-quarters of a mile.

REP. BACKER: Three-quarters of a mile, okay. And I --

TRISH BRADLEY: But -- I'm sorry.

REP. BACKER: No, go ahead.

TRISH BRADLEY: But I think there are other -- I mean, I am not -- I am concerned obviously about my children and my neighborhood.

But I believe that people in the schools should be protected, too. They shouldn't be near children at all.

REP. BACKER: Well, you know a lot of people from the

school spoke for themselves and I appreciate that. But this is three-quarters of a mile. I appreciate that. Thank you.

SEN. PETERS: Representative Duff.

REP. DUFF: Thank you, Madam Chairwoman. Good afternoon. I just had a question. Who did the testing for you of your microwave and your computer?

TRISH BRADLEY: CL&P.

REP. DUFF: They did come out and do it for you?

TRISH BRADLEY: I have the sheets attached of the measurements. Well, he didn't write down those measurements, but the other ones -- the measurements in my house are attached. And if you look at, there was a comment by a CL&P employee that I highlighted.

REP. DUFF: Right, okay. Thank you very much. I appreciate your testimony. Thank you, Madam Chair.

SEN. PETERS: Thank you. Other questions? Thank you. And Ruth Ann Wiesenthal-Gold.

RUTH ANN WIESENTHAL-GOLD: I don't know. Can I change my name to protect the innocent?

I am here today Madam Chairman to speak to you about two bills. As I have been sitting here listening to the testimony, I am reminded of my first day up here three years ago and the 12-hour day of listening to testimony and how you allowed us to group together at the end so that we could make our statement and get to a public hearing for Phase I.

And I would like to fantasize that this will be the last time that I will be testifying in front of you, but I suspect that if I said that, no one would believe me.

The first bill I wanted to speak to you about today -- let me take off my glasses so that I can see.

H.B. 5419, AN ACT CONCERNING COMPENSATION FOR CONNECTICUT SITING COUNCIL MEMBERS. I come to you today as the Woodlands Coalition representing some 5,800 people throughout Connecticut and New England, as well as across the country. Subsection (f) of section 16-50j reads: "The public member of the Council, including the Chairman, the members appointed by the Speaker of the House, President Pro Tem of the Senate and four Ad Hoc members specified in subsection (c) of this section, shall be compensated for their attendance at public hearings, executive sessions or other Council business as may require their attendance at a rate of $150.00, provided in no case shall the daily compensation exceed $150.00. The annual compensation for any member for attending such hearings shall not exceed $12,000 a year." (Just in case you didn't have that memorized.)

In today's climate, with a seemingly endless proliferation of applications, the members of the Siting Council are, in essence, being asked in the above listed statute to donate their time for a thankless job. If one contentious docket can require eight public hearings just to get to the door of the evidentiary hearings, it is difficult to fathom how they can be asked to handle the multitudinal cell tower applications.

Agree with the decisions made by the Council or not, approve of the process or not, the Siting Council is asked to do an onerous job. They should receive compensation commensurate with the task to which they are assigned.

And I would like to -- my next bill is 5418, AN ACT CONCERNING ELECTRIC LINE SITING CRITERIA. I think it is important to note the incredible work that was put forward today by Jody Ellant an the forces that she marshaled in bringing all of these amazing experts out.

I am not even going to begin to try to present the kind of information that they have given you and just ask that, as you have for every other bill that I have testified for in front of you, pass this bill. And you have been proactive. You have

created the Connecticut Energy Advisory Board and in that vein, we ask that you consider the children for today, as well as any other dockets that will be before the Siting Council in the next couple of hundred years.

Any questions?

SEN. PETERS: Thank you. And I would agree with you. I think the presentations from the folks that testified today was amazingly well researched and put together. We appreciate the fact that you put forward this information for our consideration. Thank you for your testimony.

And that concludes this public hearing.

(Whereupon, the hearing was adjourned.)

Yale University

Center for Children's Environmental Toxicology
toxikid.org

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February 26, 2004

Dear Members of the Energy Committee:

I am a resident of Woodbridge and have two small children who attend schools in the vicinity of the power lines in question. As a pediatrician and medical toxicologist, I have a professional interest in the interaction between children and any potential hazard in their environment, from biological agents to chemicals to radiation.

The risk of a particular hazard may vary according to multiple factors, and risk assessment must take into account critical differences between children and adults. For example, children have rapidly dividing cells and are therefore unusually sensitive to certain hazards. The typical child has many more years of life ahead than the average adult, a fact that is important in cases of hazards that occur over long periods of time.

In my role as Director of the Center for Children's Environmental Toxicology at Yale-New Haven Children's Hospital, I provide information regarding environmental hazards to children. It is my duty to provide information that is evidence-based; in other words, I review the available medical literature on a subject in order to provide a balanced opinion, and to allow health care professionals, public officials, and parents an opportunity to make appropriate risk-benefit decisions for the children in their care.

Having reviewed the medical literature on the subject of power lines and the electromagnetic fields they generate, I believe the following are true:

The medical literature DOES support an *association* between electromagnetic fields and childhood leukemia that is unlikely due to chance; the exact *cause-and-effect* relationship between the two, however, has yet to be determined. Furthermore, the National Institutes of Health have concluded that exposure of children to electromagnetic fields cannot be considered safe.

I believe the Energy Committee has the responsibility to consider *all* scientific evidence on the effects of electromagnetic fields. In the face of uncertainty about health hazards to children, it seems prudent to choose alternate routes for power lines in order to mitigate the intensity of electromagnetic fields in areas where children spend significant time. The children of Connecticut demand better, safer options, and I urge you to support HB5418.

Sincerely,

Carl Baum, MD

Carl Baum, MD, FAAP, FACMT

Funding for the Center provided by the Friends of Yale-New Haven Children's Hos ital

000639

Peter Rabinowitz, M.D., M.P.H.
15 Shorewood Forest Lane
Westport, CT 06880
Peter.rabinowitz@yale.edu

February 26, 2004

Re: **An Act Concerning Electric Transmission Line Siting Criteria**
House Bill 5148

HB5418

My name is Peter Rabinowitz. I am an Assistant Professor of Medicine at the Yale University School of Medicine, and Director of Clinical Services at the Yale Occupational and Environmental Medicine Program. As a board certified specialist in Occupational and Environmental Medicine, I am concerned for the children of Connecticut, because what the power companies are proposing goes against recommendations of the National Institutes of Health and the World Health Organization.

The WHO's International Agency for Research in Cancer has labeled EMF as "possibly carcinogenic". The NIH's National Institute for Environmental Health Sciences recently concluded that because of a possible link with childhood leukemia, "ELF-EMF exposure cannot be recognized as entirely safe". The NIEHS report called for "continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures".

What does reducing exposures mean? Background EMF exposures for the general population have been estimated in the range of less than 1 milligauss, averaged over a 24-hour period. In studies of children, EMF daily exposures of 3-4 milligauss have been associated with a doubling of leukemia risk.

The Ezra Academy School in Woodbridge illustrates the problem. According to plans proposed by the Power Companies, EMF exposures at the Ezra Academy will increase substantially, well in excess of the 4 milligauss level that has been associated with elevated cancer risk. Children at the school could spend hours and hours being exposed at these levels. Scientific studies of children going to school near power lines have found that school EMF exposures contribute significantly to their total daily exposure.

Therefore, the increase in children's EMF exposures that the Power Companies are proposing goes against recommendations of our top scientific and public health authorities.

I urge the legislature to do the right thing and protect the children of this state by not allowing the power companies to increase EMF exposures near schools and playgrounds.

Re: HB5148, An Act Concerning Electric Transmission Line Siting Criteria

My name is Alan Gerber. I am a Woodbridge resident and my three young children attend Ezra academy. When I first heard about the utility company's plans I thought the main harm from this project was that it would frighten people. I vaguely remembered reading that claims of adverse health effects had been discredited. I am a Yale graduate and have a Ph.D in economics from M.I.T. I am currently a professor of political science at Yale and I teach statistics to the graduate students. My research involves quantitative analysis and I regularly evaluate technical material, and so I decided to take a look for myself at what the statistical studies show.

What I found surprised me. Study after study associates childhood leukemia with exposure to elevated electromagnetic field (EMF) levels. In a New Haven Register article a utility company spokesman called a parents statement that sustained exposure to elevated EMF levels is associated with higher rates of childhood leukemia Auntrue and unfounded.≅[1] In fact, I quickly learned that the spokesman's view was mistaken. I have examined several recent meta-analyses, studies that combine the results of many previous studies in order to draw more precise conclusions: These studies all demonstrate a strong association of 3-4mG EMF exposure and childhood leukemia. There is also some evidence that lower levels of EMF exposure are harmful to children.

One recent meta-analysis reported in the British Journal of Cancer, based on the data collected in 9 previous studies, found that exposures in the range of 4mG and over are associated with a statistically significant doubling of the risk of childhood leukemia.[2] Another recent meta-analysis, appearing in the journal Epidemiology, examined the results of 12 previous studies. 11 of the 12 studies show increased risk of leukemia at the 3mG or greater exposure level.[3] A positive association this strong is produced by chance only 1 time in 300. Yet another recent analysis, appearing in Bio electromagnetics, reviewed 19 previous studies, and the results also support the link between leukemia and EMFs, and suggest that exposure levels even lower than 3mG are suspect.[4]

A panel of three scientists from the California Department of Health Services conducted a careful review of the evidence linking health effects to EMFs. Their June 2002 report states: AThe conclusions after reviewing all the evidence: to one degree or another, all three of the DHS scientists are inclined to believe that EMFs can cause some degree of

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[1] New Haven Register, February 3, 2004.
[2] Ahlbom, et al. (2000). British Journal of Cancer 83(5): 692-698. See abstract, tables 2 and 3.
[3] Greenland et al. (2000). Epidemiology 11(6): 624-634. Tables 3 and 4. 3 of the 12 studies required coding: if there were cases and no controls, it was a positive association, controls and no cases, a negative association. Excluding these three cases leaves 9 studies. 9 out of 9 studies of these studies show a positive association and so the inference is similar to the 11 out of 12 calculation.
[4] Wartenberg (2001). Bioelectromagnetics Supplement 5:S86-S104.

increased risk of childhood leukemia, adult brain cancer, Lou Gehrigs disease, and miscarriage.[5]

The epidemiological evidence does show a clear association between elevated EMF exposure and childhood leukemia. Based on utility company filings, it is very plausible that during a typical school day, many children will receive average EMF exposure at levels associated with elevated risk.[6] Given the potential danger, going ahead with the current utility company plan is extremely irresponsible and fails to show proper regard for our children's health and safety.

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[5] Neutra et al. (2002). An Evaluation of the Possible Risks From Electric and Magnetic Fields (EMFs) from power lines, internal wiring, electrical occupations, and appliances. California EMF Program. Final Report (June 2002). Page 3.

[6] Though I am not a natural scientist, it appears that approximate EMF exposure levels can be calculated in a straightforward fashion based on data provided in the regulatory filings. My calculations were based on utility company EMF reports (Tables A-1 and A-2 of the Application to the Siting Council, Volume 6) and several assumptions I supply. Some assumptions were required to complete the calculations since important figures were missing. Most importantly I did not find any utility company calculations of average EMF field levels during school days (the average EMF levels appear to be 24 hour averages). It is also unclear what percentage of the time the lines will be operating at "peak" load in 2007 and how that percentage will chance in subsequent years, as well as how the "peak" EMF levels might change over time. For "realistic" school day EMF levels, I selected the average of the all day average numbers and the peak level numbers provided in the utility company filing. According to these calculations many students will receive average school day EMF exposure well in excess of 3mG, and so the conclusions are robust to changes in the assumptions.

February 26th, 2004 Statement by Leonard Bell, M.D. to the Legislature Regarding HB5148, An Act Concerning Electric Transmission Line Siting Criteria

- My name is Leonard Bell. I am a physician, a researcher, and the CEO of a publicly traded biotech company. I am responsible for evaluating the safety and effectiveness of drugs. I have substantial expertise in the interpretation of large sets of clinical data with thousands of patients and a clear understanding of the Federal regulatory criteria required for proof of drug safety and effectiveness.

- There have been over a dozen clinical studies of EMF and children. Many different health effects have been studied. In these individual clinical studies, the one health problem that consistently has been found to be associated with EMF exposure is acute childhood leukemia, a rare and potentially fatal disease.

- When clinical scientists are trying to study rare clinical events, these scientists may frequently use an approved scientific technique where they combine the subjects from many individual trials together into one group. With this combined, single, larger and more representative group of subjects, clinical scientists are more likely to be able to accurately identify the presence of rare, or infrequent, events. Further, with these "meta analyses", clinical scientists can measure whether different interventions increase or decrease the likelihood of rare events, such as childhood leukemia.

- At least three major scientific meta-analyses have been performed examining whether EMF is associated with childhood leukemia. Each of these studies has shown similar results: at exposure levels of 2-4 mG (milligauss) and above, the risk of childhood leukemia doubles. These findings have been described as unlikely to be due to chance. In fact, one study with over 13,000 subjects concluded that the likelihood that EMF is associated with childhood leukemia is 99.8% (Ahlbom et al. *British Journal of Cancer*.2000; 83:692-698).

- Based on these very large studies, the likelihood that EMF <u>is</u> associated with cancer, therefore, is VERY high, further supporting the 1999 U.S. National Institutes of Health's conclusion that EMF cannot be considered safe for humans.

- The Connecticut State Legislature currently allows for increases in high voltage power lines which will cause children in adjacent schools to be exposed to EMF levels which are 800% - 3200% GREATER than the level associated with a doubling of the childhood leukemia risk.

- Presidential Executive Order #13045, enacted in April 1997, explicitly requires that each agency "shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

- Similar to the WHO, the Connecticut State Department of Public Health implicitly advocates prudent avoidance. The Department recommends, "...there is enough uncertainty that some people may want to reduce their exposure to EMF." The Department further cautions, "If the power lines are less than 300 feet away from the home, you may want to consider obtaining EMF measurements in the yard...Deciding where to live rests upon a number of considerations that varies with each individual. EMF exposure is one of many factors in this decision."

- Given this regulatory mandate to protect children, together with the Federal Government's conclusion that EMF cannot be considered to be safe, how can the Legislature allow power companies to expose children to high levels of EMF?

- As a society, we are obligated to protect our citizens from hazards. We each have a particular responsibility to protect our children from such hazards. I urge you to act now to protect the health of all of the children in the State.

YALE UNIVERSITY
SCHOOL OF MEDICINE
DEPARTMENT OF PSYCHIATRY

JOHN H. KRYSTAL, M.D.
Deputy Chairman for Research

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Date: February 23, 2004

To: Bill HB5418, Hearing

From: John H. Krystal, M.D., Robert L. McNeil, Jr. Professor of Clinical Pharmacology

Re: High Power Lines in Woodbridge

I am writing to raise two issues in support of Bill HB5418.

My name is John Krystal of 119 Maple Vale Dr. I am the father of two children who attend Beecher Road School, who attend Hebrew School at Congregation B'Nai Jacob three times each week, and who utiiize the Jewish Community Center. I am also the Robert L. McNeil, Jr. Professor and Deputy Chairman of the Department of Psychiatry at the Yale University School of Medicine.

I ask you consider the potential long-term negative psychological consequences of living in a community that they believe is fundamentally unsafe due to environmental hazards. In my private capacity as the Director of the Clinical Neuroscience Division of the National Center for Post-Traumatic Stress Disorder, Director of the Neurobiology Subcommittee of the Task Force on Bioterrorism for the American College of Neuropsychopharmacoiogy, a former member of the Board of Directors for the International Society for Traumatic Stress Studies, and a former member of the Editorial Board for the *Journal of Traumatic Stress,* I have reviewed the literature from man-made ecological disasters including Three Mile Island, Love Canal, and others. Negative consequences of these disaster included emotional distress, sleep disturbance, and impaired concentration. Medical consequences of this stress response included increased levels of stress hormones, elevated heart rate, and changes in the levels of chemical factors (cytokines) involved in immune function. Placing high power lines in close proximity to schools and other community organizations could have a negative impact on the psychological life of our community.

I also ask you to appreciate the possibility that placing high power lines in close proximity to schools and community organizations could have an adverse effect on brain function for the exposed children. **As a neuroscientist who studies the effects of magnetic fields on the human brain (for example (Hoffman et al. 2000)), i know that the brain is protected against many insults, but it is accessible to the impact of magnetic fields. i am very concerned that we do not know the impact of long-term EMF exposure on brain function. In our research, we use brief magnetic pulses to stimulate the brain. We can produce therapeutic effects, but magnetic stimulation may also transiently disrupt speech or impair learning and memory. The fact that magnetic field exposures at 10 – 60 kV may produce behavioral changes in animals suggests that these fields can aiter brain function. Exposure to 10 kV magnetic fields induced the release of stress hormones in mice (de Bruyn and de Jager 1994), while 60 kV magnetic fields disturbed sociai behavior in baboons (Easley et al. 1991).**

Please support the iegislation introduced by Senator Crisco and Representative Klarides to safeguard the children of Connecticut. I ask you to consider the negative psychological impact of the proposed power lines for this community and the possibility that the proposed power lines could adversely affect the brain function of our children. There are safe alternatives and they should be explored.

Thank you for your attention to these concerns.

Citations:

de Bruyn L, de Jager L (1994) Electric field exposure and evidence of stress in mice. Environmental Research. 65: 149-60

Easley SP, Coelho AM, Jr., Rogers WR (1991) Effects of exposure to a 60-kV/m, 60-Hz electric field on the social behavior of baboons. Bioelectromagnetics. 12: 361-75

Hoffman RE, Boutros NN, Berman RM, Krystal JH, Charney DS (2000) Transcranial magnetic stimulation of left temporoparietal cortex inpatients reporting auditory hallucinations. Lancet 355: 1074-1076

Jody P. Ellant
Co-Chairperson Keepthechildrensafe
P.O. Box 3628
Woodbridge, Connecticut 06525

My name is Jody Ellant. I live at 67 Deer Run Road, Woodbridge, Connecticut. I am the co-chairperson of Keepthechildrensafe, a grass roots organization created to protect the children of the state of Connecticut from unprecedented exposure to electromagnetic radiation.

I am here to speak to you about corporate safety Standards set by Power Companies in other states with respect to power transmission lines and schools.

In many states in our country, the issue of power transmission lines near schools and other childcare facilities does not occur, as there is ample land to locate power lines away from schools. In fact, when I called advocacy groups in some of the Midwestern states they expressed disbelief that Power Companies would even think of locating transmission lines near schools.

However in other similarly densely populated states, Power Companies have self-regulated by making the ethical corporate decision not to site high voltage power transmission lines near schools. Thus, Power Companies who operate in the states of Florida, Wisconsin, Alabama, Tennessee, Virginia, Georgia, Kentucky, Mississippi, and North Carolina have specific guidelines NOT to site high voltage power transmission lines near schools.

In fact, the Tennessee Valley Authority, our country's largest power transmission company, states that a desirable distance between transmission lines of a similar voltage to the ones proposed by Connecticut Light and Power and United Illuminating and schools is 1200 feet.

A DESIRABLE DISTANCE BETWEEN TRANSMISSION LINES AND SCHOOLS IS 1200 FEET.

Yet here in Connecticut, Connecticut Light and Power and United Illuminating have been brazen in proposing that a 460kV power transmission line run directly over schools, playgrounds, and daycare centers, exposing the children of the State of Connecticut to EMF levels of between 25 and 96 milligaus. In sharp contrast, the Application filed by the Power Companies with the Connecticut Siting Council acknowledges that

Jody P. Ellant
Co-Chairperson Keepthechildrensafe
P.O. Box 3628
Woodbridge, Connecticut 06525

there is a statistical association between EMF and childhood leukemia with radiation levels of over 4 milligaus.

In fact, United Illuminating's 2002 annual report states and I quote "litigation expenditures may also increase as a result of scientific investigations and speculation and debate concerning the possibility of harmful health effects of Electric and Magnetic Fields".

The United Illuminating's misplaced concern about litigation costs underscores the problem. The United Illuminating has concerns about its bottom line, while we, the parents, are concerned with the health and safety of the children of the State of Connecticut.

In proposing the route of the 460kV-transmission line be directly over school campuses, Connecticut Light and Power and United Illuminating are acting in blatant disregard of the most recent scientific findings by the federal government, the State of California and the World Health Organization.

As Connecticut Light and Power and United Illuminating have demonstrated an unwillingness to meet the industry safety standards set by other Power Companies with respect to exposure of children in schools to electromagnetic radiation, I come before you today to ask you to legislate and support proposed House Bill 5418 to protect the health and safety of the Children of the State of Connecticut from Connecticut Light and Power and United Illuminating who are operating without regard to the health implications of their actions.

Furthermore, I ask that you support language in the proposed legislation to insure that the proposed safety buffers are in enacted with respect to the Phase II application presently before the Connecticut Siting Council. The Children of the State of Connecticut need to be protected NOW from Connecticut Light and Power and United Illumninating's reckless disregard for their Health and Safety.

There are ways to bring power to Connecticut and safety to our children. We IMPLORE you to require the utilities to do so.

Rachel Humphrey, MD

Re: HB5148, An Act Concerning Electric Transmission Line Siting Criteria

My name is Dr. Rachel Humphrey. I have 2 children, ages 13 and 10, who attend schools in Woodbridge. I'm a physician, a cancer specialist, trained at Harvard, Case Western Reserve, Johns Hopkins Hospital and the National Cancer Institute. My current practice of medicine is limited to once per week, Thursdays, at the St. Raphael's Hospital where I volunteer to assist in the care of cancer patients without Medical Insurance. I am not paid for this work. The rest of the week, I spend full-time at Bristol Myers Squibb Pharmaceuticals where I design, run and analyze international clinical studies of new and upcoming anti-cancer therapies. Specifically, most of my time is focused on determining whether clinical data are true or not. Normally, I worry about this because of the high costs of Pharmaceutical Investments. We're not talking about money now, though. We're talking about lives…the lives of our children.

When I learned about the issues surrounding the new power lines, I spent several hours reviewing the data myself. I found studies of small communities that failed to show an association between cancer and high power lines and I felt reassured. But even if you're not a trained statistician, it makes sense that studies can be flawed by evaluating too few people. **Small negative studies can often miss an important finding. Studies, or reviews of groups of studies, that show statistically significant results are less often wrong.** If I had found no positive studies, I wouldn't be standing here today.

I found a study done by the Vatican that showed that the closer Romans live to the Vatican Radio Tower, the higher the incidence of leukemia and I got worried. I read recent Meta-Analyses…studies that pool all of the smaller negative studies…and a statistically significant increase, **a doubling**, in childhood leukemia was observed. I grew alarmed. It is my life's work to critically evaluate clinical data. I was prepared to remain open-minded. But I leave you with 2 clear messages. (1) In my mind, **there are enough data to suggest an increased risk to my children that there is no debate in my mind. The lines must be buried or diverted.** (2) In my medical practice, as in my life, I advise patients as if they were my father, brother, sister, child. I never tell a patient to take chemotherapy, unless I would be willing to take it myself or give it to my husband in the same situation. In this vein, **I ask you to treat our children as your own.** Given the alarm of trained physicians, would you place your own child under the power lines. Would you experiment with your own kid?

Please support this bill and ensure that all children are treated equally.

Respectfully Submitted,

Rachel Humphrey, M.D.
50 Penny Lane
Woodbridge, CT 06525

Susan Birke Fiedler
90 Gilnock Drive
New Haven, CT 06515

Re: Bill HB5418, Hearing Thursday, February 26, 2004

Dear Committee:

I am writing regarding Bill HB5418. I am the mother of three children ages 5-11. I live in New Haven, Connecticut and my children attend school in Woodbridge, Connecticut. At my children's school there is currently a power line of 115kv within 50 feet of the school. Until the Utilities' submitted their proposal for an additional power line of 345kv, I did not focus on the power line. The new proposal forced me to look at the data and consider what it means to have a power line at such close proximity to a school.

I have used my energy to educate myself on what the risks are for power lines near schools and I have discovered the following: 1 – Children are the most vulnerable of our population; 2 – Areas where children congregate for long periods of time are riskier places; 3– Distance Counts. The further away power lines are from children the harmful fields become less of a threat.

In my community, more than 3,000 children spend most of their days in close proximity to these power lines. The current power proposal would put a power line in such close proximity to my children's school that the electrical and magnetic fields emitted from the lines would be 800-3200% *Greater* than what is considered safe. I pray that our community will be spared this power line. But where does that leave other communities and other children who may not have the information or the resources to understand the implications of a power line near their school? Our situation highlighted the problem. This process should not be a town by town issue. We are dealing with a major health risk that affects all children.

This bill currently before you will protect all children, not just those with parents or friends who can negotiate a deal with the power companies. The power infrastructure will be in place for more than fifty years. This is a long term public policy decision regarding the health of our children this generation and going forward that needs to be made thoughtfully and with uniform.

We do need power. We also need protection for our children. Please support power and with this Bill create a safety zone for children.

Very Truly Yours,

Susan Birke Fiedler, Esq.

EZRA Academy
A Solomon Schechter Day School
The George G. and Leah E. Posener Elementary School
The Middle School at Ezra Academy

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Norman Ravski

February 2004

Dear Chairwoman Katz and Members of the Siting Council,

I am Shelley G. Kreiger, I serve as Head of School for Ezra Academy on the B'nai Jacob campus. Ezra Academy is an Independent Day School with accreditation from the Connecticut Association of Independent schools and the Solomon Schechter Day School Association. For more than 30 years, Ezra Academy has been a special tenant at B'nai Jacob. There is a unique familial relationship between us. We have approximately 213 students who are on the campus more than eight to ten hours a day. Our school day is 8:00 to 3:10 but we have a breakfast club at 7:00 A.M. as well as after school clubs, activities and sports. The proposed line is within 30-50 feet of our classrooms and above our basketball court, soccer fields and adjacent to our playground area. Many of our parents have expressed their concern to me regarding the health and safety of their children. I take their concerns seriously. I know personally what it is like to have a child who dies from a childhood cancer. One of my children was one of the statistics you heard tonight. I don't wish that pain and suffering on any other family. In addition to echoing their concerns, I also must share the concern for my staff and faculty many of whom are at school for 12 hours daily, giving of their time, energy and commitment to the children of this community. As a Head of School, I must also share my concern for the health of our school. We do not want any increased exposure either in the new proposed lines or in the existing lines. I have the blessing of hearing the happy healthy voices of children every day. I hope you can hear their voices tonight and going forward as you make this decision.

Thank you,

Shelley G. Kreiger

Shelley G. Kreiger
Head of School

Bill No. HB5418 2/24/2004 2:02 PM

Dear Representatives,

My name is Walter Pietruska, residence 58 Black Walnut Drive, Durham, CT. I am hear to testify on Bill No. HB5418.

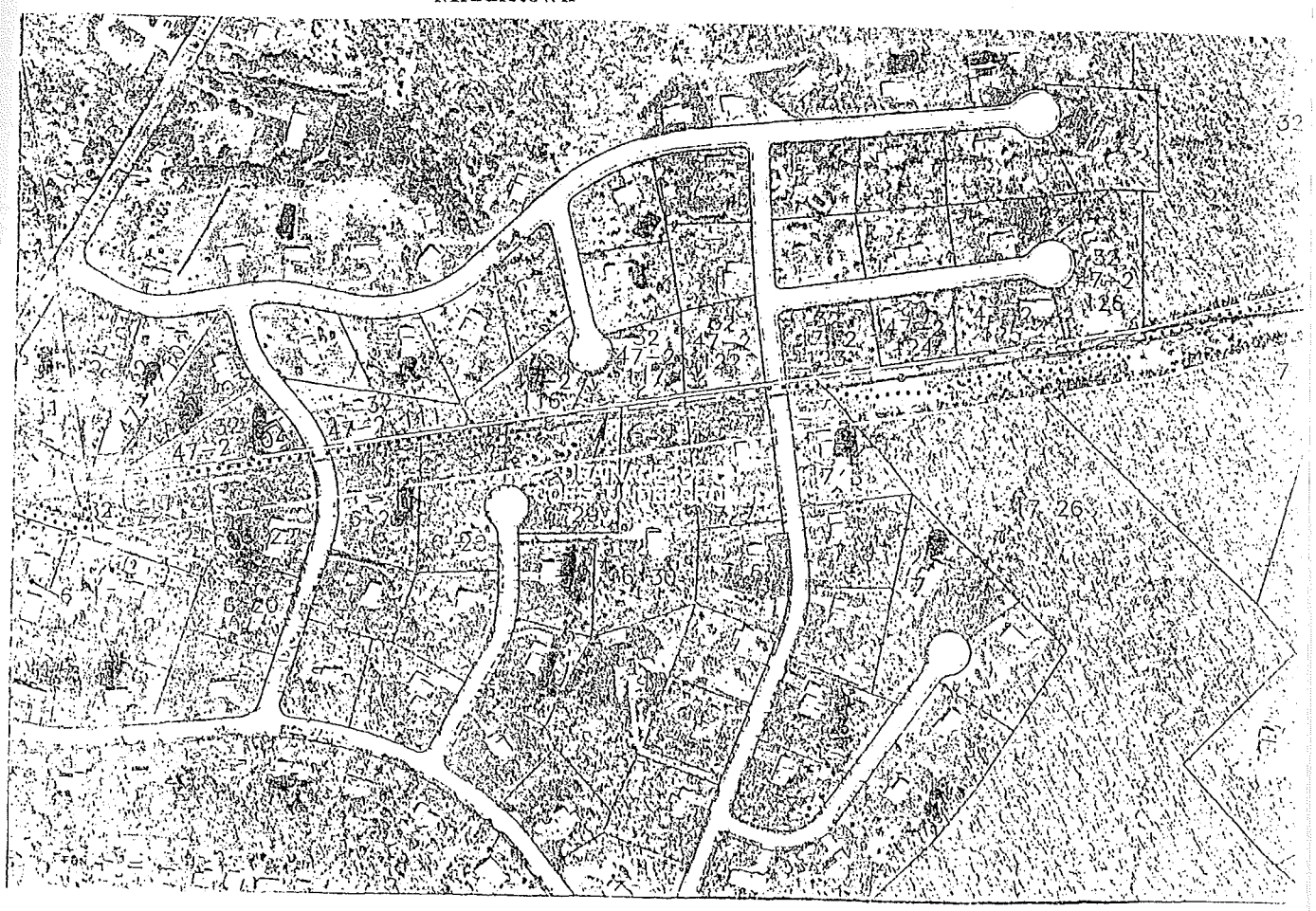
CL&P has a 125-foot easement through my property for transmission of electricity. This is the location of the proposed 345kV line that runs along the Durham/Middletown border.

It is my understanding that the highest increase in EMF (radiation), along the proposed power line, will be in my Durham/Middletown Royal Oak neighborhood. The measurement of radiation is "milligauss". This measurement increases or decreases depending on various variables such as transmission load, angle of the line that changes during varying weather conditions.

There are nine swimming pools, on property adjacent to the Royal Oak easement, and over 26 in the Royal Oak neighborhood. These pools are mostly used by children who will be swimming in the path of high levels of EMF radiation. For this reason I would like the language of this bill to be changed to include "densely populated areas".

Attached is a map of this neighborhood. I have highlighted the location of the proposed 345kV transmission lines in yellow and the pools in green.

Middletown



Durham

TESTIMONY OF

THE UNITED ILLUMINATING COMPANY

BEFORE THE ENERGY AND TECHNOLOGY COMMITTEE

RE:

RHB5418, LCO NO. 1320 – AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA

February 26, 2004

Good afternoon, Senator Peters, Representative Backer, and members of the Energy and Technology Committee. I am Dennis E. Hrabchak, Vice President Regulatory Policy of The United Illuminating Company ("UI"). I am presenting UI's testimony in opposition to Raised Bill No. 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA.

This proposed legislation is unnecessary. Today, under existing statutes (Conn. Gen. Stat. § 16-50p(a)(5)), the Connecticut Siting Council cannot issue a certificate of environmental compatibility and public need for an overhead electric transmission line unless the Council determines that "the location of the line will not pose an undue hazard to persons or property along the area traversed by the line." Since the 1980's, the Siting Council has included electric and magnetic fields as criteria for evaluating all electric transmission line applications, and has been proactive in assuring that it has information necessary to make the required statutory determination:

- The Council keeps abreast of scientific studies and articles on electric and magnetic fields.
- The Council has adopted Best Management Practices with respect to electric and magnetic fields.
- Section N of the Council's guidelines for electric transmission lines requires that the certificate application include:

  "Justification that the location of the proposed transmission line would not pose an undue safety or health hazard to persons or property along the area traversed by the proposed transmission line including:

  1. Measurements of existing electric and magnetic fields (EMF) at the boundaries of **adjacent schools, daycare facilities, playgrounds, and hospitals**, with extrapolated calculations of exposure levels during expected normal and peak normal line loading; [emphasis added]

  2. Calculations of expected EMF levels at the above listed locations that would occur during normal and peak normal operation of the transmission line; and

3. A statement describing consistency with the Council's '"Best Management Practices for Electric and Magnetic Fields', as amended."

- Each Council opinion granting or denying an electric transmission line application, and the Council's associated findings of fact, explicitly discuss electric and magnetic fields.

Thus the Council already has the statutory responsibility and the statutory authority to consider the issues of concern in this Bill. If the Siting Council determines that a specific proposed location for an electric transmission line would cause undue hazard to persons or property, the Council is required to reject the location.

There is no scientific basis for requiring that electric transmission lines be a specific minimum distance from any location. The level of electric and magnetic fields at schools, day care facilities, camps or playgrounds, or any other location, near a power line or other electrical source is not simply determined by distance. No state or federal agency or legislative body anywhere in the country has developed or imposed health-based exposure standards with respect to electric and magnetic fields. This includes Connecticut's interagency task force on electric and magnetic fields. The public health and safety is well protected by the Siting Council continuing its rigorous required consideration of electric and magnetic fields in the context of specific applications and specific locations, taking into account all information and literature to the date of the Council's evaluation of the application.

UI appreciates the opportunity to comment on this Bill. We share the concern for the public health and safety that forms the underlying intent of the Bill. However, as outlined in this testimony, these concerns are already comprehensively addressed in the existing siting process.

STATE OF CONNECTICUT GENERAL ASSEMBLY
ENERGY AND TECHNOLOGY COMMITTEE

February 26, 2004 PUBLIC HEARING

RE: AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA : RAISED BILL NO: 5418 : LCO 1320

Statement of Limited Appearance

(Electromagnetic fields and childhood leukemia: close proximity of homes in Durham)

My name is Trish Bradley of 47 Ironwood Lane in Durham. My husband and I live in Royal Oak Park, a peaceful and beautiful, family neighborhood. Newly married and planning a large family, our home was to provide a safe and healthy environment in which to raise our children. Nineteen years and 5 children later, this proposal strikes fear into my heart. The two most important things to us, our children and our home are being threatened.

NU has identified Durham as one of the five densely populated pockets along the 69 mile route. **One hundred (100)** families and approximately **two hundred and fifty (250)** children live in this neighborhood alone. Cl&P's easement cuts through the heart of this subdivision, crossing streets and yards where children play. Sixteen hours or more a day are spent at home playing or sleeping, especially in early years of childhood development.

I have read hundreds of articles and studies on EMFs trying to convince myself that it would be safe to remain in my home if this proposal were to be accepted. The more I've

read, the more desperate I have become to leave. The statistical evidence linking EMFs to childhood leukemia is astounding.

The EMF measurement under the existing 115kv lines on my property is approximately 5.0 mG (CL&P 60Hz Magnetic Field Measurement Report). At the ROW boundary it is point 7 (0.7) mG. Inside my home the highest measurement is (0.4) mG. The Connecticut Department of Public Health states that typical levels found inside homes range from point one(0.1) to four (4.0) mG. My home is typical.

Nu's "Overall Project EMF Assessment" (Volume 6, section 4 page 96) states that "the magnetic field will be lower along one or both right-of-way edges for **five of eight** overhead sections." What they fail to mention is **Cross Section 2**, representing Durham, will **INCREASE 10-fold**, resulting in the **highest EMF levels** and the **highest NET INCREASE** in EMF levels of the **entire** project.

It is indicated in the application (Volume 6, section 2.6 Calcualted Electric and Magnetic Fields From Transmission Lines, table 5, page 26 , also shown on the graph on page 34, figure 27, Electric and magnetic field profiles for cross section 2) that our average EMFs will measure 31.5 mG at the ROW boundary for the 15 GW case and for the 27 GW case it will be **58.4 mG**. (Volume 6 Appendix, Supplementary EMF Data, Table A-3, page A-3). This is 15 to 18 times the measurement of 3 or 4 mG cited as being a safe level (Volume 6, section 3, EMF Research, subsection 3.1.1.1, page 84 – Studies of Magnetic Field Exposures).

Furthermore, it is shown that homes are at least 50 feet from the ROW boundary (Volume 6, section 2.5.2, figure 7, page 15). This is not so. Children's bedrooms in this neighborhood are as close as **three (3) feet** from the right of way (ROW). My house is **12 feet from the ROW**. Consequently, my family will be engulfed in high EMF levels not considered to be typical. NU will no longer be in their right of way. Lowering the towers in this area will not decrease the EMFs. This is not the environment that we chose to live in 19 years ago.

We are being forced to make the choice between gambling with our children's lives or leaving our home and enduring a financially devastating impact to protect the health and lives of our five children.

Members of Energy and Technology, I put my trust in you to protect my children and all the children of Connecticut. Do not allow one child's life to be included in the price of this upgrade. Please have NU seek more responsible alternatives for the safety of our children. If that means burying the lines, then

BURY THE LINES, NOT OUR CHILDREN.

I support Raised HB 5418 but however I strongly feel that residential areas where children spend 16 (sixteen) hours or more a day should also be included in this bill. Please refer to the proposed language submitted by Kelly Lymm of Middletown, CT which would establish a magnetic field contour line in accordance with the typical EMF levels referenced by the Connecticut Department of Public Health.

4 Overall Project EMF Assessment

The proposed project will affect ambient levels of electric and magnetic fields, with the greatest effect within the boundaries of the Middletown-Norwalk right-of-way. Outside the boundaries of the right-of-way and substations, the effect of the project on EMF levels will be limited. At distances greater than approximately 100 feet from edges of the proposed right-of-way, the differences between the levels of fields produced by existing and future line configurations become smaller for this and other route sections under consideration. This results from the overall design and the location of the proposed facilities, the proposal to expand the right-of-way in some sections, and the placement of the 345-kV line underground between the East Devon and Norwalk Substations.

Despite the addition of a 345-kV overhead transmission line to existing rights-of-way, the electric field will be lower along one or both right-of-way edges for five of the eight sections of the primary overhead route because of consolidation with existing transmission lines (Cross Sections 1-8, Table 4). The changes in electric field level (increase or decrease) at the edge of right-of-way would be less than 0.8 kV/m except for one side of one route section. No change in the electric field will occur on sections where the line would be placed underground on the proposed route (Section 9), Alternative A (Section 9A) or Alternative B (Section 10).

Similarly, the magnetic field will be lower along one or both right-of-way edges for five of eight overhead sections of the primary route (Cross Sections 1-8, Table 5). The contribution of the HPFF underground line to magnetic fields on streets above would be less than 3 mG. At a distance of 20 feet, the magnetic field would diminish to 0.2 mG or less. A 345-kV XLPE underground line has been considered for sections of Alternative Routes A and B. The magnetic field over this XLPE line is about 30 mG and diminishes to less than 3 mG within 20 feet.

The "supported changes" to the proposed route arising from the public consultation process involve the relocation of a 115-kV overhead line to an underground 115-kV XLPE line. This may lower the electric field, particularly for Cross Section 8 – Alternative A. The effects of the "supported changes" in magnetic field levels produce small decreases for Cross Section 8 and a small increase/decrease on opposite right-of-way edges of Section 7B relative to the proposed route.

On the Alternative A route (Cross Sections 9A and 17-22) and Alternative B route (Cross Sections 10-22), the addition of a 345-kV overhead line would have a minimal effect on the electric field at the edge of the ROW and beyond for most cross sections. However, along the East/South edge of Sections 20-22, closest to Norwalk on Alternative A and B routes, the electric field will increase by just over 2 kV/m. The magnetic fields from existing overhead lines tend to be higher on the proposed overhead route than on the alternative routes but the addition of the 345-kV line reduces the magnetic field on one or both sides of the right-of-way on 11 of 12 Alternative cross sections. The addition of the proposed line will reduce the magnetic field more than 10 mG and sometimes more than 20 or 30 mG at the edge of some sections.

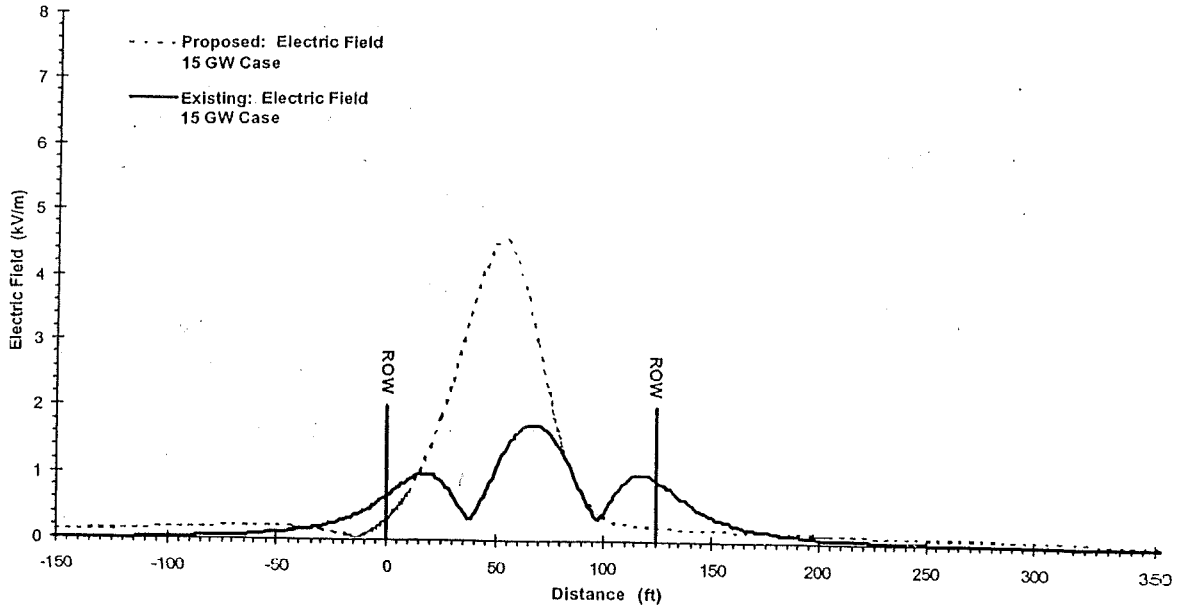
Table 5. Edge of right-of-way magnetic field values for existing, proposed, and alternative line configurations

2007 annual average loading (15 GW)

Cross Section	Existing Magnetic Field (mG)		Proposed Magnetic Field (mG)	
	East/South* ROW	West/North** ROW	East/South ROW	West/North ROW
Proposed Primary 345-kV Overhead Route				
1	35.6	35.3	31.0	17.3
2 DURHAM	3.0	4.5	31.5	21.5
3	13.5	5.2	4.0	13.8
4	5.7	10.1	2.8	19.8
5	5.7	27.3	11.4	28.3
6	0.9	6.6	2.5	6.1
7 and 7A	0.5	6.7	6.5	9.6
8 and 8B	7.7	4.3	5.7	8.6
"Supported Changes" - 345-kV Overhead and Relocation of 115-kV to Underground				
7B *(25')****	0.5	6.7	4.3	15.4
8A *(-20')*****	7.7	4.3	2.1	7.6
*(-400')*****	7.7	4.3	1.7	7.5
Proposed and Alternative Underground Line Routes+				
9 (HPFF - East Devon to Singer)	- na -	- na -	0.1	0.1
9 (HPFF - Singer to Norwalk)	- na -	- na -	0.2	0.2
9A (Alternative A) (XLPE - Singer to Hawthorne)	- na -	- na -	2.9	2.7
10 (Alternative B) (XLPE - Singer to Seaview Loop)	- na -	- na -	1.7	2.8
Alternative 345-kV Overhead Line Route				
11 (Alternative B)	2.3	9.0	2.8	7.6
12 (Alternative B)	5.6	33.3	3.4	27.7
13 (Alternative B)	1.7	2.0	5.8	6.0
14 (Alternative B)	49.2	5.2	26.3	8.2
15 (Alternative B)	63.3	59.5	26.3	14.4
16 (Alternative B)	52.3	46.3	15.4	16.8
17 Alternative A & B)	34.4	34.6	11.4	22.3
18 (Alternative A & B)	17.0	27.4	16.1	26.2
19 (Alternative A & B)	37.3	38.4	23.9	8.6
20 (Alternative A & B)	43.8	23.9	59.5	8.1
21 (Alternative A & B)	13.8	21.1	35.5	8.1
22 (Alternative A & B)	32.5	18.7	59.5	8.1

* Identified in documentation as left ROW
** Identified in documentation as right ROW
*** Distance from edge of ROW. +25' indicates 25' outside of the right (West/North) ROW.
**** Distance from edge of ROW. -20' indicates 20' outside of the left (East/South) ROW
\+ ROW edge taken as –20' left (East/South) ROW and +20' right (West/North) ROW.
- na - Not applicable

NY10132.000 COTO 1003 WB24



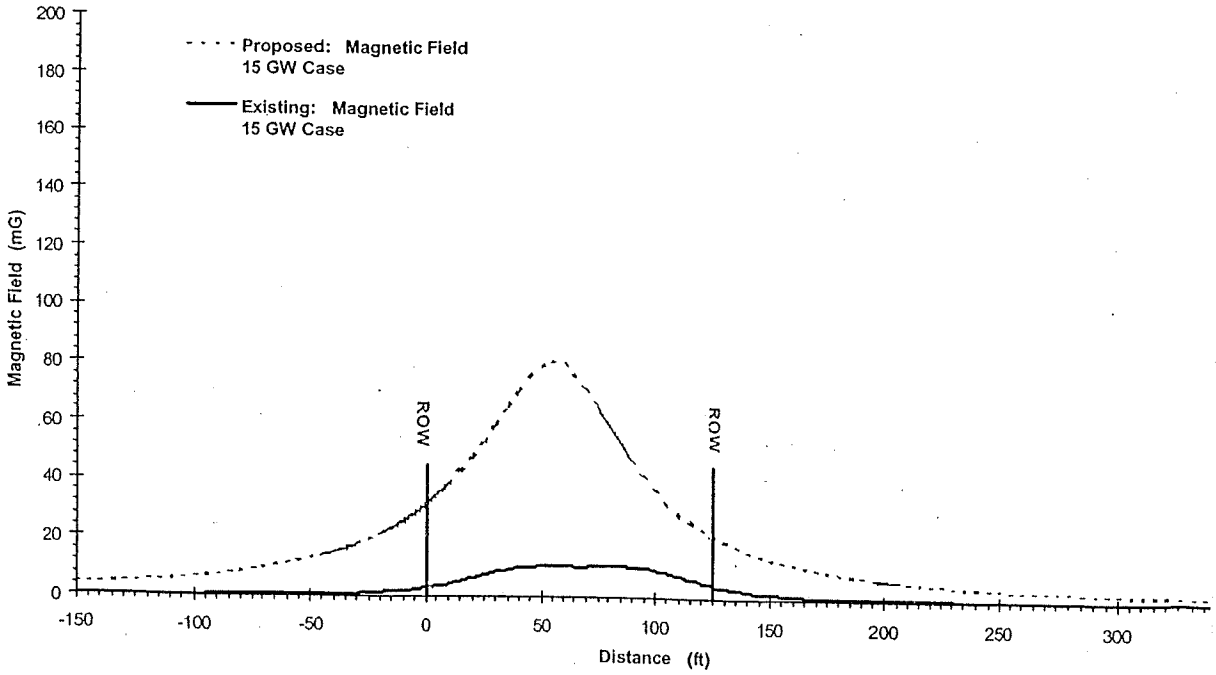


Figure 27. Electric and magnetic field profiles for cross section 2

Table A-3. Edge of right-of-way magnetic field values for proposed and alternative line configurations. Highest hour loading in 2007 – 27 GW

Electric field values are the same as for the 15 GW case.

Cross Section	Existing Magnetic Field (mG)	Proposed Magnetic Field (mG)	
	Existing Transmission System will not Support 27 GW Projected Load	East/South* ROW	West/North** ROW
Proposed Primary 345-kV Overhead Route			
1	- na -	58.8	41.2
2 BURBHAM	- na -	58.4	39.4
3	- na -	12.0	10.7
4	- na -	5.5	17.1
5	- na -	45.0	61.6
6	- na -	16.3	39.9
7 and 7A	- na -	38.0	44.7
8 and 8B	- na -	28.1	49.5
"Supported Change" 345-kV Overhead and Relocation of 115-kV to Underground Line Sections			
7B *(25')***	- na -	19.4	54.6
8A *(-20')****	- na -	14.1	49.1
*(-400')****	- na -	14.1	49.1
Proposed and Underground Line Routes+			
9 (HPFF - East Devon to Singer)	- na -	0.2	0.2
9 (HPFF - Singer to Norwalk)	- na -	0.2	0.3
9A (Alternative A) (XLPE - Singer to Hawthorne)	- na -	4.6	4.4
10 (Alternative B) (XLPE - Singer to Seaview Loop)	- na -	6.1	5.1
11 (Alternative B)	- na -	9.7	15.7
12 (Alternative B)	- na -	38.4	46.2
13 (Alternative B)	- na -	20.1	38.1
14 (Alternative B)	- na -	63.5	6.7
15 (Alternative B)	- na -	63.5	11.5
16 (Alternative B)	- na -	42.2	14.7
17 Alternative A & B)	- na -	20.8	19.3
18 (Alternative A & B)	- na -	13.2	25.4
19 (Alternative A & B)	- na -	33.8	20.9
20 (Alternative A & B)	- na -	91.3	24.8
21 (Alternative A & B)	- na -	54.8	24.8
22 (Alternative A & B)	- na -	91.3	24.8

* Identified in documentation as left ROW
** Identified in documentation as right ROW
*** Distance from edge of ROW. +25' indicates 25' outside of the right (West/North) ROW.
**** Distance from edge of ROW. -20' indicates 20' outside of the left (East/South) ROW
\+ ROW edge taken as –20' left (East/South) ROW and +20' right (West/North) ROW.
- na - Not applicable

field levels measured in the bedroom represent a mixture of sources from household appliances, powerlines, etc., and cannot link magnetic field levels directly to any specific source; the authors note, "...fewer than one-third of all stronger magnetic fields were caused by high-voltage powerlines..." Several aspects of the study detract from the validity of the results. The estimate included a broad margin of error because only a small number of the cases were exposed at the higher levels, and many eligible cases and controls did not participate, which means that the responders may not represent the population and results could be biased. Another concern is that magnetic field measurements were taken in 1997, a long time after the relevant exposure period for cases that were diagnosed in 1990-1994.

Recently, researchers reanalyzed the data from previous epidemiology studies of magnetic fields and childhood leukemia that met specified criteria (Ahlbom et al, 2000; Greenland et al, 2000). In each of these analyses, the researchers pooled the data on individuals from each of the studies, creating a study with a much larger number of subjects and therefore greater statistical power than any single study. In addition, pooling the individual data is preferable to other types of meta-analyses in which the results from several studies are combined, using the grouped data reported in the published studies. These meta-analyses focused on studies that assessed exposure to magnetic fields using 24-hour measurements or calculations based on the characteristics of the power lines and current load. Both Greenland et al and Ahlbom et al used exposures less than 1 mG as a reference category, which is roughly the average level reported in a survey of American homes (Zaffenella, 1993). Ahlbom et al combined nine studies, and Greenland et al used 12 studies of magnetic fields, eight of which were the same as used by Ahlbom. Both studies included ALL as well as other forms of leukemia. The Greenland et al study did not include results from the recent, very large study from the United Kingdom (UKCCS, 1999, 2000). The statistical results of these analyses can be summarized as follows:

- The pooled analyses provided no indication that wire codes are more strongly associated with leukemia than measured magnetic fields.
- Pooling these data corroborates an absence of an association between childhood leukemia and magnetic fields for exposures below 3 mG.
- Pooling these data results in a statistical association with leukemia for exposures greater than 3-4 mG.

Average magnetic fields above 3 mG in residences are estimated to be rather rare, about 3 % in the US. The authors are appropriately cautious in the interpretation of their analyses and they clearly identify the limitations in their evaluation of the original studies. One limitation is that there are too few cases at higher environmental levels to adequately characterize a relationship between magnetic fields and leukemia. Another limitation is the uncertainty related to pooling estimates of exposure obtained by different methods from studies of diverse design without evidence that all of the estimates are comparable. The authors also expressed concern about the possibility of systematic error in the selection of control populations. Greenland et al (2000) comments, "In light of the above problems, the inconclusiveness of the results seems inescapable; resolution will have to await considerably more data on high electric and magnetic-field exposures, childhood leukemia, and possible bias sources."

2.5.2 Black Walnut Drive, Durham - ROYAL OAK PARK

Magnetic field measurements were taken along a profile from south to north perpendicular to the existing 115-kV transmission lines. The highest magnetic field measured was 14.6 mG and occurred under the transmission lines. The magnetic field profile is plotted in Figure 7.

Electric field measurements were also made along the profile perpendicular to the transmission lines. The highest electric field measured was 1.45 kV/m and occurred under the transmission lines. The electric field profile is plotted in Figure 8.

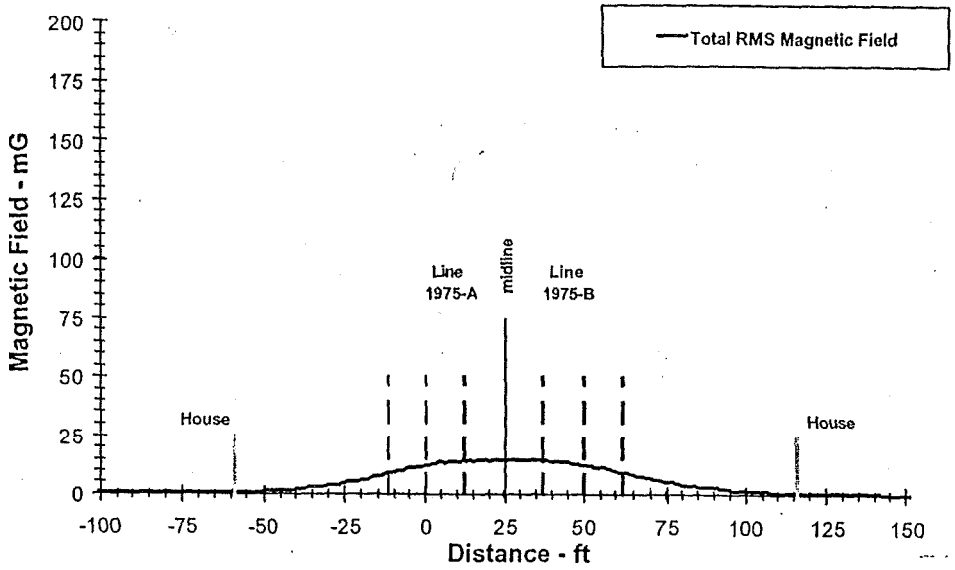


Figure 7. Magnetic field profile from south to north for the transmission lines passing over Black Walnut Drive

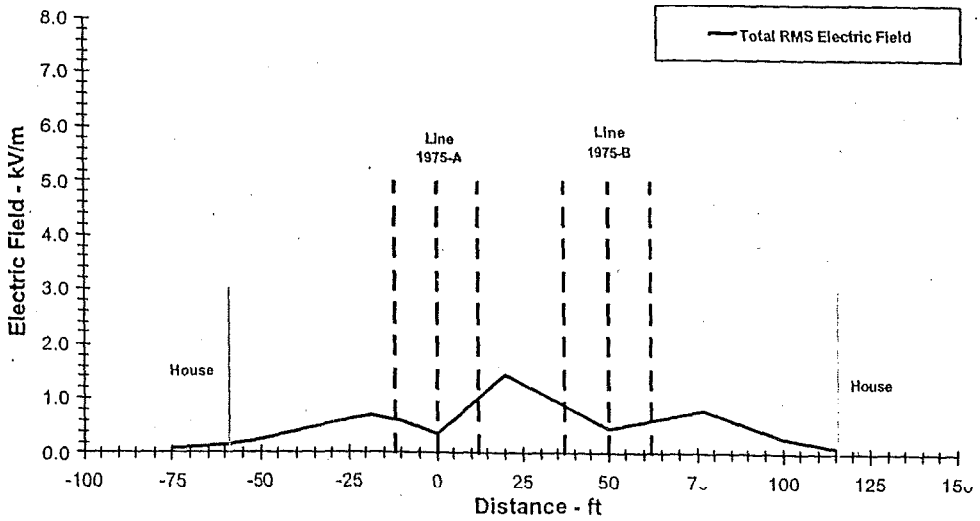


Figure 8. Electric field profile from south to north for the transmission lines passing over Black Walnut Drive

000664

CL&P/WMECO/PSNH

60 Hz Magnetic Field Measurement Report

NAME		PAGE
TRISH BRADLEY	349-9157	1 OF 1

MAILING ADDRESS

STREET	CITY	ST	ZIP CODE

MEASURED ADDRESS

STREET	CITY	ST	ZIP CODE
47 IRONWOOD LANE	DURHAM	CT	

MEASURED BY	DATE
JOHN DOANE	10/18/02

MEASUREMENT LOCATION	MAGNETIC FIELD (mG) mG = milligauss
UNDER SOUTH LINE	5.3
UNDER NORTH LINE	6.4
EDGE OF ROW	.8
SWINGSET	.5
POOL SIDE	.3
DECK	.4
PLAY ROOM	.3
KITCHEN	.3
RYANS RM (FAR SIDE)	.3
CAMARONS RM	.3
MEAGANS RM	.4
SHAINA + SKYLA RM	.3
MASTER BR	.4
ROAD INTERSECTION	.4

ED5953 REV. 02-00 ORIGINAL - *CUSTOMER* YELLOW - *SYSTEM FILE* PINK - *DISTRICT/REGION FILE* GOLD - *FILE*

CL&P/WMECO
60 Hz MAGNETIC FIELD MEASUREMENT REPORT

PAGE OF

ED5953 REV. 2-91

NAME: TRISH BRADLEY

MAILING ADDRESS | CITY/TOWN | STATE | ZIP CODE

ADDRESS MEASURED: 47 IRONWOOD LANE | CITY/TOWN: DURHAM | STATE: CT | ZIP CODE

MEASURED BY: JOHN DOANE | DATE: 10/18/02

MEASUREMENT LOCATION	MAGNETIC FIELD (mG) mG = milligauss
UNDER LINE (SOUTH)	~~4.3~~ 5.3
UNDER LINE (NORTH)	6.4
EDGE OF ROW	.8
SWINGSET	.5
POOL SIDE	.3
DECK	.4
PLAY ROOM	.3
KITCHEN	.3
RYANS RM (FAR SIDE)	.3
CAMARONS RM	.3
MAECANS RM	.4
SHADINA + SKYLA	.3
MASTER BR	.4
RD INT.	.4

ORIGINAL : CUSTOMER CANARY : SYSTEM FILE PINK : DISTRICT/REGION FILE GOLDENROD: FILE

CL&P/WMECO
60 Hz MAGNETIC FIELD MEASUREMENT REPORT

PAGE OF

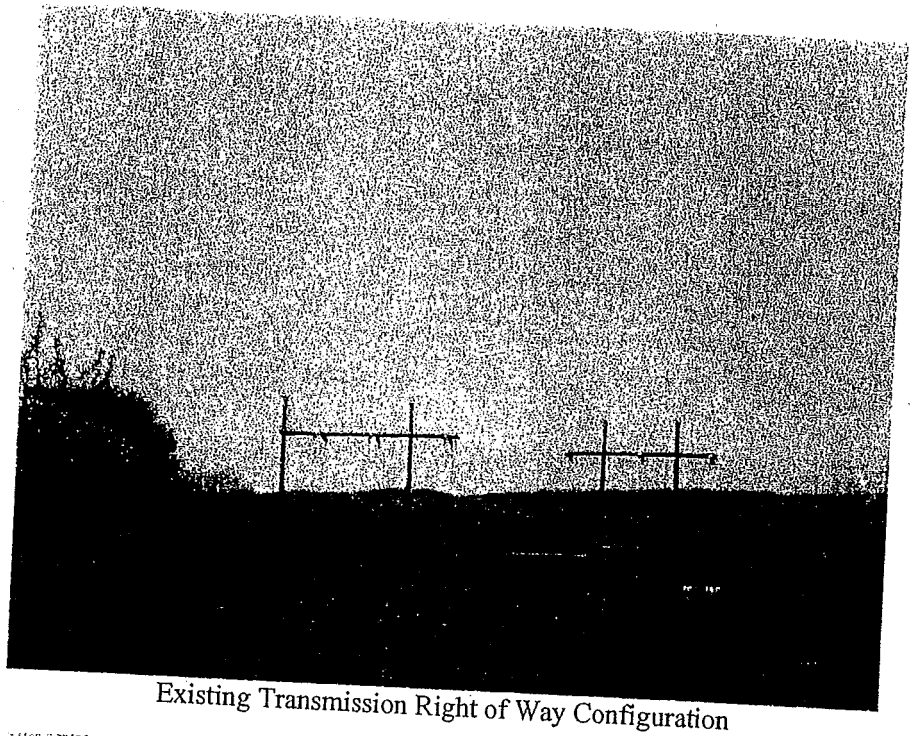
ED5953 REV.2-91

NAME: TRISH BRADLEY 349-9157		
MAILING ADDRESS	STATE	ZIP CODE
ADDRESS MEASURED: 47 IRONWOOD LANE DURHAM	STATE: CT	ZIP CODE
MEASURED BY: JOHN DOANE 447-5835		DATE: 11/3/03

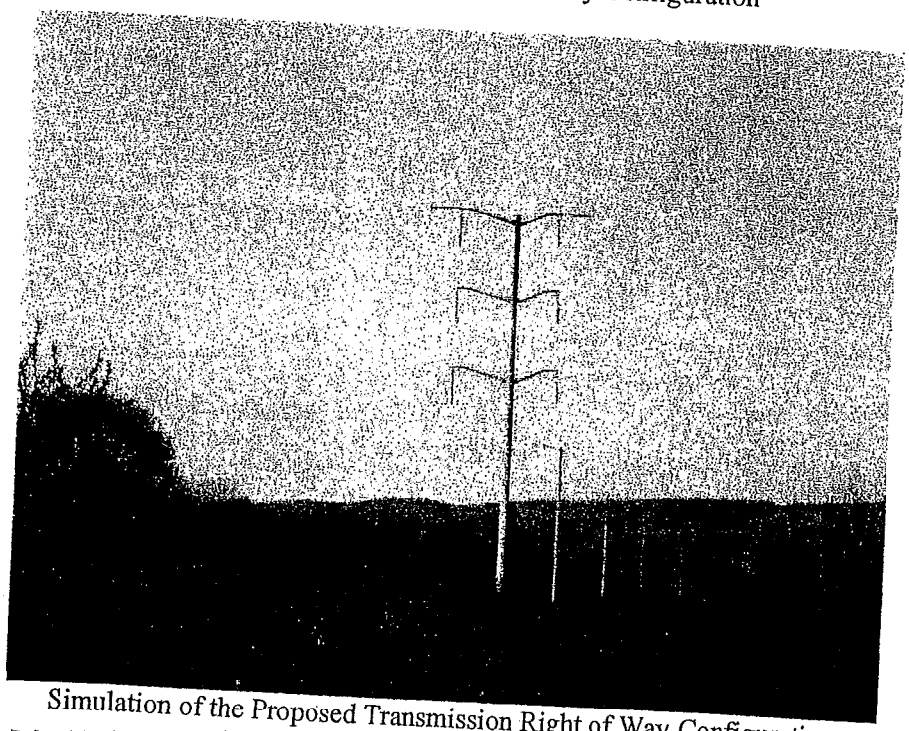
MEASUREMENT LOCATION	MAGNETIC FIELD (mG) mG = milligauss
UNDER LINE	5.8
EDGE OF ROW	.7
PLAY ROOM	.4
KITCHEN	.3
FAMILY RM	.3
LIVING RM	.3
PIANO RM	.3
RYANS RM	.3
CAMERONS RM	.3
MARGEN RM	.3
SHANNON & SKLA	.3
MASTER BR	.3
POOL SIDE	.3
*LOOKS READING ABOVE 4 MG	
COULD BE A PROBLEM.	

Middletown to Norwalk
Transmission Right of Way
Typical Cross Section 2
Town of Durham & City of Middletown

000667



Existing Transmission Right of Way Configuration



Simulation of the Proposed Transmission Right of Way Configuration

THIS PHOTO WAS TAKEN BETWEEN 47 IRONWOOD LN, DURHAM AND 29 IRONWOOD LN, MIDDLETOWN, LOOKING WEST. THIS PHOTO FAILS TO SHOW EITHER HOUSE ABUTTING THE ROW. THE HOUSE AT 29 IRONWOOD IS ONLY 3 FEET FROM THE ROW.

STATE OF CONNECTICUT GENERAL ASSEMBLY
ENERGY AND TECHNOLOGY COMMITTEE

February 26, 2004 PUBLIC HEARING

RE: AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA : RAISED BILL NO: 5418 : LCO 1320

Statement of Limited Appearance

Members of the Energy and Technology Committee, Good Afternoon, my name is Kelly Lymm of Middletown, CT.

I am in favor of the proposed bill and commend Senator Crisco and Representative Klarides for bringing this proposal here today for the protection of our children.

The California EMF Risk Evaluation for Policymakers and the Public was completed in June 2002. Three highly credentialed doctors reviewed 91 studies on EMFs and childhood leukemia, adult leukemia and adult brain cancer. The average of their confidence levels on the degree of certainty that there is an added personal risk to individuals because of EMF exposure was as follows: for Childhood Leukemia, there was a 71% confidence level in the degree of certainty that there was an added risk because of EMF exposures, for Adult Leukemia a 58% confidence level in the degree of certainty that there was an added personal risk because of EMF exposures and for Adult Brain Cancer a 64% confidence level in the degree of certainty in added personal risk because of EMF exposures.

These links needs to be recognized especially in a situation where the EMF levels will be magnified to such high levels and in such densely populated areas.

Potential health risks to babies, children, and pregnant women of the approximately 100 homes in the Royal Oak Subdivision are amplified because of the location of the proposed overhead 345,000 volt electrical transmission lines. These lines happen to be in the middle of this subdivision where families live and children play. The current Northeast Utilities application does not have EMF levels dissipate to safe levels until hundreds of feet beyond the existing ROW. For the Royal Oak Subdivision EMF levels

from the proposed electrical transmission lines are not acceptable and can pose potential health risks to families and children.

We have seen the situations arise where we said no proof or correlation exists between cigarettes and lung cancer when in fact they did. Research is just beginning in this EMF arena and early indications lead us to believe that our children or your children or grandchildren could be at additional risk in getting leukemia because of the number of hours of continual exposure to higher EMFs from the proposed electrical transmission lines. Therefore, I implore you, members of the Energy and Technology Committee, to explore legislative ways that reduce these risks.

These children do not have the ability to make choices today regarding where they live and their exposure to these potential hazards. Therefore it is now our responsibility to make the right decisions on there behalf. Lets help these children grow up to be healthy and productive leaders and contribututors to our community versus the alternative -- children who grow up and experience long term adverse health conditions that prevent them from maximizing their abilities and contributions to society and place them into a potential group that adds costs to our society as we help to take care of them.

Communities for Responsible Energy has over 1,000 signatures opposing the current overhead 345,000 electrical transmission line upgrade for Durham, Middletown and Middlefield residents. This petition was done in just a matter of a few weeks.

It is for these reasons that I have attached some language that may assist you in adding Residential language into the proposal. I think that this language does two good things. First, it establishes EMF safety zones for residential living areas that protect children and families from potential harmful EMFs. Secondly, it provides disclosure to citizens about the risks of EMFs. Both have been a consistent concern of the citizens who have attended the numerous Citing Council Hearings on the electrical transmission line upgrades. Please get the hearing transcripts if you have any doubts.

I have based the information off of Irvine California City Ordinances that have been in place for approximately 12 years. In summary, the California ordinances have what are called magnetic field contour lines that establish what you could consider a potential hazard area. They are using annual mean or median loads classified by milligaus. I have used 3 milliguass since Connecticut Department of Public Health Division of Environmental Epidemiology & Occupational Health found that 95% of homes have an average EMF levels of below 3 mG and some studies, conclude a weak link between household EMF exposure and a small increased risk of childhood leukemia at average exposure levels above 3 mG. The applicants of applications to the Citing Council would have to provide affected residents along the contour with averages, current and proposed EMF levels. If the city and the Connecticut Citing Council determine that the average proposed residential living area is above 3 mG then the applicant will have the ability to mitigate the situation i.e. bury the lines or move the lines, reduce the levels by reducing the number of lines etc..

The final objective of this proposed language is that full disclosure needs to happen upon sales transactions of residences about EMF health risks so that people can make informed decision about living near electrical transmission lines i.e., bibliography of research data on EMFs and whom they can contact for additional information.

The National Institute for Environmental Health Sciences, National Institutes of Health "*encourages technologies that lower exposures from neighborhood distribution lines provided that they do not increase other risks, such as those from accidental electrocution or fire*". While this proposed language is not a technology and is simply a method it still achieves the same end result and more....lowering exposures from neighborhood distribution lines and doing it in the most equitable way for your citizens.

PROPOSED LANGUAGE FOR RESIDENTIAL LIVING AREAS AND ELECTRIC TRANSMISSION LINES SITING CRITERIA

Section 1. Subsection c of section 16-50(p) of the general statutes is amended by adding subdivision (4) as follows: *(Effective from passage and applicable to applications for a certificate of environmental compatibility and public need for which the Connecticut Citing Council has not rendered a decision upon the record prior to the effective date of this section)*:

(NEW) (4) (a) Any application for an electric transmission line with a capacity of three hundred forty-five kilovolts or more shall include tract maps that indicate a three-milliguass magnetic contour line. This contour line will be based upon the typical annual mean load (median load if annual mean is not available) as provided by the applicant. No residential living areas shall be added or developed between the applicants right-of-way and the magnetic field contour line unless alternate mitigation requirements are met as stated in Section 4(b). Residential living areas, that are in existence at the time of application and are between the applicants right-of-way and the magnetic field contour line must comply in accordance with section 4 (b). "Residential living area" is defined as the area included within the exterior walls of a building, excluding any garage or storage area.

4 (b) The applicant shall submit and have approved an application for the city and the Connecticut Citing Council in accordance with 16-50g of the general statutes and shall additionally include a compilation of the current research for the average typical exposure of magnetic fields levels of the affected residential living areas, and what the current and proposed electromagnetic field levels will be for each. If the city and the Connecticut Citing Council determine that the research indicates that the proposed average typical exposures of magnetic fields levels are substantially different from the three-milligauss level, then the milligauss contour lines shall be revised and restrictions to overhead line placement will be made pertaining to residential living areas. The applicant may propose alternate mitigation measures as an alternative to modification of the electromagnetic field contour lines provided that such mitigation measures demonstrate the ability to reduce magnetic field exposure to below or equal to 3 milligaus. Such mitigation measures will be subject to the approval of the city and the Connecticut Siting Council. Notification of the analysis completed in this section shall be

provided by the applicant to all affected property owners through written correspondence using the US Postal service.

4(c) If the city and the Connecticut Citing Council approve the application request , then the applicant shall submit and the city and Connecticut Citing Council shall approve, an electromagnetic fields (EMF) notification and information and disclosure statement to be signed by each prospective tenant or buyer for residential, adjacent to the applicants right-of-way, and shall be used as part of the final sales literature, with the most current information on the following:

1. A statement of the EMF's health risk, including, but not limited to:
   (a) The location of the applicants electric transmission line in the vicinity of the Residential Living Area;
   (b) A statement that notes that this subject has been addressed and information on EMF research is available with the Connecticut Citing Council.
   (c) A bibliography of research that has been prepared since January of 1990, including that from the Environmental Epidemiology and Occupational Health Division of the State of Connecticut Department of Public Health and the Connecticut Department of Public Utilities, which indicates where and from whom information can be obtained (i.e., name, organization, address, and telephone number).
   (d) A statement that, in the future, the applicant may increase the number of power lines and/or voltage through the lines that traverse the area.
   (e) A listing of the name, address, and telephone number of the applicants representatives from whom additional information can be obtained.

State of Connecticut

HOUSE OF REPRESENTATIVES
STATE CAPITOL
HARTFORD, CONNECTICUT 06106-1591

REPRESENTATIVE THEMIS KLARIDES
ONE HUNDRED FOURTEENTH DISTRICT

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ASSISTANT MINORITY LEADER

MEMBER
JUDICIARY COMMITTEE
EDUCATION COMMITTEE
INSURANCE COMMITTEE

Testimony of Representative Themis Klarides On Phase II HealthRisks in Woodbridge and the Proximity to Schools and Daycares
Before the Energy & Technology Committee
February 26, 2004

Good morning, Senator Peters, Representative Backer, and members of the Energy and Technology Committee. For the record, I am State Representative Themis Klarides of the 114th district representing the towns of Woodbridge, Orange and Derby. I appear before you in support of Raised Bill No. 5418, *An Act Concerning Electric Transmission Line Siting Criteria.*

This legislation before you would provide that a public service company will be prohibited from constructing, or modifying an existing overhead electrical transmission line if the right of way or easement of the line is within 100 feet of such institutions for a 50-133 kiloVolt line, 150 feet for a 220-230kV line, 250 feet for 345-495 kV line, or within 350 feet for a 500-550 kV line.

Electricity is a beneficial part of our daily lives, but whenever electricity is generated, transmitted, or used, electric and magnetic fields (EMF) are created. Over the past 25 years, research has addressed the question of whether exposure to power-frequency EMF might adversely affect human health. This association is difficult to interpret and more scientific research is needed to reproduce the laboratory evidence and a scientific explanation that links magnetic fields with childhood leukemia. In the meantime, there is evidence from epidemiology studies that exposure to power-frequency EMF is associated with an increased risk for childhood leukemia. The National Institute of Environmental and Health Sciences (NIEHS) recommends continued education on ways of reducing exposures.

Currently, the proposed overhead power line route for Woodbridge will require the line to pass through or very near to the campuses of Trinity Evangelical Church, the

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Congregation B'nai Jacob, the Jewish Community Center, Ezra Elementary, Gan Hayeled Nursery School and Beecher Elementary School.

At present there is no definitive link between childhood leukemia and EMF, however there is some evidence of a cause and effect relationship. Until this relationship is clearly understood, we should avoid placing power lines overhead in residential areas.

The EMF readings on this section of the line are of serious concern. For example, at the B'nai Jacob campus the 345kv line would emit an average load of 25.3 mG (milliguass) and a peak load of 96.5 mG.

In the interests of families with children who face these or similar potential health risks from exposure to EMF, I hope this committee will approve this legislation.

I thank the committee for the opportunity to be heard on this matter, and appreciate my remarks being taken into consideration as you deliberate on Raised Bill No. 5418. I welcome any questions or comments you may have at this time.

South Central Regional COG

Bethany - Branford - East Haven - Guilford - Hamden - Madison - Meriden - Milford
New Haven - North Branford - North Haven - Orange - Wallingford - West Haven – Woodbridge

SOUTH CENTRAL REGIONAL COUNCIL OF GOVERNMENTS
Judy Gott, Executive Director

Testimony: February 26, 2004 Committee on Energy and Technology Public Hearing

Subject: Raised Bill #5418 An Act Concerning Electric Transmission Line Siting Criteria

Committee Chairs and Members of Committee on Energy and Technology

My name is Mitch Goldblatt, First Selectman of the Town of Orange and Chairman of the South Central Regional Council of Governments, a regional agency made up of the fifteen (15) Chief Elected Officials from the greater New Haven area.

I am here today to testify in favor of Raised Bill #5418 An Act Concerning Electric Transmission Line Siting Criteria.

At our SCRCOG meeting yesterday, the following motion was made and adopted unanimously: "The members of the SCRCOG support Raised Bill #5418, including endorsing the amendments in Sections (D), (E), and (F)"

This would mean burying high voltage lines underground when they are close to private or public schools, licensed child day care facilities, licensed youth camps, or public playgrounds. The actual distance from these areas would be determined by the amount of kilovolts. In the case of the most recent application for upgrades to existing powerlines to 345kV by Connecticut Light and Power Company and United Illuminating, this would mean that if the lines are within 600 feet of such facilities, that the lines would have to be buried.

The safety of the families in our communities are dependant on this committee's action. Please vote Raised Bill #5418 out of committee and to the floor for the good of the residents in the entire state.

As First Selectman of the Town of Orange, I have attended three Public Hearings conducted by the Connecticut Siting Council concerning these powerlines. It is very evident that not only don't the residents of my town and the towns surrounding me, want overhead power lines increased in voltage, they are legitimately concerned for the health and safety of their children and support the lines going under existing streets and highways. This bill will begin to protect our citizens going forward. This is a great first step. Please consider the future health of those citizens you represent and those not yet old enough to vote when you decide this matter.
Thank you for your consideration of my testimony.

Mitchell Goldblatt, First Selectman, Town of Orange
Chairman SCRCOG

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State of Connecticut

HOUSE OF REPRESENTATIVES

MAJORITY LEADER
JAMES A. AMANN

February 26, 2004

HB 5418: AAC Electric Transmission Line Siting Criteria

Representative Backer, Senator Peters, and distinguished members of the Energy and Technology Committee, I am here today to offer my support for House Bill 5418, "An Act Concerning Electric Transmission Line Siting Criteria."

For over two decades, there has been heated debate over the potential danger of electromagnetic forces (EMF) that emanate from overhead power lines. While some of the debate has been conflicting, the risks are believed to be relatively low. However, some scientists have found an association between childhood cancer and power lines as well as similar exposure risks among occupationally exposed workers.

In actuality, for every published study claiming a relationship between cancer and overhead power lines, one or more alternate studies have been released which refute any potential dangers.

Given the conflicting scientific effort regarding health risks from electromagnetic fields, the question remains: How should we proceed when locating high voltage lines in our communities.

I believe we must come down on the side of caution. We must take measures to protect our children from health hazards and to me that means these power lines must be located away from such areas as playgrounds, schools, day care and related facilities.

I have another safety concern about overhead power line structures.
Recently in Milford a high voltage line went down in a residential backyard. This could be the result of severe weather or some other uncontrolled accident. Let's be cautious. Locate the lines where people are protected and where it is safe for everyone!

Thank you for your attention and support.

Sincerely,

James A. Amann
Majority Leader

Legislative Office Building Suite 4100 Hartford, CT 06106-1591 phone (860) 240-8500 fax (860) 240-0206
Jim.Amann@po.state.ct.us

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ATTORNEY GENERAL

55 Elm Street
P.O. Box 120
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Office of The Attorney General
State of Connecticut

TESTIMONY OF
ATTORNEY GENERAL RICHARD BLUMENTHAL
BEFORE THE ENERGY AND PUBLIC UTILITIES COMMITTEE
FEBRUARY 26, 2004

I appreciate the opportunity to support in concept House Bill 5418, An Act Concerning Electric Transmission Line Siting Criteria. This proposal would prohibit the siting of transmission lines of 345 kilovolts or larger within 600 feet of a private or public school, licensed child day care facility, youth camp or public playground. In addition, it would prohibit the siting of transmission lines of between 220 kilovolts and 345 kilovolts within 250 feet of such facilities and finally, it would prohibit the siting of transmission lines of greater than 68 kilovolts but less than 220 kilovolts within 100 feet of such facilities.

The concept of House Bill 5418 is to recognize that high voltage transmission lines may endanger children, and are inappropriate near sites where children play for extended periods of time.

Debate over the public health and public safety implications of transmission lines are raised directly and urgently by proposals now under consideration by the Siting Council. Citizens groups and environmental and health advocates as well as public officials have rightly urged that these lines be placed underground to the maximum extent possible. The bill's critical purpose is to compel state siting and utility officials to err on the side of caution. If some public health experts are correct, the long term health and financial cost of siting these facilities close to schools and similar areas could be many times the expense of other alternatives such as relocating or burying such lines.

I urge the committee to ensure that the Connecticut Siting Council reviews and considers all alternatives to current siting plans for these high power transmission lines -- including conservation measures and small, local power plants -- prior to final approval of any siting permit.

WOODLANDS COALITION

Testimony Submitted to
THE COMMITTEE ON ENERGY AND TECHNOLOGY

February 26, 2004
HB 5418
AAC ELECTRIC TRANSMISSION LINE SITING CRITERIA

Madam Chairman and distinguished members of the Energy and Technology Committee:

We are before you today representing citizens all over Connecticut who have grave health concerns regarding the proposed transmission line upgrades.

Last year, we supported 6508, AAC Long-Term Planning for Energy Facilities, a bill concerning long-term planning for energy facilities. This committee JF'd the legislation to the next committee who did the same through the Finance, the GAE and so forth until it was referred for a vote to the General Assembly, where it passed unanimously in both the House and the Senate. This excellent work, reflective of the attitude of the General Assembly's desire to put in place good energy policies, was also the result of the dedication of many of you to whom we speak today. The bill stressed a planning process that would, among many other things, protect public health, and that would invite significant public input. Out of it has come the new CEAB, the Connecticut Energy Advisory Board, which is meeting, consulting, and drafting as we speak to put together a good plan for our state's energy future.

In that statewide context, we ask you to amend this bill by adding the simple words "residential neighborhoods." There is much scientific evidence regarding impact of elevated EMF levels to children, yet they are in school about 30 hours a week. The rest of the time, they are in their homes and their own backyards or about another 138 hours a week.

You have been listening and responding positively to the testimony by the Woodlands Coalition for three sessions now. You know from hearing us speak that we work to be proactive and inclusive, worrying about tomorrow as well as today. You have helped us in our goal of fixing the process, not just the immediate problem. In that proactive context and in light of Public Act No. 03-140, we ask you to pass this legislation. Doing so would work to protect not only the citizens whose lives are most immediately touched by the current transmission upgrade, but those who will be "on the line" for future upgrades as well. We ask you to consider 5418 in terms of overall energy planning to break the cycle of "more of the same"--more upgrade proposals, more towns, more neighborhoods, facing the same issues the citizens of 24 communities face today.

Thank you,
Ruth Ann Wiesenthal-Gold
President, Woodlands Coalition

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Northeast
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Northeast Utilities Service Company
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ENERGY AND TECHNOLOGY COMMITTEE

TESTIMONY OF ROBERT E. CARBERRY

ON BEHALF OF

THE CONNECTICUT LIGHT AND POWER COMPANY

REGARDING

RAISED BILL 5418

AN ACT CONCERNING ENERGY FACILITY SITING CRITERIA

February 26, 2004

Good afternoon and thank you for the opportunity to present comments to your committee regarding Raised Bill 5418 that could affect the electric transmission industry.

My name is Robert Carberry and I am appearing here on behalf of the Connecticut Light and Power Company ("CL&P"). I am the Project Director of CL&P's Bethel to Norwalk Transmission Project. In my 30-year career with Northeast Utilities, I have held management positions in Transmission Engineering and Substation Engineering, and served as the company's issue manager and engineering expert on power-frequency electric and magnetic fields for 25 years. I hold a Bachelor of Science and a Master of Engineering degree in Electric Power Engineering from Rensselaer Polytechnic Institute. I am also a Senior Member of the Institute of Electrical and Electronics Engineers' Power Engineering Society, and am a past member of Edison Electric Institute's EMF Task Force.

Proposed House Bill No. 5418 (the Bill) proposes unnecessary construction limitations which threatens to compromise NU's ability to provide reliable service to Connecticut consumers.

Enactment of this Bill would impose significant constraints on the siting of electric transmission lines making the process unnecessarily difficult and the cost of these facilities far most costly to Connecticut consumers than is necessary to address the concerns noted by bill sponsors. In serving the electric needs of Connecticut consumers, Northeast Utilities is dedicated to ensuring the reliability of system for the benefit of the state. This Bill would serve to restrict and in many cases outright prohibit electric companies from using existing rights of way for the purpose for which they were acquired them years ago because others have chosen to build schools close to those rights of way. The inability to use a portion of a given right of way has far reaching effects because it may require the rerouting of a much larger segment of line than the section that would be proximate to a school. The General Assembly should not impose such costs on Connecticut consumers without a rational basis for doing so. Yet that is just what the Bill would do.

Enactment of the Bill would also be contrary to the consistent advice of the administrative agencies and experts from which the General Assembly has sought and received advice over the last decade with respect to the issue of the claimed potential health effects of electric and magnetic fields ("E&MF") associated with electric power. While sponsors have expressed their concerns over the issue of E&MF, this Bill if enacted would amount to an unnecessary and overly broad "solution" on the part of the legislature, which would unduly increase costs to consumers.

Northeast Utilities is well versed in the issues which surround E&MF and understands the concerns noted by bill sponsors, however this bill goes well beyond what is necessary to address these concerns and is wholly inconsistent with the findings of the Interagency Task Force.

The E&MF / health effects issue is not new. It first came to the attention of the General Assembly in 1991, when the reported results of certain recent epidemiology studies suggesting a possible link between power line magnetic fields and certain diseases, including childhood leukemia, received widespread publicity. Connecticut was one of the first states to initiate a public policy response to the public concerns that arose from this publicity. The State's administrative agencies responsible for public utilities, public health, and the environment formed an Interagency Task Force, and soon after its formation, the General Assembly provided that task force with significant resources and responsibility.

By Public Act 91-317, entitled: "An act concerning experts to assist the interagency task force studying electric and magnetic fields" (the "1991 Act"), the General Assembly gave official status to the Interagency Task Force and tasked it "to study electric and magnetic fields" and to " determine the appropriate role of the state in addressing the potential problems associated with electric and magnetic fields." To assure that all relevant expertise within state government was brought to bear on this effort, the Act specified that the task force would consist of the following officials or their designees:

- the Commissioner Of Health Services
- the Commissioner Of Environmental Protection
- the Commissioner Of Economic Development
- the Secretary Of The Office Of Policy And Management
- the Chairperson Of The Public Utilities Control Authority Or His Designee And
- the Chairman Of The Connecticut Siting Council

By 1992 Public Act 169 (the "1992 Act"), the General Assembly reauthorized the Interagency Task Force and directed it to "make recommendations to the general assembly regarding any legislation which it deems appropriate." This legislation is now codified as Conn. Gen. Stats. § 16-261a. The Interagency Task Force is still a legislatively authorized entity, and its activities are funded by assessments on the State's

electric public utilities. The Interagency Task Force's most recent report to the General Assembly, mandated by Public Act 96-245, was submitted in January, 1998.

The Interagency Task Force has never recommended any legislation regulating power frequency E&MF, because its careful study has not found any such regulations to be justified. Before further consideration of the proposed Bill, we strongly encourage this committee to review and reflect upon the work which was undertaken by this Task Force and the related State agency actions taken since 1991.

In order to respond to the General Assembly's study directive, the Department of Health Services, acting on behalf of the Interagency Task Force, submitted an inquiry concerning electric and magnetic fields to the Connecticut Academy of Science and Engineering (the "Academy"), which the Academy accepted on June 21, 1991. The Academy was established by 1953 Special Act No. 76, which states the purposes of the Academy to be, among other things: "To promote the application of science and engineering to human health and welfare" and to "provide guidance to the people and the government of the State of Connecticut, upon request, in the application of science and engineering to the economic and social welfare." To respond to the inquiry of the Interagency Task Force, the Academy appointed a "Respondent:"

Jan A.J. Stolwijk, Ph.D.
Professor of Epidemiology and Public Health
Yale University School of Medicine

To assist Dr. Stolwijk, the Academy appointed an "Ad Hoc Committee on Electromagnetic Field Health Effects," consisting of:

Ralph H. Bartram, Ph.D.
Professor and head, Department of Physics
The University of Connecticut

Michael B. Bracken, Ph.D.
Professor of Epidemiology and
Obstetrics and Gynecology
Yale University School of Medicine

Sean M. Brennan, Ph.D.
Assistant Professor of Anatomy
University of Connecticut Health Center

David Carpenter, M.D.
Dean, School of Public Health
The University at Albany

Terrence W. Doyle, Ph.D.
Director of Antitumor and
Natural Products Chemistry
Bristol-Myers Squibb

Robert E. Handschumacher, Ph.D.
Professor of Pharmacology
Yale University School of Medicine

Franklin Hutchinson, Ph.D.
Professor of Biophysics and
Biochemistry (ret.)
Yale University School of Medicine

Hallie Krider, Ph.D.
Professor of Molecular and
Cell Biology
The University of Connecticut

Marvin Tanzer, M.D.
Professor and Head,
Department of Biostructure and Function
University of Connecticut Health Center

On April 1,1992, the Academy responded to the Task Force's inquiry with a report entitled: "Response to Inquiry: Electromagnetic Field Health Effects." After a careful review of relevant scientific knowledge, the Response recommended against the adoption of stringent guidelines for human exposure to power frequency E&MF because it found no "rational basis" for any such guidelines.[1]

As directed by the General Assembly, the Interagency Task Force presented supplemental reports on its activities to the General Assembly in 1994, 1995, and 1998. Each of these reports reviewed and summarized the outpouring of research of the proposition that power frequency electric or magnetic fields could have human health effects, and each concluded:

- "The Task Force does not recommend changes to the present electrical supply system in Connecticut...;" and
- The Task Force does not recommend any health-based EMF power-frequency exposure standards at this time. [2]

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[1] Connecticut Academy of Science and Engineering, Response to Inquiry - Electromagnetic Field Health Effects, Prepared for the Department of Health Services, State of Connecticut(1992), at 9.
[2] The quotation is from Connecticut 1998 Report on Task Force Activities to Evaluate Health effects from Electric and Magnetic Fields, January 1998, Presented to the Connecticut General Assembly Energy and Technology Committee, Public Health Committee, Environment Committee, Prepared by The Interagency

The General Assembly has not requested any further reports from the Interagency Task Force since 1998. However, more recent reports from governmental health agencies in the United States and other nations have been published. These include publications of the (United States) National Institute of Environmental Health and Sciences in 1998; the National Radiological Protection Board of Great Britain in 2001; the Health Council of the Netherlands in 2001; and the International Agency for Research on Cancer in 2002. The conclusions of these reports are consistent with the state of the literature that the Interagency Task Force evaluated and reported on in its 1998 report. In their pending application to the Siting Council for the Middletown to Norwalk line, CL&P and UI have included a summary of these more recent reports.

House Bill 5418 is also inconsistent with the General Assembly's own recognition that it is neither practical nor prudent to statutorially mandate specific types of construction and that the most appropriate forum to resolve issues relative to construction is properly vested with the Connecticut Siting Council.

Although the expert agencies tasked by the General Assembly to evaluate the need for E&MF legislation have found no rational basis for any heath-based regulation of power frequency electric or magnetic fields, the Connecticut Siting Council has, on its own, adopted "Electric and Magnetic Field Best Management Practices" to which it refers in evaluating applications for new and modified transmission lines. See Attachment 1. "These practices are intended to recognize the latest information as well as effective technologies and management techniques on a project-specific basis..."*See*, Attachment 1.

The Siting Council's Best Management Practices reflect a sophisticated understanding of technical aspects of E&MF, which the Bill does not. For instance, the Best Management Practices require "consideration of low-EMF designs during the siting and construction of new facilities," including "compact spacing" and "optimum phasing of conductors." These recommended practices recognize that magnetic fields associated with a particular transmission line can be altered by the manner in which its phases are arranged in relation to one another and in relation to other lines on the same right-of-way. For this reason, it may be that when a new transmission line is built alongside existing lines on the same right-of-way, the magnetic field levels on the edge of the right of way will go down, rather than up.

The complex technical issues related to transmission construction and associated E&MF levels are appropriately vested in an agency that is capable of appreciating the phyisical relationship between electric currents and magnetic fields.

The Bill assumes that magnetic fields associated with an electric transmission right-of-way increase proportionally with the voltage of the lines on the right-of way, so that higher voltage or more lines always means more E&MF. In fact, E&MF levels are

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task Force Studying Electric and Magnetic Fields," Executive Summary, at 3. The same recommendations were included in the earlier reports.

determined by current, not voltage. Thus, magnetic fields associated with lower voltage sources, such as distribution lines and even home appliances may be higher than those associated with electric transmission lines.

In summary, the agencies and experts to whom the General Assembly has looked for advice have advised it that any bill setting limits on E&MF exposure from power lines has no basis, and the particular bill under consideration reflects not just a fundamental unsupported premise that E&MF from transmission lines is a recognized cause of harm or disease in children, but also a fundamental misunderstanding of how E&MF exposure may be limited.

I have brought with me today copies of the Response of the Connecticut Academy of Science and Engineering and the 1998 Interagency Task Force Report, which I would be pleased to leave with any of you who would like them.

We suggest that Connecticut legislators continue their cautiousness when considering actions taken by other states and appreciate the true nature of the action taken by states such as California.

California legislation regulates site selection for new schools not transmission lines. It has been suggested that there is a precedent for the requirements of the proposed Bill in California legislation. This claim also reflects a misunderstanding. While the California regulations in question[3] are unique, they do not regulate transmission lines. Rather, they relate to the process by which the California Department of Education selects sites for new schools. Under these regulations, proximity to high-voltage power transmission lines is only one of many factors considered in selecting a school site. Other factors that must be considered include proximity to airports, railroads, high-pressure natural gas lines, gasoline lines, pressurized sewer lines or high-pressure water pipelines, propane tanks, and major roadways.

In siting schools pursuant to these regulations, the California Board of Education considers distances from the edge of transmission line easements that are far shorter than provided in the proposed Bill. These distances are 100 ft for 50-133-kV lines, 150 feet for 220-230 kV lines, and 350 feet for 500-550-kV lines. The evaluation of sites regarding transmission lines, as well as other factors, is made by a consultant to the Department of Education, and the California guidelines do not include a blanket prohibition on the siting of schools within the stated distances.

Finally, I am informed that the California Department of Education's experience with these guidelines has not been satisfactory. In consideration thereof, they are presently engaged in an effort to update these guidelines (first developed about 1993), and is proposing to abandon the simple distance guidelines. Under the new guidelines presently

[3] California Department of Education, School Facilities Planning Division. School Site Selection and Approval Guide. http://www.cde.ca.gov/facilities/field/publications/schsiteg.htm.

under consideration, when a new school is sited near pad-mounted transformers or overhead transmission lines greater than 50 kV, or near any underground electrical line (of any voltage), a field management plan would be devised to minimize magnetic fields from a variety of sources through location of buildings and other use areas. This plan would consider not just transmission line sources, but would also seek to manage magnetic fields associated with the school's own wiring – which California research found to be the major source of magnetic field exposure in schools.

In conclusion, I suggest that this committee and the legislature should not now short circuit the well thought out process the General Assembly initiated more than a decade ago to address the suggestion that there were health effects associated with power frequency magnetic fields. The General Assembly has properly delegated the siting of electric transmission lines to the Connecticut Siting Council pursuant to the Power Facility Environmental Standards Act, Conn. Gen. Stats. §15-50g, et seq; and it has properly tasked the Interagency Task Force with responsibility for determining, after expert evaluation of a complex scientific issue, if there is basis for any legislation regulating power frequency E&MF exposure. The General Assembly should allow these agencies to execute the tasks assigned to them, and not adopt hasty legislation that has no rational basis.

OFFICE OF THE MAYOR
City of Middletown
CONNECTICUT 06457

DOMENIQUE S. THORNTON
MAYOR

MAYOR DOMENIQUE S. THORNTON
PUBLIC HEARING TESTIMONY
HB5418
February 26, 2004

Chairman Senator Peters and Representative Backer and members of the Energy and Technology Committee, Good morning my name is James Sipperly, Planning Environmental Specialist for the City of Middletown. Mayor Domenique S. Thornton could not be here this morning and asked me to deliver this testimony on her behalf. The City of Middletown goes on record in support of HB5418 proposed by Representative Themis Clarides and cosponsored by Senator Joseph Crisco. I would only ask that you consider a friendly amendment that would also prohibit overhead transmission lines to be underground if located in densely populated areas

My constituents are specifically concerned with the power lines that will run through the Royal Oaks subdivision on the Durham/Middletown line. I have taken the liberty of reviewing the plans for the 345-kV transmission lines, and I am requesting that the lines be placed underground for the short distance that they will traverse the subdivision.

Royal Oaks is a rather densely populated residential subdivision that includes over one hundred single-family homes. Great concern has been expressed regarding the health risks that have been attributed to the electromagnetic emissions that are produced by transmission lines, such as the ones in question. There is conflicting information as to the real impact that the new

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transmission lines will have on the health of neighborhood residents, their children, and their grandchildren for years to come. On one side, we are being told that the emissions from the new lines will have little to no effect. On the other side, we have been told that the taller poles will simply disperse the emissions over a larger area. It certainly does not appear that the case has been proven beyond a reasonable doubt, and that only leads me to suggest that we err on the side of caution.

The city certainly understands the benefits that this project offers to both its residents and businesses. Maintaining a capable and reliable system for delivering power should always be a priority. However, it is often necessary to tailor such projects so as to reduce the negative effects on neighborhood settings. In this case, putting the new 345-kV transmission lines underground for a distance of only one mile, according to the maps given to me, will allow the project to proceed with minimal opposition from the public. While, subterranean placement of the transmission lines will incur increased monetary cost, it does not appear that such a small modification of the original plan will place a significant burden on the completion of the project.

Thank you for your time and consideration.

State of Connecticut

HOUSE OF REPRESENTATIVES
STATE CAPITOL
HARTFORD, CONNECTICUT 06106-1591

REPRESENTATIVE AL ADINOLFI
ONE HUNDREDTH THIRD DISTRICT

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RANKING MEMBER
SELECT COMMITTEE ON AGING

MEMBER
APPROPRIATIONS COMMITTEE
GOVERNMENT ADMINISTRATION & ELECTIONS COMMITTEE

Testimony of State Representative Al Adinolfi on HB5418
An Act Concerning Electric Transmission Line Siting Criteria
Before the Energy & Technology Committee
February 26, 2004

Chairman Peters, Chairman Backer, Senator Herlihy, Representative DelGobbo, and members of the Energy and Technology Committee:

Good afternoon. For the record, I am State Representative Al Adinolfi, a member of the Connecticut General Assembly representing the towns of Cheshire, Hamden, and Wallingford. I am appearing before the Committee in support of HB 5418, AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA that will restrict the distance to the edge of the easement or right-of-way for the installation of overhead power lines within the proximity of schools, licensed daycares, accredited preschools, public playgrounds, or religious institutions.

I would also recommend that you modify this bill to include Hospitals, Nursing Homes and Elderly Housing.

There is potential health risks associated with this kind of transmission line that we are talking about today. The National Institute of Environmental Health Sciences have reported that there is an association between exposure to electric magnetic fields (EMF) and an increased risk for chronic lymphocytic leukemia, and brain cancer. With these kinds of potential risks, it only makes sense that we strictly limit the location of these power lines near where our communities' children spend a great deal of their time at school or play.

According to the US Food and Drug Administration (FDA), interference from EMF may affect various medical devices, including cardiac pacemakers and implantable defibrillators. Inconsistent heart rates in association with EMF exposure have been reported, though the level of biological response is small and does not continue when exposure ends.

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According to Connecticut Department of Public Health a link has been established between EMF and Childhood Leukemia although the studies are still on going in many places around the world; we would be remiss if we did not proceed cautiously and not put the health and welfare of our children at risk

An unusually large number of cancers, miscarriages, or other adverse health effects that occur in one area or over one period of time is referred to as a "cluster." Clusters can provide early warnings about certain health hazards. While no proven direct link to cancer cluster have been linked directly to EMF exposure, cancer clusters have been found near power substations and at several other locations, including one in Guilford Connecticut.

It has been stated that for every report stating the existence of health hazards that there is another report that states there is not a hazard. Even the remote possibility of a health hazard should be given prime consideration. The health of my constituency is more important than any additional monetary costs associated with installing this 345KV line underground.

I urge this committee to err on the side of caution, and to support this legislation. Thank you, and I would be happy to take any questions you may have.

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AMEY W. MARRELLA
FIRST SELECTMAN

February 26, 2004

TESTIMONY IN SUPPORT OF RAISE BILL #5418

Thank you for giving me the opportunity to speak in support of Raised Bill #5418. This health and safety legislation is vitally needed to help protect the children of Connecticut.

Others today will explain the health effects data. I'd like to focus on two issues.

First, this legislation, as proposed, should -- when enacted – go into effect immediately. Because it is aimed at protecting children from serious health concerns, the electric transmission line siting criteria set forth in the bill should go into effect as soon as possible. As drafted, the legislation should cover all applications pending before the Connecticut Siting Council.

The current state law already requires the Siting Council to take into account many siting limitations. This new bill simply amplifies one of those already-existing limitations, which requires the Council to consider health impacts. Specific guidance from the State Legislature will help the Siting Council carry out its obligations.

Further, the State Legislature stepped into a pending application in a far more significant way when it imposed a moratorium on the Phase I application before the Siting Council. That legislation suspended the proceeding and required the Council to conform to the decisions of the specially-created Working Group. The current bill is more modest in scope. It imposes no delay and it sets forth limited and specific siting criteria.

My second point focuses on the costliness of the current process. Absent clear siting criteria regarding schools and other facilities where children congregate, municipalities and others must expend a great deal of money and enormous amounts of time to achieve common sense in the siting process. Fundamental notions of safety provide that where there is a life-threatening risk, especially to children, prudent steps should be taken to avoid that risk. In the Phase I proceeding, the Town of Bethel expended some $250,000 to persuade the utilities and Siting Council to re-route the proposed transmission line away from the Bethel educational campus (see attachment). Please impose some sanity into the process so that Towns and other parties need not expend tremendous amounts of money and effort to persuade the utilities and Siting Council to protect the health of children.

Given the potential health effects, it makes sense to enact a limited and specific siting requirement that safeguards all schools, day care facilities, camps, and playgrounds within Connecticut. I resepectfully urge you to vote this bill out of committee and to the floor.

Thank you for your consideration of my testimony.

Respectfully submitted,

Amey Marrella

Amey W. Marrella
First Selectman

Attachment

Attn. Tony

Costs Associated with CL&P Transmission Lines through Siting Council Hearings

As of 7/11/03

	Invoice Total	Billing Date	Wilton	Redding	Weston	Bethel
			32.8%	15.2%	18.7%	33.3%
Land Tech	$20,400.40	3/27/2002	6,691.33	3,100.66	3,814.88	6,793.33
	$3,330.94	4/30/2002	1,092.55	506.31	622.88	1,109.20
	$148.68	7/1/2002	48.77	22.60	27.81	49.50
	$3,178.75	10/21/2002	1,042.63	483.17	594.43	1,058.52
*does not include late charge	$1,539.95	12/5/2002	505.11	234.08	287.87	512.79
	$14,078.12	1/31/2003	4617.63	2139.88	2632.61	4688.00
	$150.00	2/28/2003	49.20	22.80	28.05	49.95
Total	$42,826.84		$14,047.22	$6,509.70	$8,008.63	$14,261.29
			32.8%	15.2%	18.7%	33.3%
Synapse	$15,286.50	*10/31/01	5,017.25	2,325.06	2,860.43	5,093.76
	$51,579.30	5/3/2002	16,917.98	7,840.03	9,645.30	17,175.99
	$4,874.00	9/30/2002	4,784.00			
	$2,263.24	11/14/2002	742.34	344.01	423.23	753.67
	$17,533.74	12/10/2002	5,751.06	2,665.12	3,278.80	5,836.76
	$23,183.93	2/11/2003	7,604.33	3,523.95	4,335.39	7,720.26
Norwalk	$10,000.00	2/11/2003				
Total	$124,730.71		$40,816.96	$16,698.17	$20,543.15	$36,582.44
Fitzgerald & Halliday	$4,413.69	2/28/2002	4,413.69			
	$7,586.31	6/30/2002	7,586.31			
	$2,059.00	9/30/2002	2,059.00			
	$3,500.00	1/31/2003	3,500.00			
Total	$17,559.00		$17,559.00			
Milone & MacBroom	$4,240.00	1/16/2002	4,240.00			
Total	$4,240.00		4,240.00			
SUB TOTAL	$189,356.55		$76,663.18	$23,207.87	$28,551.78	$50,843.73
			49.3%	22.7%	28.0%	
Cohen and Wolf	$19,402.50	10/3/2001	9,565.43	4,404.37	5,432.70	
	$38,864.20	11/13/2001	19,160.05	8,822.17	10,881.98	
	$31,132.78	2/21/2002	15,348.46	7,067.14	8,717.18	Pullman &
	$60,199.32	4/26/2002	29,678.26	13,666.26	16,855.81	Comley
	$24,115.38	10/31/2002	11,888.88	5,474.19	6,752.31	(thru 11/02)
	$59,723.29	12/31/2002	29,443.58	16,722.52	13,557.19	
	$77,270.00	3/28/2003	38,094.11	21,635.60	17,540.29	
	$32,915.37	7/9/2003	16,227.28	7,471.79	9,216.30	
Cohen and Wolf Total	$343,622.84		$169,405.05	$85,263.03	$98,953.76	249,321.24
Pullman and Comley Total	$135,604.27					~~$135,604.27~~
GRAND TOTAL	~~$668,583.66~~		~~$246,068.23~~	~~$108,470.90~~	~~$117,505.54~~	~~$436,608.00~~

As of 12/31/03

000692

Testimony of Diana McCain, 262 Skeet Club Road, Durham, Connecticut, on Raised Bill No. 5418, An Act Concerning Electric Transmission Line Siting Criteria, before the Energy and Technology Committee, February 26, 2004

I encourage the authors of this bill to change the text of added subsections D, E, and F, each to read "no private or public school, licensed child day care facility, licensed youth camp or public playground **or residence** within . . . "

If proximity to overhead high-voltage power lines poses a risk to children, that risk is far greater for children in their homes than it would be for children in schools or day care facilities. A child attending school, a day care center, or similar facility is typically exposed to any hazard from nearby overhead high-voltage power lines at most 12 hours a day, five days a week – a maximum of 60 hours per week. A child whose house is located in the same proximity to overhead high-voltage power lines is likely exposed to any hazard 16 hours a day seven days a week, or 112 hours a week – twice as long as those at a school or similar facility.

For the General Assembly to pass this legislation requiring that such facilities as schools and day care centers be located a minimum distance from the edge of the easement or right of way of overhead high-voltage power lines without mandating the same for residences would display deliberate disregard for the welfare of thousands of Connecticut children who live in homes as close or even closer to the edge of the easement or right of way as a school or playground is. If proximity to overhead high-voltage electric transmission lines poses a risk, not a single child should be exposed to it on a regular, prolonged basis, whether at school, at play, or at home.

Further, if the legislation is approved without requiring that the edges of easements or rights of way be the same minimum distance from residences as from such facilities as schools and day care centers, it would serve to virtually condemn any dwelling located less than that minimum distance from the edge of the easement or right of way. The legislation would constitute an official pronouncement by the General Assembly that living closer to power line easements than the minimum distance mandated for schools is undesirable and unacceptable for children. The impact on the value of homes located less than that minimum distance from the easements would plummet, wreaking financial disaster on unoffending owners and having the ripple effect of driving up property taxes in towns where such devalued properties are located.

Should the General Assembly approve the legislation as it stands, without extending the protection to residences, the state must expect to be held liable for the subsequent extraordinary medical expenses of any child who the General Assembly, by law, allowed to be put in his own home in closer proximity to overhead high-voltage electric transmission lines than the state deemed safe for children in schools. It also must stand ready to compensate any dwelling owner by agreeing to purchase their residence for fair market value as determined immediately prior to when the legislation was passed, plus any increase in value it acquired in subsequent years, at any time in the future the owner might decide to sell.

State of Connecticut

SENATE

SENATOR JOSEPH J. CRISCO, JR.
SEVENTEENTH DISTRICT

CHIEF ASSISTANT PRESIDENT PRO TEMPORE
FEDERAL RELATIONS LIAISON

CHAIRMAN
INSURANCE AND REAL ESTATE COMMITTEE
PROGRAM REVIEW AND INVESTIGATIONS COMMITTEE

VICE-CHAIRMAN
BANKS COMMITTEE
COMMERCE COMMITTEE

MEMBER
LEGISLATIVE MANAGEMENT COMMITTEE

Testimony of State Senator Joseph J. Crisco, Jr.
on SB:5418: An Act Concerning Transmission Line Siting Criteria.

Before the Energy and Technology Committee
February 26, 2004

Senator Peters, Representative Backer, members of the Committee. I am Senator Joe Crisco representing the 17th district towns of Woodbridge, Bethany, Hamden, Ansonia, Derby, Naugatuck, and Beacon Falls. I appear before you in support of SB: 5418: An Act Concerning Electric Transmission Line Siting Criteria.

I concur in the testimony of Representative Klarides. I, too, am concerned that with the utilities' plan before us, we are confronted with the possibility that electromagnetic fields (EMF) will impact negatively on the health of children, especially very young children.

As you have heard, the transmission lines traverse an area in the town of Woodbridge where there is a high concentration of children who participate in programs at several institutions. These children come not only from Woodbridge, but also from New Haven, Cheshire, Hamden, Westport, and other towns and cities.

I am concerned about the possible health risks the plan could have on children who congregate in close proximity to the transmission lines.

During the past few years, we, as legislators, have become aware of the way in which environmental quality issues have impacted residents of our towns. In the town of Woodbridge, for example, indoor air quality conditions brought about by mold at Amity Regional High School have caused illnesses in students and teachers. It required scores of children and teachers becoming ill, and, in some cases, being forced to attend school or teach elsewhere, for us to seek changes in school construction law.

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Although a definitive link between EMF and childhood leukemia has not been shown to exist at this time, I do not believe that we should proceed under the assumption that one does not exist. We have the opportunity to approach the potential for harm with foresight, rather than hindsight.

This bill would allow the Siting Council to deny the Phase II transmission line plan submitted by the utilities, if construction of those lines occurs in the vicinity of schools, playgrounds and daycare centers. It would create a buffer zone from the power lines to protect the safety and well being of the children.

The utilities have other options are available to them. They include re-routing or burying the transmission lines.

Every society has always strived to make life better for the next generation. I ask you to consider the importance of your decision upon the children of Woodbridge and surrounding towns.

Thank you for the opportunity to appear before you. I respectfully request that these views be given serious consideration in your deliberations.

POWER LINE PRESENTATION

Rabbi Richard Eisenberg
Congregation B'nai Jacob

I am Rabbi Richard Eisenberg, spiritual leader of Congregation B'nai Jacob in Woodbridge. Our congregation was founded in 1881, and we have occupied our current home since 1961. B'nai Jacob's membership consists of over 700 family units. Over the years, we have grown into a vibrant educational center. Within our walls you will find a daily pre-school program, a Jewish Day School, a Religious School that meets six hours per week, and a regional Jewish High School program. In total, approximately 700 children spend significant amounts of time within our walls.

The proposed power line is 30 to 50 feet from our classrooms and directly above the nursery school playground and basketball court. The actual and perceived health risks posed by these power lines are of grave concern to our congregation. Our Judeo-Christian tradition places the highest value on human life, physical well-being and, especially, the health and well-being of our precious children. The current proposal runs counter to these values. It challenges our sense of safety and comfort in our current spiritual home. Moreover, if implemented, it would severely threaten the viability of our institution, as parents would be likely to hesitate sending their children to our educational programs.

We ask that you support passage of the proposed bill # 5418, which will require a safety zone between power lines and the areas where children play and learn. This assures the protection of children both in our community and throughout the State of Connecticut We at B'nai Jacob hope that you will hear the voices of over 700 children within our building asking for protection from the proposed power lines. The children of B'nai Jacob and our entire state demand better, safer options. Thank you.

Town of Durham

OFFICE OF THE FIRST SELECTWOMAN

PRIDE in the Past,
FAITH in the future.

Maryann P. Boord
First Selectwoman

ENERGY AND TECHNOLOGY COMMITTEE HEARING

HOUSE BILL NO. 5418

FEBRUARY 26, 2004

I am Maryann Boord, First Selectwoman of the Town of Durham. I am present to testify in favor of House Bill No. 5418.

I speak in support of the ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA and applaud Representative Themas Klarides and Senator Joseph Crisco for their effort to address the health concerns resulting from siting transmission lines in close proximity to schools, day care centers, and locations where children gather.

I would, however, recommend additional language, such as, "residential neighborhoods," be added to the Bill. As you may know, there is a Northeast Utilities/United Illuminating (NU/UI) proposal before the Connecticut Siting Council to upgrade existing 115-kV transmission lines in the Town of Durham to 345-kV. The existing Right of Way cuts through the middle of just such a residential neighborhood.

TOWN HALL • 30 Town House Road
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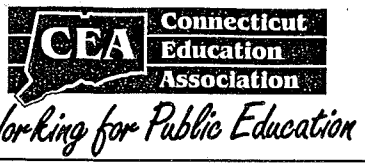
In this neighborhood, there are 100 homes with approximately 250 children who will be exposed to these very high levels of Electro Magnetic Fields (EMF). The projected levels of EMF in the NU/UI application for our community are well above the limits seen in studies focusing on childhood leukemia. We must make certain that the levels of EMF are within acceptable standards. We know the present proposal is not within acceptable standards. Therefore, I request that when Bill No. 5418 becomes law, it apply to pending as well as future applications before the Connecticut Siting Council.

At a Public Hearing held by the Connecticut Siting Council February 24, 2004, for the towns of Durham, Haddam, Middlefield, and Middletown, alarming statements were made about potential health risks, especially regarding childhood leukemia. Although some say there are no conclusive findings regarding EMF as yet, there are extensive studies, which I believe will provide more than sufficient information to support stronger efforts to protect our children from their affects. The EMF limits projected for our community are the highest levels, the highest net change, and the closest in proximity to homes in the entire project.

There are other states which have set limits of acceptability regarding Electro Magnetic Fields. Shouldn't we?

Thank you for the opportunity to share our community's concerns and for your interest in and efforts to address them.

Rosemary Coyle, President
Philip Apruzzese, Vice President
Brenda Key, Secretary
Bob Packard, Treasurer



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Rae Baczek, NEA Director
Patricia Jordan, NEA Director

GOVERNMENT RELATIONS
Mark Waxenberg, Director
Dr. John Yrchik, Executive Director

Written Testimony for
Energy and Technology Commission
An Act Concerning Electric Transmission Line Siting Criteria
Raised Bill No. 5418
Submitted by the Connecticut Education Association
February 26, 2004

The CEA supports An Act Concerning Electric Transmission Line Siting Criteria.

Over the past several years there has been much controversy over the link between illness and overhead transmissions lines. Though there has been no conclusive study establishing a direct casual link between electric magnetic fields and illness there is considerable disagreement that such a link exists. Members of the committee certainly have heard of incidences where clusters of illness and/or cancer have been associated by the distance of electro magnetic fields. The Connecticut Education Association is not claiming expertise in the electro magnetic field area; but is supportive of this legislation that could avoid possible health risks.

There is an old adage: "It's better to be safe than sorry" and that adage certainly applies to this legislation.

State of Connecticut

HOUSE OF REPRESENTATIVES
LEGISLATIVE OFFICE BUILDING
HARTFORD, CONNECTICUT 06106-1591

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DEPUTY SPEAKER

MEMBER
EDUCATION COMMITTEE
EXECUTIVE AND LEGISLATIVE NOMINATIONS COMMITTEE
LEGISLATIVE MANAGEMENT COMMITTEE
JUDICIARY COMMITTEE
SCREENING COMMITTEE - CO-CHAIR

Good Morning Chairman Backer, Chairman Peters and Members of the Energy and Technology Committee.

For the record, I am State Representative Mary Fritz of the 90th Assembly District, serving people in both Cheshire and Wallingford. I am here before you to support Raised Bill # 5418. I inherently believe that the conditions spelled out, clearly addresses the needs of the communities reflected in this raised bill by language. Of course, we all know that this will be addressing Phase II of the expansion of transmission lines throughout so many of our towns in Fairfield County, New Haven County and Middlesex County.

Earlier, I had submitted a request for raised bill to this committee. Although, technically I had not missed the raised committee bill deadline, the committee had already voted on that agenda the day before.

So, to still be able to address my concerns and the concerns of my constituents, I respectfully request that Raised Bill # 5418 be amended. I am also respectfully requesting that after this hearing there be a meeting to put together a master bill which will address the needs of all the legislators and their constituents who are part of Phase II.

My first amendment would respectfully request that any community which is part of Phase II of the expansion of electric transmission lines, which already has a 345 K.V. line in an area, that no duplication of 345 K.V. line be allowed in that same area. Moving from 115 K.V. to 345 K.V. is one thing; going from 345 K.V. to 690 K.V. is way over the top.

My second amendment would respectfully request that the Connecticut Siting Council shall require of the applicants of Phase II, known as docket 272, alternate routes for every community which is part of Phase II, with emphasis and full discovery on placing transmission lines underground or under road.

My last request for an amendment is to respectfully request the Connecticut Siting Council in fact, mandate the Connecticut Siting Council to give weight to the arguments and testimony provided regarding health concerns and economic concerns in this expansion of the electric transmission lines know as Phase II docket 272.

In conclusion, please let me state the facts: Wallingford has the longest mileage of the expansion of transition lines in Phase II, therefore I very strongly recommend that Wallingford deserves major consideration in any and all deliberation. Additionally, in the interrogatory from the Attorney General's Office regarding the expense of putting the line under ground in the Devon to Norwalk areas, it was determined that in the fact it was no more expensive. So, this argument of $1 million versus $3 million is suspect. So please, for the benefit of all of us in Phase II, please amend Raised Bill 5418, to include my amendments.

Thank you,

Mary Fritz
State Representative
Deputy Speaker

Testimony of Mayor James L. Richetelli, Jr.

City of Milford, Connecticut

February 26, 2004

Testimony Re: HB-5418; AN ACT CONCERNING ELECTRIC TRANSMISSION LINE SITING CRITERIA

Good morning, Senator Peters, Representative Backer and members of the Energy and Technology Committee. My name is James L. Richetelli, Jr., and I am the Mayor of the City of Milford. I am here to speak in support of HB-5418. Thank you for allowing me the opportunity to speak to this proposed bill and its potential impact to my community and those communities similarly situated.

As you may know, Milford is one of the municipalities located in the path of the proposed 345kV loop from Middletown to Norwalk. If the project is approved these high power transmission lines will have an irreparable impact on the City's residents and environment.

This project includes a substation to be located in Milford. The City does not oppose or object to the substation, as it is proposed for location in a

heavy industrial district. As suitable as that area of Milford may be for a substation, the location of the 345kV aerial transmission lines is equally unsuitable.

As proposed, these 345kV lines will run right through several dense residential neighborhoods. The residents of these neighborhoods are understandably concerned about health and safety implications. In addition to the fear about increased electric and magnetic fields, these residents are also concerned about the structures themselves. Many of the fall zones of these new structures actually encroach on property lines, and in some cases the actual homes themselves.

Further, the current proposal would locate the 345kV transmission lines right through the center of Eisenhower Park, the largest open-space and recreational parcel in the City. Allowing the lines to bisect this parcel limits recreational use and impacts the open space character of this property. If the 345kV lines are installed through the center of the park as proposed, the City will be unable to provide the recreation and youth programs, including summer camps, swimming, skating rink that it might if the lines did not limit the park's usage.

Although there is concern about the aspects of the project that will be visible to the human eye, there is far more concern about the aspects of

the project that will remain unseen. The environmental implications of this project are far more serious than simple land use issues. If approved, new 345kV lines will result in the exponential increase of electric and magnetic field levels in the areas around the lines. In Milford, areas that will be impacted by the increase in EMF includes recreation areas, ball fields, children's play areas, houses of worship, and dense residential neighborhoods, including at least one subdivision comprised of approximately 400 homes.

Residents are specifically concerned about the exponential EMF increase associated with this proposal. As an example, the calculated magnetic field of the existing transmission lines at Eisenhower Park is 2.6 mG (milligauss). The Docket 272 application materials indicate that the magnetic field at peak load in the same area will be increased to 30.7 mG (milligauss) once the 345kV lines are installed.

The EMF studies and scientific conclusions are replete with ambivalence, caution and caveats. Not one of these studies can unequivocally confirm that EMF experienced at the anticipated levels will be safe. Further, there is no irrefutable or convincing proof that these exponentially higher EMF levels will not negatively affect the adults and children that live and recreate in the shadow of the transmission line. To that end I would suggest that the proposed language be revised to change "public

playground" to "public recreation area." I would also request that "dense residential areas" be included. This is an issue in which risk is not acceptable, particularly when there are alternatives available.

Finally, this is an opportunity to make our future and that of future generations better. It is rare that we, in the present day, can bequeath a gift of such enormous value to our children and grandchildren. As a result, I support this bill with the hope that it will protect those individuals, families and communities that will be impacted as well as ensuring the health and safety of our community's future. If these restrictions are implemented, it will have a resounding effect on the lives and safety of our constituents.

Thank you for your time.

State of Connecticut

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MINORITY LEADER PRO TEMPORE

Testimony before the Committee on Energy and Technology
State Senator William A. Aniskovich 12th District

Feb. 26, 2004

Good morning. Thank you to the co-chairs and members of the committee for this chance to testify on Raised Bill 5418, AAC Electric Transmission Line Siting Criteria.

Just two nights ago I addressed the Connecticut Siting Council on issues that have been raised by this bill regarding the health and safety concerns associated with overhead electric transmission lines. As you are aware, construction of an overhead 345-kilovolt power line has been proposed by the state's two major energy utilities that would affect two dozen communities along a 45-mile corridor between Middletown and Milford.

Needless to say, this issue has drawn enormous public concern and response. People are scared for the health of their children, worried their property values will plummet and that their way of life will be forever altered if the Siting Council approves the application from NU and UI as it now stands.

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There were more than 200 people in attendance in Middletown Tuesday night. It was the seventh public hearing on the application. Sooner or later, whether it is this particular proposal or another down the road, your constituents and mine will be affected by this issue.

There is no question that the state's power grid desperately needs to be upgraded. It's antiquated and cannot meet energy demands at peak times. Our state's population growth over time and the needs of business have outstripped the ability of the utilities to generate adequate power.

There is an alternative to the overhead line proposition - bury the transmission lines in existing rights of way. This bill would restrict where the Siting Council could allow certain overhead lines to be located – for lines carrying between 345 and 495 kilovolts at least 250 feet from any school, day care facility, camp or playground. That would affectively restrict the ability of utilities to construct overhead lines in much of the state.

The utilities argue that there is no conclusive, persuasive evidence that exposure to overhead power lines can be directly linked to increased incidence of disease, particularly certain types of cancer. The Siting Council, reacting to the overwhelming response to this proposal, has properly asked for an opinion from the state Department of Health on the health implications that this project poses. I have been assured by the department that a response will be rendered within an appropriate time frame.

The utilities have acted responsibly, for the most part, as good corporate citizens. They employ thousands of people in good paying jobs. They have been philanthropic partners with the state and within their host communities. But I believe we need additional scientific evidence to allay all our concerns.

If you are a homeowner or you grew up and started a family in one of the 24 towns along the existing right of way, you don't want to hear the arguments that there are no known health and safety concerns associated with increased exposure to elevated radiation levels from the power lines. When there is doubt we must err on the side of caution.

The opposition spoke loudly and clearly Tuesday night in Middletown.

Again, thank you for your time.

TESTIMONY OF ROBERT E. EARLEY
CONNECTICUT BUSINESS AND INDUSTRY ASSOCIATION
BEFORE THE
ENERGY & TECHNOLOGY COMMITTEE HEARING
LEGISLATIVE OFFICE BUILDING
HARTFORD, CONNECTICUT
FEBRUARY 26, 2004

Good afternoon. My name is Robert E. Earley. I am a staff attorney for the Connecticut Business and Industry Association (CBIA). I am also a member of the state's Energy Conservation Management Board. CBIA represents over 10,000 companies in the state. Our membership includes many of the state's largest employers, but over 90 percent of our members are small businesses with fewer than 50 employees.

I am here to testify in opposition to **HB-5418 An Act Concerning Electric Transmission Line Siting Criteria**.

We have a transmission crisis in our state. The DPUC, ISO-NE and FERC at various times over the last two years identified Connecticut's congestion problems as the worst in New England and among the ten worst in the country. Simply stated, during times of peak demand, we can not move enough supply into key portions of our state. In 2003, Connecticut had to pay over $185 million for congestion and experienced a blackout. In 2004, locational installed capacity changes, regional demand response programs, and delays in transmission upgrades will likely result in hundreds of millions of additional costs to state consumers. In sum, until we address our infrastructure deficiencies in southwest Connecticut, state consumers will pay a high price.

Reliable energy at stable prices is fundamental to a healthy economy. Increasingly, the policy choices we make with regard to energy directly translate into consumer costs or savings. For example, if we delay the construction of new transmission lines, state consumers will pay more. If we alter reliable transmission engineering for aesthetics, consumers will pay more. If we choose to generate electricity from subsidized renewable sources, consumers will pay more. If we deplete conservation funds, consumers will pay more. If we choose moratoriums over modernization, state consumers will pay more. Arguably, there are benefits to making the above choices, but there most certainly are quantifiable, financial costs. CBIA appreciates the environmental concerns and prudent compromises that make for sound energy policy in our state. However, **HB–5418** will make it more difficult and costly to construct improvements to our woefully deficient transmission system.

CBIA believes that the ultimate solution to Connecticut's energy problems requires a comprehensive approach that goes beyond transmission enhancement and siting revisions.

In short, state energy policy must recognize the need to support the following three priorities:

- Upgrades to our electric and natural gas transmission systems and the siting of adequate generation capacity;
- The creation of vibrant competitive marketplaces for both electricity and natural gas;
- Conservation and load management efforts, as well as, the development and deployment of alternative energy technologies.

Such a multifaceted approach will likely remedy the problems not only in southwest Connecticut, but the entire state. It can also help ensure that Connecticut consumers continue to lead the nation in the efficient use of energy and have a reasonable choice of energy resources.

More specifically, CBIA recommends that the state continue to encourage energy conservation and load management efforts and preserve the integrity of the state's energy conservation and load management fund and process. In addition, state energy policy should encourage the development of alternative energy sources, including fuel cells, which reduce pressure on the power grid, and avoid disincentives to their deployment. Last, Connecticut must maintain a diversity of fuel sources for both generation purposes and end uses to avoid an over-reliance on one supply.

Thank you.

Testimony of Lee M. Levison
Headmaster, Kingswood-Oxford School, West Hartford, and President, Board of Directors, Connecticut Association of Independent Schools

Re. HB 5418, AAC Electric Transmission Line Siting Criteria
Joint Committee on Energy and Technology

February 26, 2004

I represent the Connecticut Association of Independent Schools, an organization of 87 non-public, non-profit, accredited elementary and secondary schools throughout Connecticut.

We come today to ask you to support passage of House Bill 5418, which would require a minimum setback of all future high-voltage aerial power lines to keep them a safe distance from public and private schools, playgrounds, and other areas which attract numbers of children.

The proposed legislation, based on regulations which already exist elsewhere in the nation, would not be burdensome. It requires setbacks of as little as 100 feet (less than the length of the atrium of this building) for aerial lines of 51 to 219 kV, and no more than 600 feet for ultra-high-power aerial transmission lines. These regulations would not apply to power transmission lines which are buried.

CAIS would not support legislation which set unreasonable barriers or imposed cost-ineffective burdens on our public utilities — we too use electric power, and depend on its uninterrupted availability. Moreover, we know that the scientific research regarding the exact range of dangers high-EMF fields present to children is incomplete. However, since at least some of the nation's foremost experts believe there is a clear risk to children from close and persistent exposure to the EMF fields generated by high-voltage aerial transmission lines, and since this possible risk can be easily, affordably and completely removed by a modest setback requirement of these lines, mandating setbacks not only is prudent government policy, but really should be seen as a part of the duty of care and protection that each of us owes to all children.

CAIS urges each and every one of you to support the proposed setback legislation.

February 26, 2004

ELECTRIC TRANSMISSION LINE SITING CRITERIA Bill # 5418

Chariman Melodie Peters, Chairman Terry Backer and Committee Members:

Thank you for giving me the opportunity to speak on the **ELECTRIC TRANSMISSION LINE SITING CRITERIA Bill # 5418.** My name is Lynn Stanwood. I live at 67 Royal Oak Drive, Durham CT.

Residential Neighborhoods must be included in the Energy bill simply due to reasonable doubt.

Is the scientific evidence beyond a reasonable doubt the EMFs do not cause leukemia in children. Is it beyond a reasonable doubt that the corona ions do not cause lung and mouth cancer. Is it beyond a reasonable doubt that the lightning rod effect that the power towers will create will stay within the easement through the residential neighborhoods or that NU and UI are only going to install one 345 kV line and not three 345 kV lines thorough the residential neighborhoods? Or that the property values of homes in residential neighborhoods will not decrease 20% and more?

Is it beyond a reasonable doubt that the upfront cost of under grounding may be more expensive but the upkeep much cheaper than regular overhead lines?

Is it beyond a reasonable doubt that there really is no limiting factor in under grounding high-tension power lines other than huge up front corporate profit? All power lines must be under grounded especially in residential neighborhoods.

Sincerely,

Lynn Stanwood

State of Connecticut
GENERAL ASSEMBLY

COMMISSION ON CHILDREN

Testimony submitted by

Elaine Zimmerman, Executive Director, Commission on Children

on Raised Bill No. 5418

Energy and Technology Committee

Connecticut General Assembly

February 26, 2004

Senator Peters, Representative Backer, and members of the Committee, thank you for this opportunity to testify in support of Raised Bill No. 5418, *An Act Concerning Electric Transmission Line Siting Criteria.* This legislation would prohibit the Connecticut Siting Council from siting overhead electric transmission lines within a certain amount of feet of a school, licensed child day care facility, licensed youth camp or public playground.

This legislation would provide important protection for children and families to attend school and day care at a safe distance from potentially harmful electromagnetic fields (EMFs) produced by power lines.

Although the scientific evidence is inconclusive, there is sufficient evidence to be very concerned that EMFs pose a serious health risk to children. According to some studies, EMFs may cause mutations that cause leukemia. Studies have shown that children exposed to high levels of EMF were twice as likely to develop leukemia. The National Institute of Environmental Health Sciences (part of the National Institutes of Health) concluded in a 1999 report that extremely low frequency EMF (ELF-EMF) "exposure cannot be recognized as entirely safe", due to "a fairly consistent pattern" of increased risk for childhood leukemia. The report called for "continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures." (NIEHS, 1999, *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*).

Without this legislation, Connecticut children may face increased risks from EMF exposure as power companies build new and more powerful above-ground cables. A planned high voltage power line in Woodbridge would cross the grounds of Ezra Academy and the Jewish Community Center, which houses a day camp, and would continue just across the street from Beecher Elementary School. The new line would increase power from 115 kV to 345 kV, with its

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additional high dosage of electromagnetic radiation. More than 1800 children in nursery school through grade 12 frequent these campuses and other ones nearby.

EMF exposure is a statewide issue that affects all children across the state. Connecticut has no law protecting children from this potential threat, while steps have been taken in other states to protect children from high-voltage power lines. The California Department of Education has established limits for locating any part of a school site property line near the edge of easements for high-voltage power transmission lines (e.g. 100 feet from the edge of an easement for a 50-133 kV line; 150 feet for a 220-230 kV line). The Tennessee Valley Authority (TVA), created by the federal government, is America's largest power company, serving seven states. When routing transmission lines, TVA seeks to maintain a 300-foot buffer for homes and a 1,200-foot buffer for schools.

In cases such as this, where children today and for many future generations may be at risk, we must err on the side of caution. This legislation establishes a uniform safety zone for those educational learning centers where children spend much of their day. I hope the committee will broaden the legislation's protection to cover residential areas where children live, as well as public recreation areas in addition to public playgrounds already covered in the bill.

Thank you for your attention to this important child safety issue for all of Connecticut's children.

Table A-1. Measured and Calculated Electric and Magnetic Fields at Boundaries of Facility Locations Categorized by the Connecticut Siting Council

The data in this table reflect measurements of electric and magnetic fields made at, or near, the closest boundary of the facility to the proposed line, and the calculated contribution from the existing transmission lines (if any) and proposed transmission line to field levels at that boundary.

Location#	Cross Section	Aerial Segment	Category	Measurements of Fields from Existing Transmission Lines & Other Sources			Calculated Fields from Existing & Proposed Transmission Lines (Transmission Line Sources Only)				
							Existing		Proposed		
										Magnetic Field (mG)	
				Measurement Location to ROW+ (ft)	Electric Field (kV/m)	Magnetic Field (mG)	Electric Field (kV/m)	Magnetic Field (mG) Average* Load	Electric Field (kV/m)	Average Load*	Peak Load**
Overhead Lines											
Connecticut Baptist Home Meriden 06450	3	12	Assisted Living Facility	115	0.05	4.1	0.09	2	0.19	2.7	1.7
B'Nai Jacob Congregation Woodbridge 06525	8	34	Playground/School	in ROW	0.81	7.5	1.48	8.1	2.72	25.3	96.5
Peck Place School Orange, CT 06477	8	40/41	Playground/School	500	0.01	0.2	0.00	0.1	0.01	0.1	0.8
Eisenhower Park Milford 06460	8	42	Bleachers/Playing field	24	0.12	4.6	0.10	2.6	0.84	5.4	30.7
Underground Lines											
Little Lamb Day Care Bridgeport 06608	9	51	Day Care Facility	3	- na -	1.5	- na -	- na -	- na -	0.2	0.2
Washington Park Bridgeport 06608	9	51/52	Park / Playground	0 Barnum Ave	- na -	0.8	- na -	- na -	- na -	0.2	0.2
Winslow Park Westport 06880	9	61	Park	5	- na -	2.2	- na -	- na -	- na -	0.1	0.2

\+ Distances are best estimates based upon measurements (where possible) or distances scaled from aerial photographs.
\# For locations within 500 feet of overhead line or 100 feet of underground line
* 15 GW Load Case (typical system loading in 2007)
** 27 GW Load Case (hour with the highest system loading in 2007)
- na - Not applicable

000715

STATE OF C~NN~CTICUT
House Bill 5418

000716

RE: NORTHEAST UTILITES SERVICE
COMPANY APPLICATION FOR A
CERTIFICATE OF ENVIRONMENTAL
COMPATIBILITY AND PUBLIC NEED
FOR THE CONSTRUCTION OF A
345-KV ELECTRIC TRANSMISSION
AND RECONSTRUCTION OF AN
EXISTING 115-KV ELECTRIC TRANS-
MISSION LINE BETWEEN MIDDLETOWN AND NORWALK.

February 26, 2004

Thank you Chair Peters and Chair Backer, and members of the Committee, for allowing me to speak with regard to House Bill 5418- An Act Concerning Electric Transmission Line Siting Criteria. My name is Karen Leibowitz; I am a member of the Beecher Road School PTO, and a parent of two children at the school. My children also attend hebrew school 3 days a week under the power lines at Congregation B'nai Jacob. I have come to you to ask that you support the proposed House Bill 5418 for the following reasons:

- Beecher Road School is the only public elementary school in the town of Woodbridge. We have 902 students attending school on the Beecher Campus grades pre-K through 6th. Our children also attend the Recreation Department activities and summer camp, the Extended Day program and the Summer Enrichment program all located on the Beecher campus. Many of our children also attend activities, religious programs and camps at the Jewish Community Center, Congregation B'nai Jacob and the Trinity Evangelical Church. The lines cut right across areas where many of our children go to school and play.

- Power companies in other states require a safety buffer of 1200 feet between transmission lines and schools. The Beecher Road School campus would not be considered an acceptable distance in those states. Our situation highlights this problem. We ask that you support this bill because it employs a precautionary principle and ensures that our children are safe. Any risk that could potentially harm even one child must be avoided.

- This bill ensures uniform treatment for every child in the State of Connecticut. Please support power with a safety zone for our children.

Thank you.

Respectively submitted,

Karen Leibowitz
11 Davis Rd
Woodbridge, CT.

Legislative Session Testimony
House Bill 5418
February 26, 2004

Thank you Chair Peters and Chair Backer, and members of the Committee, for allowing me to speak with regard to House Bill 5418- An Act Concerning Electric Transmission Line Siting Criteria. My name is Stephanie Green; I am a physician and a concerned mother of 4 children who attend a day care facility, a private school, after school activities and summer camp in Woodbridge. I want to offer an historical perspective to the utilities proposal.

In the 2003 application filed the utilities state:

"The results of the latest studies of childhood cancer do not provide sufficient convincing evidence to support the hypothesis that exposure to electric or magnetic fields or power lines near the home are a cause of leukemia."

Now flashback to 1959 when the following statement was made:

"My contention would be that one should not feel under any compulsion to make a scientific judgment if the evidence does not warrant it. A person of true scientific discipline would never make a final judgment one way or the other on the type of evidence presented".

This statement was made by scientists, hired by tobacco companies, disputing a correlation between cancer and cigarettes.

The similarities between these two statements are instructive and alarming. Back in 1959 who would have ever thought that in the year 2004 smoking cigarettes in public places would be virtually illegal in many cities? That it is illegal to advertise cigarettes on TV and to young people? That the attorney generals of most states have sued the cigarette companies for damages related to cancer and other ill health effects caused by cigarettes?

I have come before you today, as a mother and a physician, to ask that you legislate and support the proposed House Bill 5418 to protect the health and safety of the children in the state of Connecticut. Furthermore, I ask that you support language in the proposed legislation to ensure that the proposed safety buffers are enacted with respect to the Phase II application presently before the Connecticut Siting Council.

Thank you for your time and attention.

Respectfully Submitted,

Stephanie Green, MD
2 Fox Den Way
Woodbridge, CT 06525

Infectious Diseases Specialist
New Haven Health Department

RESPONSE TO INQUIRY

000732

Electromagnetic Field Health Effects

April 1, 1992

HB5418

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING

QUI TRANSTULIT SUSTINET

1976

for the
Department of Health Services
State of Connecticut

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING

Extract of

Special Act No. 76-53

AN ACT CONCERNING THE ESTABLISHMENT OF THE CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING, INCORPORATED.

. . . . . .

Sec. 2. The purposes of the corporation shall be to foster science and engineering, to promote the application of science and engineering to human health and welfare, and to study and report upon any subject within its competence when appropriate. In particular, the corporation shall: (a) Encourage both specialized and interdisciplinary discourse among its members and with other members of the technical community by means of meetings, symposia, reports and publications, and by its example set the highest standards therefor; (b) provide guidance to the people and the government of the state of Connecticut, upon request, in the application of science and engineering to the economic and social welfare; (c) provide guidance to industry and commerce in the state of Connecticut, upon request; (d) initiate reports to the people and the government of the state of Connecticut when advances in science and engineering raise implications that impact upon public policy; and (e) encourage and foster science and engineering education of the highest quality, and promote interest in science and engineering on the part of the public, especially young people.

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING
410 Asylum Street, Hartford, Connecticut 06103-1913 • (203) 527-2161

RESPONSE TO INQUIRY

TITLE OF INQUIRY:	EMF: Electromagnetic Field Health Effects
ORIGIN:	Department of Health Services
DATE INQUIRY ACCEPTED:	June 21, 1991
DATE RESPONSE SUBMITTED:	April 1, 1992
RESPONDENT:	Jan A. J. Stolwijk, PhD Professor of Epidemiology and Public Health Yale University School of Medicine; Member of the Academy

OTHER PARTICIPANTS IN THE STUDY: Page 3

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OTHER PARTICIPATING MEMBERS OF THE ACADEMY AD HOC COMMITTEE ON ELECTROMAGNETIC FIELD HEALTH EFFECTS

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Professor and Head,
Department of Biostructure and Function
University of Connecticut Health Center

*Member of the Academy

STATEMENT OF INQUIRY:

The Department of Health Services (DOHS) is aware that there has been public concern, both at the national level and in Connecticut, that some types of non-ionizing electromagnetic fields may cause adverse health effects in humans, possibly including cancer and reproductive failure.

Electric and magnetic fields that are normally associated with 50-60 Hz electric power distribution and utilization have been particuarly identified. This would include both power lines and distribution facilities, and household and workplace wiring and appliances.

DOHS is aware also that there exists a body of scientific literature related to these suggested effects, encompassing both epidemiological and laboratory investigations. Much of this literature, particularly as it relates to carcinogenesis, has been summarized and evaluated in a draft report by the United States Department of Environmental Protection (EPA) now being reviewed by an external panel.

DOHS believes, however, that it would be valuable to obtain an independent assessment of the significance for public health of these published results and of other available scientific information. It therefore requests the Connecticut Academy of Science and Engineering to undertake such an independent assessment.

The Academy should consider in its assessment information contained in the EPA draft report (or the final reviewed report, if available), results provided by other scientific literature and sources, and the expertise of the study participants.

SUMMARY OF RESPONSE:

From the detailed report that follows, the only general conclusion can be that the state of our knowledge at this time does not permit firm judgements about possible adverse effects of Extremely Low Frequency (ELF) magnetic fields on human health. Even the weight of evidence indicating the possibility of such effects versus the weight of evidence that such effects could not occur is difficult to judge. Absolute proof of the occurrence of adverse effects of ELF fields at prevailing magnitudes cannot be found in the available evidence, and the same evidence does not permit a judgement that adverse effects could not occur, as is true for any putative hazard without a solid base of evidence.

There are some immediate or acute biological effects of ELF electromagnetic fields at levels that commonly occur, or above. These effects are not seen as a health hazard.

There are only a few studies which reported biological effects that continued after the termination of exposure, such as are common after the termination of exposure to proven carcinogens. There have been no reports of direct mutagenic action of ELF fields at prevailing field strengths.

It should be noted that consideration was restricted to ELF magnetic fields in this report, both because they are significantly more penetrating than ELF electric fields and because they have been the focus of recent epidemiological and laboratory studies.

Epidemiological studies of human populations exposed to magnetic fields are difficult to interpret. At this time, they lack a proven mechanism, the excess risks are relatively small, and the estimate of exposures is fraught with difficulties. Associations between exposure and effect have most often been based on proxy measures of exposure, and attempts to relate the excess risks to actual measurements of magnetic fields have been relatively unsuccessful. This failure may be due to the difficulties in documenting past exposures by recent measurements.

Thus, the epidemiological literature does not presently support a conclusion that electromagnetic field exposure unequivocally increases risk for cancer or any other adverse health outcome. In fact, the totality of the epidemiological studies suggests that if adverse health effects from residential electromagnetic field exposure exist, they are not likely to make a large contribution.

The findings of laboratory investigations on cells, tissues and embryos are also difficult to interpret. There seems to be a tendency for different laboratories to choose different biological systems, different exposure modalities, and not to undertake studies confirming reports by other laboratories. Where such attempts have been made there have been numerous occasions of inability to confirm. The biological effects that have been reported often are effects in which rates of certain processes already going on have been modified. In view of the propensity of living systems to change rates of many processes, and to have such processes interact with one another, it is difficult to form very firm conclusions about the significance of many of the findings.

Prior concepts about the action of 60 Hz magnetic fields at intensities that prevail in our society did not anticipate any of these effects, so that the report of such an effect in isolation focussed new attention on these unforeseen interactions of magnetic fields and tissue and organ effects.

The findings in epidemiological studies of ELF fields, and the findings in the biological laboratory about reactions in tissues and cells have, however, raised the level of interest in the scientific community, and it is hoped that newer efforts will be directed at possible coherent pathways rather than at identifying additional isolated effects. There is developing a commitment by relevant U.S. agencies to a large scale animal study of the carcinogenicity of ELF magnetic fields with a protocol based on the standard protocols used for other carcinogens. While continued research on the possible health effects of ELF fields is strongly recommended, Connecticut itself does not appear to offer any unique opportunities for such work or, for that matter, for risk assessment work.

The possibility does exist of mounting an epidemiological study of childhood cancer in Connecticut based on the Connecticut Tumor Registry; there are, however, limitations due to the population size of Connecticut. Compared with the population of Los Angeles, which is about three times that of Connecticut, we would not be able to recruit enough cases for a study with reasonable statistical power in less than five years. There are a number of these studies on childhood cancer ongoing in the U.S., under the sponsorship of the National Cancer Institute.

Currently, there are two studies ongoing in Connecticut which might provide data relevant to ELF concerns. One such study has already gathered exposure data on over 600 pregnant women around New Haven and it might be possible to study various health effects questions in that cohort, at much reduced cost. Another study is directed at childhood cancer in connection with radon exposure and is already obtaining observations on 100 cases and controls, as well as radon measurements in all residences in which these children lived. It might be feasible to carry out ELF field measurements in these same residences and thus extend this pilot study to evaluate residential radon and ELF fields as risk factors for childhood cancer. The likelihood of obtaining results that would be statistically valid and of use to the Connecticut population may be quite low and would have to be carefully evaluated.

The data in the report about the distribution of ELF exposures in the Connecticut population indicate that residential exposures are within the normal limits observed elsewhere in the country.

The existing Guidelines and Standards currently in force in various jurisdictions for personal exposures in terms of permitted levels around electric power facilities do not appear to be exceeded in Connecticut. The Academy does not see any particular utility for Connecticut to adopt these Guidelines, and there is even less reason to adopt more stringent guidelines because a rational basis for other limits is not in sight at this time.

The question has been raised in both the scientific community and publicly as to whether it is advisable to urge the public to practice "prudent avoidance" of ELF electromagnetic field exposure. The Academy concludes that it would be inappropriate -- given the above conclusions -- for public authorities to recommend "prudent avoidance."

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TEXT OF RESPONSE: This response has been edited by the Council of the Academy and is released with its approval.

INTRODUCTION

Prior to the 1970's, adverse health effects from electromagnetic fields associated with the generation, transmission, distribution and use of electric power at Extremely Low Frequencies (ELF) had been studied only at very high intensities. Acute effects had been noted at electric fields above 10 kV/m (kilovolts per meter) in the form of unwanted sensory responses at the skin and hair roots, and similarly in magnetic fields in excess of 500 μT (microtesla) or 5000 mG (milligauss), light flashes (magnetophosphenes) occur in the visual system. Below these levels, no acute or immediate effects have been reported.

Since about 1970, a number of biological effects of electromagnetic fields at various frequencies have been studied and reported. Most of these studies, especially in the earlier years, were directed at electromagnetic fields at much higher frequencies, in the microwave range. The most apparent effect was the tissue heating that occurred when the radiant fields were sufficiently intense. The absorption of microwave radiation and the heating that resulted was predictable on the basis of available knowledge and did not raise any serious controversy. On the basis of the energy available in microwave and lower radiofrequency radiation it is accepted that direct action on molecular and atomic structure is not likely or even possible.

For ELF electrmagnetic fields from power lines, the electric and magnetic fields can be considered independently. Initially, both should be examined in considering effects upon the human body. However, electric fields that are generated external to the body are severely attenuated by the high electrical conductivity of mammalian tissue, while electric fields induced by changing magnetic fields are far more penetrating. Thus, an external electric field of 1 kV/m induces an average internal field of only 20 μV/m (microvolts per meter), the same as a 60 Hz magnetic field of 10 mG. Since exposures to the latter (10 mG) are far more common and likely than to the former (1 kV/m), recent investigations, including this one, have concentrated on the effects of ELF magnetic fields.

When laboratory experiments involving magnetic fields produced biological results that could not be explained on the basis of tissue heating, and when these results could not always be reproduced in other laboratories, a considerable amount of discussion ensued.

Epidemiological studies, first by Wertheimer and Leeper followed by a number of other investigators, reported relatively weak associations between indicators of exposure to ELF magnetic fields and childhood cancer risk, and raised considerably the level of concern about possible adverse effects of low level electromagnetic fields at power frequencies.

In some discussions and reviews of the literature on ELF magnetic fields, the notion of "prudent avoidance" has been introduced. According to this notion, there is not enough evidence to introduce guidelines or regulations to limit exposures of the public to ELF electric or magnetic fields but, where reductions in such exposures are easily accomplished, such reductions in exposure should be recommended and considered.

Members of the Academy committee that performed this study discussed "prudent avoidance" in a telephone conference with Prof. John Peters, University of Southern California, after he completed his study of childhood leukemia and ELF exposures in the Los Angeles area. There was concurrence from this discussion, as well as from other information, that it would be inappropriate for health authorities to recommend "prudent avoidance" to the general public. This appears, in fact, to be the present position of the Connecticut Department of Health Services.

Throughout all of the scientific disciplines which have studied the health effects of ELF fields there is substantial risk of publication bias. That is, positive results are more likely to encourage submission for publication or acceptance, while negative studies are generally ignored. This problem is especially important for the early literature.

In this report, the Connecticut Academy of Science and Engineering will address:

- Power frequency electric and magnetic fields, their sources, factors determining the strength of these fields, methods of measurement, and observations of these fields in Connecticut.
- Possible adverse health effects associated with such fields based on studies of human populations including increased risk of cancer and adverse effects on reproduction and on neurological and behavioral systems.
- Biological effects of ELF fields in laboratory experiments, and their possible involvement in the causation of adverse effects associated with such fields in humans.
- Existing Standards and Guidelines dealing with ELF fields.
- Overall assessment of the current state of knowledge and recommendations concerning future research.

000744

MAGNETIC FIELDS DUE TO CURRENTS

Single Straight Wire

The classical description of electromagnetic fields is embodied in Maxwell's equations. The relevant equation for determining the magnetic field associated with a current-carrying wire is Ampere's Law. Magnetic flux density is the commonly used measure of the strength of a magnetic field. Ampere's Law states that the magnetic flux density B is directly proportional to the current I and inversely proportional to the perpendicular distance R from the wire. The direction of the magnetic flux density is perpendicular both to that of the current and to that of a straight line from the wire to the observation point, so that lines of flux form closed circles about the wire, as shown in Fig. 1.

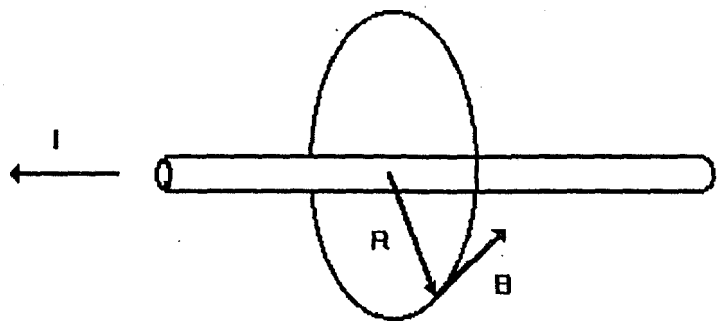

Figure 1. Magnetic flux density produced by current in a long, straight wire.

The primary units of magnetic flux density are the tesla (T) and the gauss (G); the tesla is ten thousand times larger than the gauss. Common secondary units are the millitesla (mT) (one thousandth of a tesla), the microtesla (μT) (one millionth of a tesla) and the milligauss (mG) (one thousandth of a gauss).

As an example, the magnetic flux density at a distance of 10 meters from a wire carrying a current of 100 amperes has the value B = 20 mG. This value may be put in perspective by noting that the flux density of the Earth's magnetic field is approximately 500 mG.

Physical Effects of ELF Magnetic Fields

Unlike the Earth's magnetic field, however, magnetic fields due to power lines alternate at a frequency f = 60 Hz (hertz), i.e., 60 cycles per second. These are called Extremely Low Frequency (ELF) magnetic fields. Their physical effects are governed by another of Maxwell's equations, Faraday's Law, which predicts that a time-varying magnetic field gives rise to an electric field. The induced electric field is directed azimuthally, forming circular patterns in planes perpendicular to the changing magnetic field. The magnitude of the electric field intensity E at the periphery of an object of circular cross-section is proportional to the magnetic flux density B, the frequency f, and the radius r of the cross-section.

The electric field in the interior of the circular object is just proportional to the perpendicular distance from an axis through its center parallel to the magnetic field; thus, it is far more penetrating than are externally imposed electric fields. The maximum electric field induced in an object of cross-sectional radius r = 0.1 meter, typical in magnitude of a human being, by the 20 mG magnetic field of the previous example is E = 38 μV/m (microvolts/meter). This induced electric field is the primary effect of the alternating magnetic field.

The physical response of the object to the induced electric field depends on its material properties. In the case of a homogeneous conducting medium, an eddy current density J is induced which is directly proportional to the electric field intensity E at each point and inversely proportional to the resistivity. With the assumption of an average resistivity value of 10 ohm-meter, typical of body fluids, the maximum value of the induced current density in the previous example is J = 3.8 $\mu A/m^2$ (microamperes/meter^2).

The magnetic-field-induced electric field and current in this example are typical of those encountered in electric power applications, and are very much smaller than the electric fields and currents already present in the body that result from known natural processes.

It should be emphasized that the foregoing example is greatly simplified, and is presented only to suggest orders of magnitude of physical effects. Actual biological systems are extremely heterogeneous and may respond to induced electric fields in a variety of complex ways; some possibilities are considered in subsequent sections of this report. Also considered are some physical constraints on response mechanisms at the cellular level which severely limit the possibilities.

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Maxwell's equations also support solutions which describe electromagnetic waves propagating through free space, including radio waves, visible light, x-rays and gamma rays. Electromagnetic waves are irrelevant in the present context, however, essentially because their wavelength at 60 Hz is 5,000 kilometers (3,000 miles), far greater than the largest dimension under consideration. Near-field effects predominate in electric power applications, <u>not</u> electromagnetic radiation.

MAGNETIC FIELDS FROM POWER APPLICATIONS

Although the isolated long straight wire is a useful prototype for introducing the discussion of magnetic field effects, it is seldom encountered in actual electric power applications. Currents must always flow in closed loops by virtue of the conservation of electric charge. Thus, for every current flowing from a power generating facility to a residential customer, there is a return current flowing through other wires or conducting media. Transmission lines, distribution lines, transformers, residential wiring and electrical appliances must be distinguished as types of sources, each with its own characteristic current distribution.

Transmission Lines

Transmission lines carry electric power over large distances from generating plants to substations. The simplest transmission line configuration is a single three-phase circuit as shown in Fig. 2.

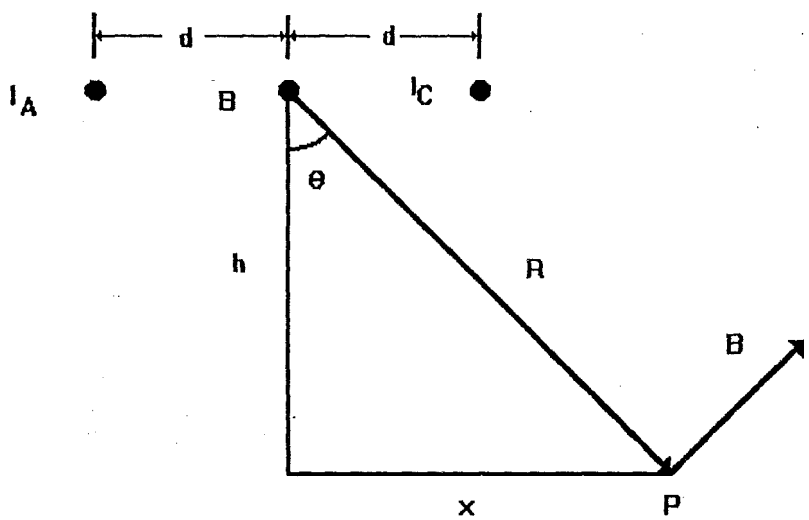

Figure 2. Magnetic flux density produced by a three-phase transmission or distribution line.

The three wires respectively carry 60 Hz currents I_A, I_B and I_C which are parallel in direction but have different phases, i.e., they are out of synchronism with one another. A person who stands below the transmission line at P, a distance R from the central wire, will experience a magnetic field B in the direction at right angles to R. Typical magnitudes of such magnetic fields are discussed below.

Transmission lines are operated at high voltages in order to facilitate the transmission of high power without excessive losses due to the electrical resistance of the wires. This resistance is proportional to the length of the wire and inversely proportional to its cross-sectional area. Since the resistance losses are proportional to the square of the current multiplied by the value of the resistance, losses could be reduced by using thicker wires. This option is more expensive than raising the voltage, and also would produce higher magnetic field flux densities. The trend in power transmission is to increase the voltage and reduce the current.

Transmission lines in Connecticut are usually operated at voltage amplitudes of 345 kV and 115 kV, where 1 kV = 1 kilovolt = one thousand volts. The 345 kV lines are 35 - 50 ft above the ground with wire separations of 26 ft, average span lengths (between poles) of 800 ft and maximum span lengths of 1200 ft. These lines may carry peak currents of 1000 amperes per wire near the power plant, with capacity of twice that.

The 115 kV lines are 30 - 40 ft above the ground with wire separations of 15 ft, average span lengths of 600 ft and maximum span lengths of 900 ft. They typically carry currents of 100 amperes per wire, with a capacity of 600 amperes per wire.

The magnetic field below a three-phase transmission line is a function of the balance of the amplitudes of the currents and the phase angles, as well as the distance from the central wire. The amplitude of the magnetic flux density diminishes as $1/R^2$ with the distance R, as compared with 1/R with the distance from a single line. An example of such relationships is given in Fig. 3.

000749

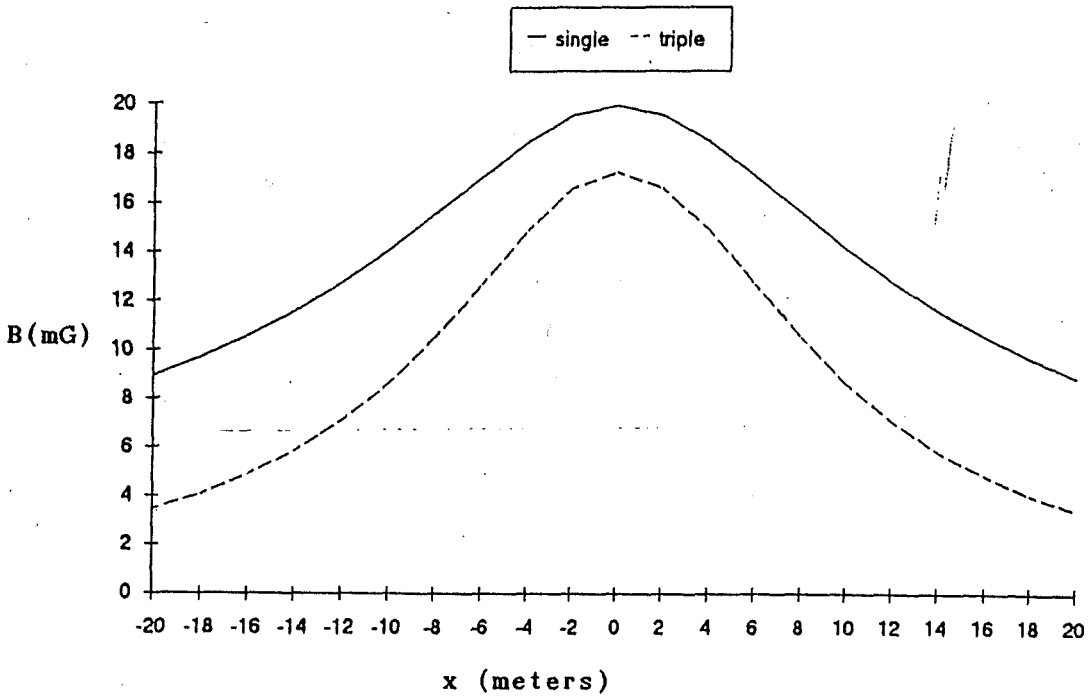

Figure 3. Magnetic flux density amplitude B as a function of horizontal distance x from the center line at ground level, for single-phase and balanced three-phase transmission lines of height h = 10 meters, current amplitude I = 100 amps/phase, and wire separation d = 5 meters.

Reducing Transmission Line Fields

Electric utilities have a number of incentives for rearranging transmission lines to reduce the magnetic fields, in addition to any exposure of the population. These include reduction of impedance losses, diminishing visual impact, and reducing right-of-way requirements. Several approaches have been considered. Alternative geometrical arrangements of the wires in three-phase transmission lines, such as delta and inverted delta configurations, have been utilized in order to promote magnetic field cancellation. Another method is to add a second circuit with phases in reversed sequence as is shown in Fig. 4

000750

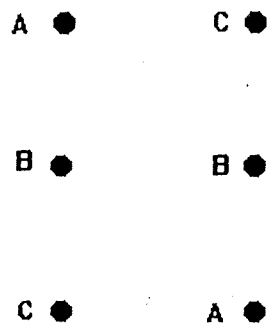

Figure 4. Low-reactance transmission-line configuration. The sequence of phases is reversed in the second circuit.

The wires are separated vertically within each circuit, and corresponding wires are connected together at each end of the line in order to ensure that currents are equally divided between the two circuits. This so-called "low-reactance" configuration provides even greater cancellation of the fields at remote observation points than does the single, three-phase circuit. It may not be feasible to retrofit an existing transmission line because of the limited load-bearing capacity of the poles, but implementation of the "low-reactance" design in new transmission lines is a relatively inexpensive option. As an extension of this concept, polyphase lines with six or twelve phases have been considered.

Compact configurations have been developed for 115 - 138 kV transmission lines with the object of diminishing their visual impact and right-of-way (ROW) requirements. Wire spacings have been reduced to as little as 3 ft from the industry standard of 15 ft. An incidental benefit from compact configuration is a reduction of the magnetic field at remote observation points by as much as a factor of five. There are severe disadvantages to such designs, however, in that span length is reduced to 300 ft and insulators become more complex. These designs are also subject to more noise, and corona losses increase.

Existing design criteria could be used to diminish magnetic fields with new transmission lines, although existing ROW's already offer substantial protection from extensive exposure.

000751

Distribution Lines

Transmission lines terminate in substations, where the voltage is stepped down by means of transformers. Secondary conductors called feeders or distribution lines radiate from these substations to bring electrical power to neighbourhoods following street and road patterns, or to commercial and industrial customers. The dominant distribution line operating voltages employed in Connecticut are 23 kV and 13.8 kV. Older parts of some towns are still served by 4.8 kV distribution lines; in that case, a secondary substation is employed to reduce the voltage from 23 kV to 4.8 kV.

Distribution lines, like transmission lines, are typically three phase circuits. However, unlike transmission lines, the phases tend not to be balanced and therefore the magnetic field falls off with distance as 1/R. Although distribution line currents are limited to 400 - 600 amperes (and are usually much less than that), they contribute much more to total exposure by virtue of their phase imbalance and their proximity to human habitation than do transmission line currents.

The phase imbalance of distribution lines is a consequence of the system of pole-mounted distribution transformers utilized to supply electric power to individual customers, as shown in Fig. 5.

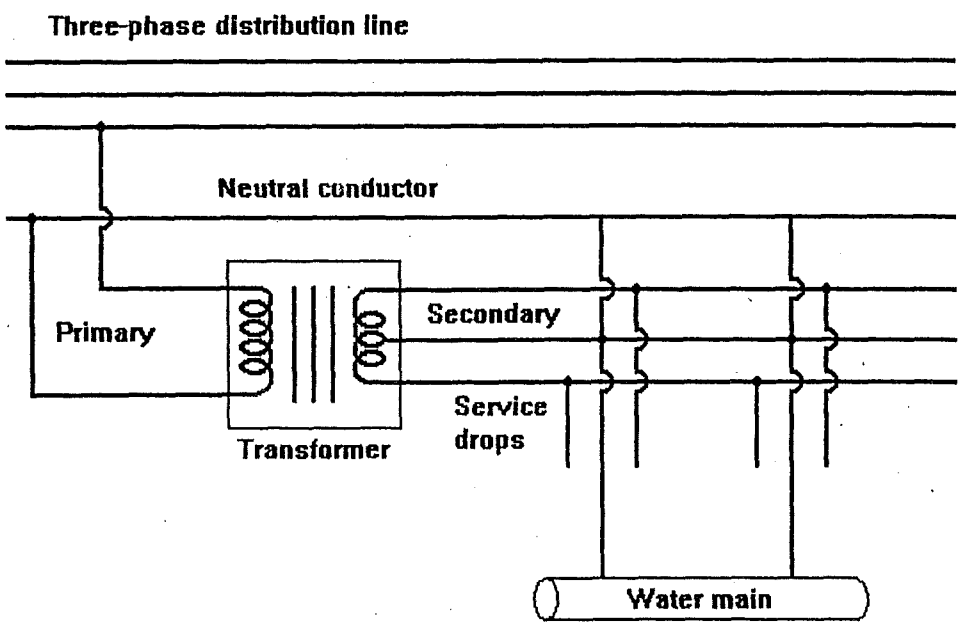

Figure 5. Schematic diagram of pole-mounted transformer.

000752

The primary wires of a transformer typically draw current from just one phase of the distribution line and return it via a neutral wire mounted lower on the same set of poles. The secondary wires of the transformer provide a service drop to one or more individual residences; they consist of a set of three wires wound together, two of which are energized at the service voltage + or -120 V, and one of which is connected to both the neutral wire and to the center tap of the secondary winding on the transformer.

Since the neutral wire ostensibly carries the return current, its magnetic field provides partial cancellation of that arising from phase imbalance. However, it is common practice to ground the neutral wire to the water pipes at each residence to reduce the hazard of shock and fire from a possible short circuit. As a consequence, an unknown and uncontrollable portion of the return current flows via ground-loops. The ground current, in general, rapidly spreads out into the earth and is thus diluted. Near the grounding point, however, it may remain concentrated. The magnetic field due to this current ground-loop is particularly difficult, since at observation points between the two currents it adds to the magnetic fields arising from the phase imbalance. A prohibition of grounding to water pipes would contribute significantly to the reduction of residential magnetic field exposures, but other provisions would be required to address the shock and fire hazards.

A distribution line carries maximum current where it emerges from the substation; this current is progressively reduced as different phases are tapped at successive distribution transformers and their currents are returned to the substation via the neutral conductor. Accordingly, magnetic field exposures from distribution lines are expected to be maximum near substations.

Underground transmission and distribution lines are sometimes employed in urban settings where overhead lines are impractical. Since the earth is ineffective in shielding magnetic fields, a buried single-phase conductor would actually increase exposures by virtue of its increased proximity to people. A significant advantage is achieved only when three-phase conductors are closely bundled within an oil-filled steel pipe which also serves as the neutral conductor. Underground installations are far more expensive to install and maintain than overhead installations.

Transformers

The very high flux densities which exist within the permeable cores of transformers in substations and on poles are confined there by design. The currents in a transformer may be regarded as a superposition of currents which flow through the transformer in primary and secondary circuits, and those which circulate internally in closed loops. The former currents are simply continuations of those already considered in connection with transmission lines, distribution lines and service drops. Magnetic fields at remote observation points from the transformer fall as $1/R^3$ away from the transformer. Therefore, transformers themselves do not contribute appreciably to magnetic field exposures, but the currents that emerge from them do.

Residential Wiring

The residential service drop from a pole-mounted transformer feeds a panel near the service entrance from which house wiring circuits originate. The neutral conductor of the service drop is ordinarily grounded at the service entrance. Typically, the two wires which carry current to and from appliances in each circuit, one energized and one neutral, remain in close proximity, so that house wiring is not normally a significant source of magnetic fields. Exceptions occur when unusual wiring configurations result in large current loops. As examples, such loops can occur in a circuit which allows a single light fixture to be controlled by two wall switches, or when the neutral conductor is grounded at more than one place in a single residence. Such loops can always be avoided, with minimal inconvenience.

Appliances

Appliances such as hair dryers and can openers with small high-speed motors produce surprisingly large 60 Hz fields near their surfaces; however, as with transformers, their fields are very short range, falling off as $1/R^3$ at increasing distance. Such devices are also non-linear loads, contributing to harmonic generation. In principle, magnetic flux densities produced by complex current distributions, such as those in substations and appliances, can be calculated by application of the Bio-Savart law, derived from Maxwell's equations.

Since the magnetic field produced by an appliance is highly non-uniform over the dimensions of a human being, its penetration and pattern of eddy currents are very different from those associated with magnetic fields produced by power lines. Furthermore, the time spent using most appliances is relatively short; consequently, their contribution to total exposure may not be excessive.

Electric blankets produce modest magnetic fields in comparison with some other appliances, but they may contribute disproportionately to exposures, by virtue of their proximity to users and the length of use per day.

Investigation of magnetic field generation by house wiring and appliances has only recently begun. The Electric Power Research Institute (EPRI) has recently established a research facility for that purpose.

Methods of Measurement

In recent years, there has been considerable development of convenient compact instruments for measuring and recording magnetic flux density at 60 Hz. The sensors consist of small coils, and with three such coils mounted at right angles to each other these instruments can be made to be independent of their orientation at a particular location. They can be made to record instantaneous values at fixed time intervals such as 10 seconds, and their stored output can be read into portable computers for further statistical processing. Such devices can be made to record the aggregated exposure of an individual, by having the individual wear the device for a given period of time such as a 24-hour day or for a week. In the same manner such devices can be set up to monitor the magnetic field flux density in a given location over time.

In epidemiological studies investigating possible associations between electromagnetic fields at 60 Hz and outcomes such as childhood cancer, the potential value of these studies would be greatly enhanced if it were possible to identify precisely what aspect of 60 Hz magnetic flux density was responsible for the association. Unfortunately, the strongest associations occur with what is called the Wertheimer-Leeper wiring code, an indirect observation of wiring configuration in the distribution system serving a residence. Wertheimer-Leeper wiring codes do not correlate perfectly with magnetic field measurements in the residence. It is not known whether background magnetic fields, integrated or average fields, peak measurements or exposures to particular appliances should be measured.

As a result, in such investigations it has become necessary to measure all the factors measured in previous investigations, and to try any other methods of approaching exposure measures that seem promising. There is considerable variability in the study protocols developed to assess exposure to magnetic fields, ranging, for example, from "spot" measurements at one place in the home to wearing personal monitors for a 7-day period. How well these different protocols correlate with each other, or with the health outcomes being investigated, is poorly understood.

Because of the variability of residential magnetic field flux densities which have been reported, it is important to recognize that such measurements can be used only to represent the population from which each sample was drawn if the sample were a proper random sample. There is no reason to believe a priori that Connecticut is different from other parts of the country with respect to magnetic field exposures. Several studies of magnetic field exposures performed in Connecticut are described below. The results are consistent with observations elsewhere.

Exposure Studies in Connecticut

A population of pregnant women was investigated by Professor Michael B. Bracken of the Department of Epidemiology and Public Health at the Yale University School of Medicine. This population may be assumed to be randomly selected for the purpose of the magnetic field exposure study, since the only common attributes of its members were their pregnancy and their intention to deliver at Yale-New Haven Hospital. Two types of observations were made: In the first type, EMDEX (a typical magnetic field exposure meter) measurements of residential exposure averaged over 24 hours were recorded at a fixed position in the house, away from major appliances, for 431 pregnant women. Only six observations exceeded 5 mG and the maximum value was 14.6 mG. The distribution appeared to be unimodal, with a geometric mean of 0.74 mG.

In the second type of measurement, an AMEX device (a single coil instrument) was employed as a dosimeter, worn on the wrist during the day and stored away from appliances at night. AMEX measurements of personal exposure averaged over seven days were recorded for 666 pregnant women. Only 11 observations exceeded 5 mG, and the maximum value was 10.34 mG. The geometric mean was 0.60 mG, not unexpected for a single coil.

Frequency distributions of magnetic field flux densities for the two studies above are presented in Fig. 6 and Fig. 7. (It should be understood that these results are intended only to illustrate typical magnetic field exposures in homes. No associations with health effects have yet been investigated, or are inferred.)

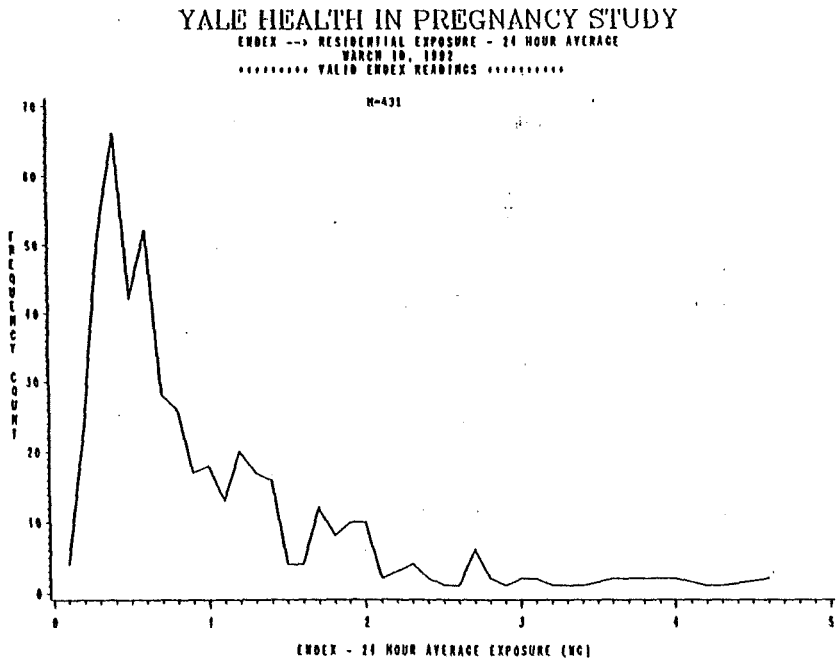

Figure 6. Frequency distribution of 24 hour average exposure of 431 pregnant women in the New Haven area.

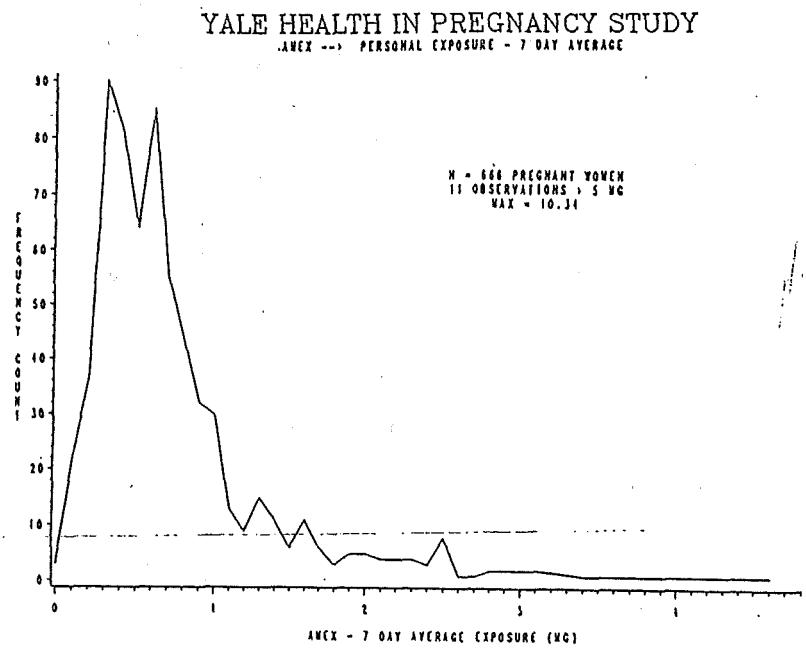

Figure 7. Frequency distribution of exposures of 666 pregnant women in the New Haven area, averaged over a 7 day period.

Northeast Utilities performed EMDEX measurements in 79 Connecticut residences in response to requests from customers. These measurements were analyzed by the Connecticut Department of Environmental Protection. Since these requests were presumably motivated by customer concerns they are likely to be biased to situations of proximity to Northeast Utilities facilities. Spot measurements were made in each room, with the highest measurements obtained in the kitchen. The geometric mean household average was found to be 0.99 mG with a geometric standard deviation (GSD) of 0.49. The geometric mean household maximum was 1.17 mG with a GSD of 0.50. The highest individual household average was 25.7 mG and the highest household maximum was 36.0 mG.

A Comparison Study of Urban Exposure

The complexity of ELF magnetic field exposures can also be illustrated by making continuous recordings of magnetic flux density as encountered in everyday life. In Figure 8, there is shown a continuous recording of the exposure of a subject walking around in a downtown area of Sydney NSW, entering different buildings. There are no overhead transmission or distribution lines in this area, and the extreme variation in magnetic fields in a dense urban environment is obvious. By comparison to residential values such as were measured in Connecticut, peak exposures in this study were quite high.

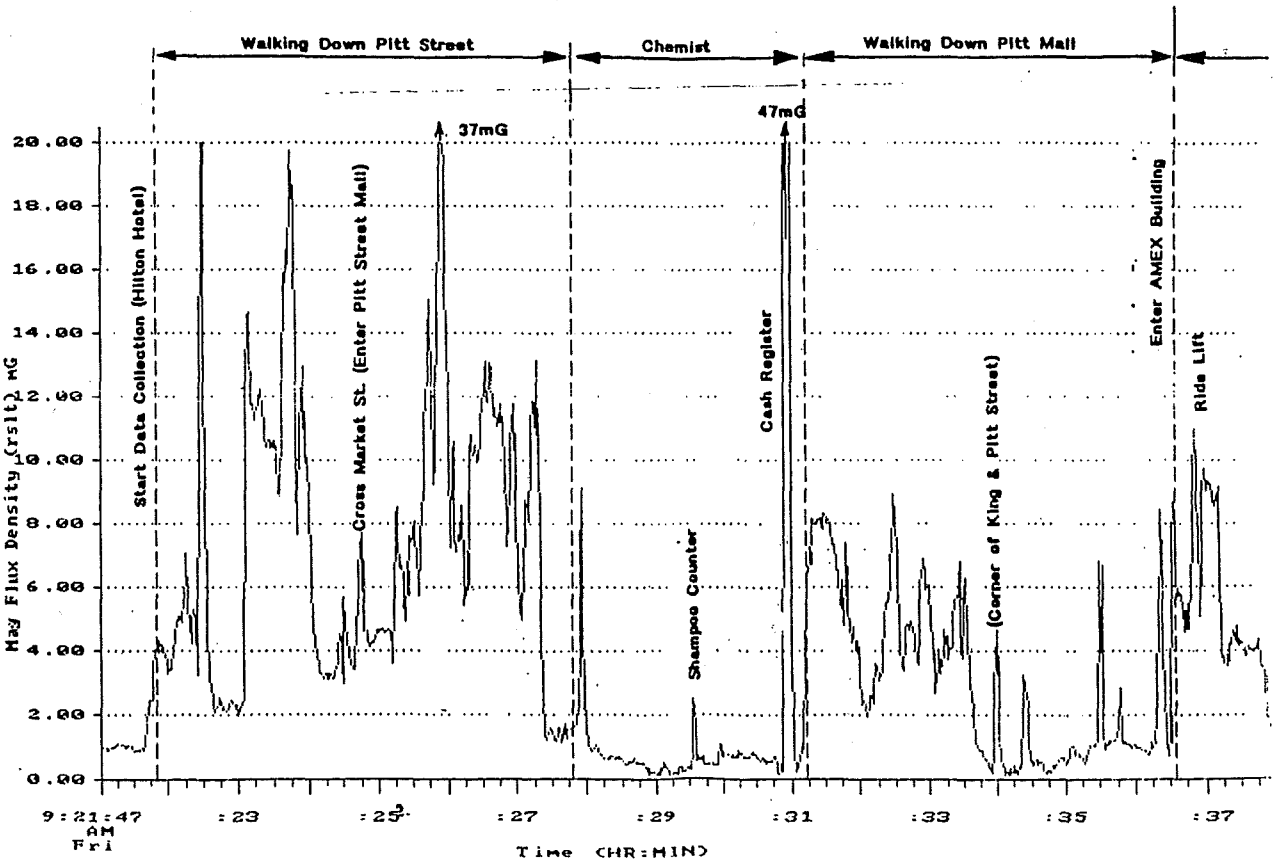

Figure 8. Continuous recording of ELF magnetic field by a portable recorder worn by a subject walking around in downtown Sydney. (Recording made by M. Silva of Enertech)

STUDIES OF HUMAN POPULATIONS WITH RESPECT TO ELF EXPOSURES AND ADVERSE HEALTH EFFECTS

During the decade of the sixties, there were a number of studies conducted in the Soviet Union and East Bloc countries that reported on symptoms experienced by workers in power switch yards. These studies reported an excessive incidence of headaches, lethargy, disorientation and other symptoms with a neurological basis. These studies were often conducted without benefits of controls and were generally not confirmed by follow-up studies. Although these studies are often quoted, there is no indication that they were accepted in any meaningful way by decision makers. Several follow-up studies in other countries failed to confirm any of the reports by the East Bloc investigators. Several investigations into the possible adverse effects of microwave or ultra-high-frequency (UHF) exposures in defined populations, such as U.S. Navy personnel and personnel at the U.S. Embassy in Moscow, failed to produce indications of any association between these exposures and excess risk of leukemia or other cancers.

U. S. Studies and Their Significance

In 1979, Wertheimer and Leeper published a study of the incidence of childhood cancer in the Denver area and its association with exposure to ELF magnetic fields.* The magnitude of the ELF magnetic field exposure in the cases and controls was characterized by a wire code describing the configuration of transmission and distribution wiring serving the houses in question. Although this study and its results did not persuade many scientists of the validity of the associations reported by the authors, the study was the main reason for a rapid expansion of similar studies testing the hypothesis that low levels of ELF fields are associated with excess risks of childhood cancer, and particularly leukemia and brain cancer.

Milham and others evaluated existing mortality records and found via an analysis based on Proportional Mortality Ratios (PMR) that several occupational groups which he believed were characterized by relatively high ELF exposures had an excess PMR for leukemia and brain cancers in adults.♦ Of necessity, the characterization of exposure in such groups is less than ideal and thus subject to considerable misclassification as to exposure. The fact that workers are healthier than the general population also introduces difficulties in interpretation, as does their exposure to other possible carcinogens. All of these factors could obscure or diminish any real association, if one exists.

*Wertheimer, N., and Leeper, E., Int. J. Epid. 11, 345 (1982).

♦For example, Milham, Jr., S., Lancet, 812 (April 6, 1985).

Several investigators followed in Wertheimer and Leeper's footsteps and repeated their study in the same locale (Denver*), and in other locations (Los Angeles♦). In each case, the design of the study incorporated improvements over that of Wertheimer and Leeper. The results of these studies resembled the Wertheimer and Leeper results. There was an association between ELF exposure as characterized by wire codes and childhood cancer incidence, although the associations weakened somewhat with the improved protocols.

Thus, later (and assumedly better) studies have not produced stronger associations and, if anything, the odds ratios have declined. Moreover, the statistical strengths of the association in successive studies have never achieved the high levels reported from the original Wertheimer and Leeper studies.

Direct measurements of magnetic field flux density in the residences where the children lived should have improved the characterization of electromagnetic field exposure but failed to produce significant associations between such exposure and excess cancer risk. The associations in each case were weak and the authors made clear that they did not feel their results were conclusive. Thus, final (or further) interpretation should await the results of later studies yet to be conducted.

Following the earlier studies by Milham and others, a number of occupational studies have been conducted in which the authors found an increased risk of male breast cancer in cable splicers and in other electrical trades.♣♠ Since male breast cancer as well as leukemia and brain cancer are relatively rare diseases, it is necessary to follow large populations for long times. There are not many populations in which the exposure can be established over a long time period and, therefore, exposures of cases and controls are difficult to assess with accuracy. Exposure assessment must rely on employment records, and there are often simultaneous exposures to other hazardous agents (e.g., solvents) which are difficult to control for but which are reasonably well established risk factors for several cancers.

*Savitz, D., Wachtel, H., Barnes, F., John, E., and Tvrdik, J., Am. J. Epid. 128, 21 (1988).

♦London, S., Thomas, D., Bowman, J., Sobel, E., Cheng, T-C., and Peters, J., Am. J. Epid. 131, 923 (1991).

♣Matanoski, G., Elliott, E., and Breysse, P., Annual Review of Research on Biological Effects of 50 and 60 Hz Electric and Magnetic Fields, U. S. Department of Energy, Frederick, MD, 1, (November 1989).

♠Thomas, T., Stolley, P., Stemhagen, A., Fontham, E., Bleeker, M., Stewart, P., and Hoover, R., J. Natl. Cancer Inst. 79, 233 (1987).

There is at the present time also no identified mechanism that could account for cancer initiation or cancer promotion as a result of exposure to ELF fields of the magnitude that are commonly encountered. There are biological effects which have been reported in the laboratory which can be quoted in support of cancer-promoting pathways, but the connection still is subject to a number of unsubstantiated assumptions.

There are almost as many reviews of the epidemiological literature on the association between ELF fields and excess cancer risk as there are reports on original research. There have been meta-analyses in which a number of original studies are combined in an attempt to increase the statistical power, but none of these reviews and re-analyses has increased the persuasiveness of the basic findings of weak associations in studies that still have unavoidable weaknesses in their design.

The epidemiological studies so far have also not provided a quantitative exposure-outcome relationship and as a result it is not possible even to suggest what such a relationship might look like. These studies, therefore, can not yet be used for developing quantitative guidance for future exposure standards or guidelines.

Thus, the epidemiological studies reported so far are characterized by low statistical strength, weak associations between exposure indicators and outcome, poor replicability of precise exposure-disease relationships, weak evidence of dose-response relationships, inability to control for many important potential confounding variables, and they are lacking a plausible mechanism that is widely accepted. Successive studies that have tried to address criticisms of earlier studies have not achieved greater persuasive power, and it may be that the question will never be able to be settled by epidemiological methods.

On the other hand, the consistency of some findings of low strength association of wiring codes and small excesses of childhood cancer, as well as indications that employment in "electric" occupations is associated with increases in some specific types of cancer, are indicators of some possible sort of relationship. If such relationship indeed exists, then its real magnitude might be underestimated because of the likelihood of substantial exposure misclassification. However, the estimates are equally likely to be over-estimates because of selection and response biases inherent to the retrospective design of all the cancer studies.

Finally, it should be noted that, while cancer is the endpoint that has received the greatest attention in the scientific literature and by the public, other possible endpoints have been suugested also, including that of effects on human reproduction. In fact, there have been studies on the possible effects on the reproductive process, but these have been at other frequency ranges. Electric power frequencies, however, have not been investigated enough to draw any conclusions with regard to their effects on human reproduction.

Electromagnetic Fields in Connecticut and Possible Future Research

The Meadow Street cluster in Guilford was investigated in detail by the Academy but was considered to be uninformative with respect to the general relationship of ELF magnetic fields to health effects. The tragic personal nature of the events on Meadow Street is appreciated. From information provided to the Academy, the magnetic field levels on Meadow Street were somewhat elevated, but with the distribution wiring being across the street from the residences, the levels measured in the houses were not unusual. The diseases reported on Meadow Street were multiple, and there was not a recognizable cluster of any given disease as defined and could be evaluated by procedures of the U. S. Centers for Disease Control. Thus, the Academy concurs with the conclusion reached by the Connecticut Department of Health Services in its assessment of the Meadow Street circumstances: There is no indication of a recognizable cluster of any type of relevant cancer.

The Meadow Street substation is closer to residences than the great majority of substations in Connecticut. If there are not recognizable clusters here, studies of the health of residents living close to substations elsewhere are not likely to add to our knowledge about the possible health effects of electromagnetic fields and the Academy does not recommend that such studies be carried out.

A more relevant series of studies might be contemplated which would identify specific cancer diagnoses from the Connecticut Tumor Registry whose residential electromagnetic field exposures could be contrasted to some appropriate comparison group of homes. Such a study would need to be able to control for several important confounding risk factors for cancer, and it would require appropriate sensitivity, specificity and power to test the study hypothesis. Such a study demands detailed and rigorous protocols for estimating residential and occupational electromagnetic field exposure, and needs to be conducted following accepted ethical standards for obtaining the consent of participants. Whether such a study can be done in Connecticut would depend on the development of a detailed scientific protocol which would examine the feasibility of this type of research plan. Such a study would be quite costly, and no assurance can be given that the results would allow a definitive conclusion.

ELF STUDIES OF ELECTROMAGNETIC FIELDS IN TISSUES AND CELLS

Effects of Electromagnetic Fields in Humans

Electromagnetic fields are one of a number of physical agents to which humans are continually and universally exposed; other examples are light, heat and sound. People have always been exposed to electromagnetic fields, such as the electric and magnetic fields of the Earth, but there has been an increase in such exposure with the increasing use of electric power over the past century.

It is likely that any biological effects of ELF electromagnetic fields from power lines and appliances would be caused by the oscillating magnetic component because it penetrates tissue without any significant attenuation. The effects induced in tissue are similar to those in a human body changing orientation in the Earth's magnetic field, as in getting out of bed, or turning sharply.

Certain physical agents are detected at very low levels by specialized organs: eyes detect light, sensors in the skin detect heat, and ears detect sound. ELF electromagnetic fields are not normally sensed by man, but are detected by some living creatures: birds use the Earth's magnetic field for navigation, and certain ocean bacteria use the Earth's magnetic field for guidance.

All physical agents have harmful effects at high enough intensity: too much sunlight induces skin cancer, too much heat causes burns, and the like. ELF electromagnetic fields are no exception. High intensity ELF magnetic fields have a variety of biological effects and can induce currents that affect the rhythm of the heart. Magnetophosphenes (light flashes in the human eye) appear at exposures to 5000 mG ELF magnetic fields.

Human exposures to magnetic fields from electric power and distribution lines, appliances, and other power devices, are less than that of the Earth's static field of 500 mG, and typically much less. The question is whether such low intensity fields can cause biological effects in living tissue other than specialized organs (such as that used by birds for navigation). An analogous question would be whether sound waves at normal level induce biological effects in human tissues other than in the ear.

The Induction of Cancer

Cancer is something that can happen to normal cells. Almost all cell types in the human body give rise to a cancer. Cancer can be initiated by many different events. Some causes of cancer are singular in their mechanisms (that is, only a single event has to occur), while others require many steps. Not all cancers are of a known cause, and not all the ways of creating cancer cells are known. Some "causes" can happen within a single cell, but almost all cancers depend on the host organism for support. Current concepts include those of "initiation," "promotion" and "progression." ELF fields have never been shown to be "initiating" but some experimental findings might be compatible with involvement with "promotion" or "progression."

Cancer cells of a specific type have distinct molecular markers or forms of behavior that can be monitored as they undergo the multi-step progression from a normal cell to a malignant lesion (invasive cancer). These markers are often expressed regardless of whether the cells are grown singly in tissue culture, or are taken from a tumor bearing host. Using such markers, cell biologists have started to learn the basics of the transition process. Cells expressing cancer often use molecules that are also used by normal cells but at the wrong time, or in the wrong place, or in the wrong amounts. The cancer cell has failed to regulate properly the expression of some process as it has grown.

The similarities between the normal process of development and the origins of cancer are more than coincidental. Many regulatory events that are important in some step of development are seen to fail during the development of clinical cancer. As a result biologists have often used developing embryos as sensitive indicators of cellular responses as well as adult animals or single cells.

Magnetic Fields and the Induction of Cancer

Because of concern about possible induction of cancer by magnetic fields, a large number of experiments have studied possible effects of ELF magnetic fields. These studies have been on tissues and cells, rather than on animals. The reasoning is that direct experiments on induction of cancer in animals are enormously expensive (millions to tens of millions of dollars per experiment) because it is already known that if cancer is induced that way, it will be at a very low rate. However, if cancer is indeed induced by low intensity magnetic fields then such fields must induce some kind of permanent biological effects in cells in culture which will be much easier and cheaper to measure.

After more than twenty years of active research and several dozens of published papers, there is still no solid evidence for a chain of biological effects that could initiate or promote cancer as a result of exposure to ELF magnetic fields at magnitudes of 500 mG or less. There are many reports of effects in various tissues but all are of small effects compared to background levels, or they are effects found as a result of very complicated tests, and many have both difficulties. Few reported effects have been confirmed in two independent laboratories, and repeats frequently lead to conflicting results.

An experiment, for example, in which weak pulsed magnetic fields reportedly altered development in chick eggs (Delgado*) was repeated in six independent laboratories, using identical protocol and equipment. Two laboratories confirmed the effect, but the other four laboratories did not confirm the effect including the laboratory that originally reported the phenomenon (Berman♦).

Clearly, more research is required in order to resolve the many discrepant reports in the literature. An important guide is recent theoretical work by Adair♣ showing that ELF magnetic fields of 500 mG cannot produce effects in normal mammalian cells that are of the same magnitude as those caused by normal metabolic processes. These flux densities are comparable to that of the Earth's magnetic field and are very much larger than those encountered in electric power applications, as documented above. In his calculations, Adair uses the assumptions of normal mammalian cells of about 20 nm (nanometer, or 10^{-9} meter) size and which have no large inclusions of material with special properties, such as magnetite.

Adair has calculated that fields of 500 mG can have no effect in a non-resonant process at the cellular level, since they are orders of magnitude smaller than the fields due to thermal noise in a 100 Hz bandwidth. This criterion is relaxed for resonant processes with narrow bandwidths. In particular, there are two resonant processes which need to be considered because their frequencies in the Earth's magnetic field are in the vicinity of 60 Hz. The first is ion cyclotron resonance, but this can be ruled out because many collisions will occur during the time of one orbit. Second, nuclear magnetic resonance can be ruled out because the conditions present do not permit efficient energy transfer.

*Delgado, J., Leal, J., Monteagudo, J., and Garcia, M., J. Anat. 134, 533 (1982)

♦Berman, E., Chacon, L., House, D., Koch, B., Leal, J., Lovtrup, S., Matiply, E., Martin, A., Martucci, G., Mild, K., Monahan, J., Sandstrom, M., Shamsaifer, K., Tell, R., Trillo, M., Ubeda, A., and Wagner, P., Bioelectromagnetics 11, 169 (1990)

♣Adair, R., Phys. Rev. A, 43, 1039 (1991)

By Adair's calculations, such fields can induce biological effects only by acting on materials with special magnetic properties, or by integrating effects of magnetic fields over distances large compared to the size of a typical mammalian cell. It should be emphasized that the stated criteria do not exclude mechanisms involving whole organisms since the noise fields are greatly reduced on that scale.

A limited amount of work has been conducted on the effects of electromagnetic fields on the regulation of molecular processes. It has been shown that electromagnetic fields will change the patterns of proteins synthesized in various types of cultured cells, and that the pattern of proteins synthesized in cells subjected to electromagnetic fields is different from the pattern of proteins induced by heat-shock (Goodman*). Furthermore, there appear to be subtle differences in the spectrum of proteins induced by electromagnetic fields which are dependent on both the frequency (between 1.5 and 72 Hz) and the type of the inducing electromagnetic field (single pulse, pulse train or sinusoidal wave).

It may well be that more research will indeed find reproducible biological effects of low intensity magnetic fields, which raises the question of whether any such effects might be harmful. The epidemiological evidence that such harmful effects might exist is, at the present time, equivocal.

The particular kinds of cancer implicated by some epidemiological data are leukemia, brain tumors and, recently, male breast cancer. These cancers are known to be inducible by x-rays which have sufficient energy in one photon to ionize the atoms and molecules of tissues, which releases enough energy to bring about chemical changes in the DNA of the cell leading to mutations. If the mutation is in that part of the DNA carrying genetic information for proteins regulating control of cell proliferation, the change could initiate a process that could lead to uncontrolled growth or cancer. ELF magnetic fields, however, interact with matter by mechanisms that are well understood, and cannot cause genetic effects in such a direct manner; this conclusion is further reinforced by data showing no mutagenic effects of such fields in well tested experimental systems.

Agents that encourage cells to divide more often than normal can also lead to cancer; examples are certain natural human hormones that induce breast cancer in this way. Moreover, pulsed electromagnetic fields are used clinically to promote healing of bone fractures that have been slow to join. It is possible, but not well demonstrated, that bone healing involves cell proliferation. The available evidence that ELF fields at 500 mG or less can affect cell proliferation is not yet very convincing, however, but this area is a likely one for further investigation.

*Goodman, R., Basset, C., and Henderson, A., Science 220, 1283 (1983)

Low-frequency electromagnetic fields have been reported to affect calcium fluxes in chick brain tissue slices.*♦ Since calcium plays a role in the regulation of cell growth, and since the stimulation of cell proliferation may, in some instances, lead to an increase in tumor formation, a possible mechanism for carcinogenic effect of electromagnetic fields might appear to exist. The observed effects on calcium fluxes, however, are unlikely to lead to an increase in cell proliferation. Thus, a possible mechanism for ELF electromagnetic field carcinogenesis remains to be demonstrated.

Conclusions

The literature on interactions between electromagnetic fields and cells forms a very large bibliography. A major review has recently been issued by the EPA that includes these interactions.♣ The current state of our knowledge and our understanding of these interactions can be summarized with a few statements:

1. There is much work that was neither reliably nor carefully performed. Some of these studies argue that strong effects are seen, while others report that no effects can be observed. This should not be understood as a reflection on either the competence or the ethics of the researchers involved. Rather it has more to do with the intense attention that the issues of ELF effects have drawn. The Academy has seen no signs that investigators are falsifying results, however, either to provide support for the reality of effects of ELF fields or to cover up the existence of such effects.

2. Well documented experiments have been published, and reproduced in independent laboratories, that show biological effects of ELF fields on cells, tissues and embryos, but only for conditions such that the voltages and currents generated were larger than those for 60 Hz fields of 500 mG. No readily reproducible effect of weaker ELF fields seems to have been reported.

3. Well documented experiments have been published in which experimenters have been unable to reproduce earlier observations reported by others. This emphasizes the importance of confirming reports of positive effects. While negative results are not directly interpretable, it is anticipated that positive results should be repeatable. Not all of the positive observations have been rigorously reinvestigated.

*Bawin, S., Adey, W., and Sabbot, I., Proc. Nat. Acad. Sci. U. S. A. 75, 6314 (1978).

♦Blackman, C., Benane, S., and House, D., Bioelectromagnetics 12, 173 (1991).

♣Office of Research and Development, Evaluation of the Potential Carcinogenicity of Electromagnetic Fields. U. S. Environmental Protection Agency, Washington, D.C., External Review Draft, (October 1990).

4. While it is often theoretically possible to develop a link between the observations and cancer, none of these researchers has been able to demonstrate unequivocally that the effect(s) they observe can or do lead to a cancerous state.

5. There is no formal basis to evaluate electromagnetic field risks to human populations using the cell, tissue and embryo data. No electromagnetic field effects have been demonstrated that provide reliable measurement parameters to determine if damaging exposure has occurred. And cell, tissue and embryo tests that identify other potential carcinogens are not useful in studies of electromagnetic field effects. This does not suggest that there are no effects or risks. Rather, we would argue that there is currently no model of electromagnetic field-tissue interaction that provides a means of assessing this issue.

Inadequacies and Limitations in the Available Data

A relatively straightforward matter that needs attention is the clarification of some of the reported effects on cells of very small ELF fields, effects that have not yet been reproduced by other laboratories and particularly those involving resonance. It is important to know if they are real or artifacts of the experimental procedures. This is said to be straightforward because the normal scientific process should lead to new experiments, experiments that are relatively inexpensive, that will verify the reported results, or indicate where the original experimenters probably went astray.

A far more serious problem is the lack of data on animals. This is more serious both because of the costs associated with doing such experiments, and because of the difficulties in formulating reasonable hypotheses to test from the available data. It is necessary to recognize explicitly that investing millions or tens of millions of dollars in measurements of the possible effects of weak ELF fields on animals means that similar measurements for one of the thousands of other possibly toxic agents and chemicals will not get done, a point sometimes overlooked by supporters of research in this area. It is also useful to realize that experiments of this kind get done because experimenters make a proposal to the appropriate governmental agencies to fund such experiments. The fact that no such data (on animals) are available suggests that no qualified group has proposed a well organized experiment of this type. A further interpretation of this fact is that qualified scientists have been dubious that such work will lead to interesting results, i.e., an effect.

Notwithstanding this possibility, and because of the public policy ramifications of this problem, the Academy recommends that at least one properly designed animal experiment on the effects of ELF magnetic fields be carried out. The Academy is, indeed, happy to report that such an experiment, under the auspices of the National Institutes of Health, is in the planning stage.

STANDARDS, GUIDELINES AND REGULATIONS GOVERNING ELF FIELDS

A number of organizations, and agencies of local, state and national governments, have considered the desirability and feasibility of defining Standards, Guidelines and/or Regulations to limit the exposures of occupational groups and the general public to electric and magnetic fields at Extremely Low Frequency, and specifically at the electric power frequencies of 50 or 60 Hz. Such Standards or Guidelines normally are expected to:

1. define the hazard against which they are designed to provide protection;

2. consider the state of knowledge about the scientific basis of the nature of the interaction between exposure and the adverse health outcome the Standard or Guideline is designed to prevent or minimize;

3. consider the quantitative relationship between exposure and adverse health risk; and

4. consider the technical and economic feasibility of measures to eliminate or reduce the exposures.

International Radiation Protection Association

The International Non-Ionizing Radiation Committee (INIRC) of the International Radiation Protection Association (IRPA) develops health criteria documents in the area of non-ionizing radiation, in cooperation with the Environmental Health Division of the World Health Organization (WHO). The resulting documents form a part of the WHO Environmental Health Criteria Program, and are sponsored by the United Nations Environment Program. These criteria documents form the basis of Guidelines for exposure limits for workers in occupational environments and for the general public. INIRC has developed Environmental Health Criteria (EHC) documents on Ultraviolet Radiation (EHC 14, 1976), Radiofrequency and Microwaves (EHC 16, 1981), Ultrasound (EHC 22, 1982), Lasers and Optical Radiation (EHC 23, 1982), Extremely Low Frequency Fields (EHC 35, 1984) and Magnetic Fields (EHC 69, 1987).

In 1989, INIRC published a guideline on "Limits of Exposure to 50/60 Hz Electric and Magnetic Fields".* This guideline was based on the state of knowledge in 1989 and recommended limits of exposure for occupational settings and for the general public for electric fields and magnetic fields. The recommended limits are shown in the following table:

Limits of Exposure to 50/60 Hz Electric and Magnetic Fields

Exposure Characteristics	Electric Field kV/m (RMS)	Magnetic Flux Density mT (RMS)	mG (RMS)
Occupational:			
Whole working day	10	0.5	5000
Short term	30 a)	5 <2h	50000 <2h
For limbs	--	25	250000
General Public:			
Up to 24 h day	5	0.1	1000
Few hours/day	10	1	10000

a) The duration of permitted exposure to fields between 10 and 30 kV/m may be calculated from t <= 80/E where t is the duration in hours and E is the electric field in kV/m

In adopting these Guidelines, INIRC followed the rationale that these exposure limits would provide protection against any known and established effects of currents and fields occurring in the human body. The basis of these limits was that, at these limits, the induced currents and potentials in the body were below the levels naturally occurring in the body as the result of electric fields generated within the body by physiological processes normal in the living organism.

*IRPA Guidelines on Protection against Non-Ionizing Radiation. A.S. Duchene, J.R.A. Lakey and M.H. Repacholi, ed. Pergamon Press, Oxford (1991)

INIRC in its Guideline commented on possible effects of magnetic fields at levels considerably below the guideline limits it adopted:

> "The exposure limits (EL) are based on established or predicted effects of exposure to 50/60 Hz fields. Although some epidemiological studies suggest an association between exposure to 50/60 Hz fields and cancer, others do not. Not only is the association (between magnetic fields and cancer) not proven, but present data do not provide any basis for health risk assessment useful for the development of EL's. Current laboratory studies are testing the hypothesis that 50/60 Hz fields may act as, or with, a cancer promoter. These studies are still exploratory in nature and have not established any human health risk from exposure to these fields.
>
> "These limits have been developed from present knowledge, but there are still areas of research where questions have been raised that need to be addressed. A major research effort to supplement our knowledge on the health consequences, if any, of long-term continuous exposure of humans to low-level 50/60 Hz is required..."

American Conference of Governmental Industrial Hygienists

The American Conference of Governmental Industrial Hygienists (ACGIH) publishes Threshold Limit Values (TLV) for occupational exposures to a wide range of chemical and physical agents. In its 1991/1992 Guidelines,* ACGIH included for the first time TLV's for magnetic fields at frequencies below 30 kHz. The TLV is set at: $B_{TLV} = 60/f$, in mT, where f is again the frequency in hertz.

This TLV corresponds to 1,000 μT, or 10,000 mG, at 60 Hz. It is recommended that wearers of cardiac pacemakers not be exposed at 60 Hz to more than 100 μT, or 1000 mG. It is mentioned in the TLV Guideline that at 30 kHz, exposures should be limited to 2 μT, or 20 mG, or a magnetic field strength of 1.6 A/m.

*1991-1992 Threshold Limit Values for Chemical and Physical Agents and Biological Exposure Indices. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (1991)

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Adoption of Guidelines

Some other countries, such as the United Kingdom and Australia, have adopted official guidelines about 50/60 Hz magnetic and electric fields corresponding closely to the IRPA/INIRC guidelines, while countries on the European continent, such as Germany, adopted limits somewhat above the IRPA/INIRC guidelines.

In the U.S., several jurisdictions, such as the State of Florida the State of New York, and some towns in the State of Washington have adopted or are considering guidelines addressing limits of exposure in connection with high voltage transmission lines. These guidelines have not been based on the health effects anticipated near these transmission lines. In general, the basis for and the philosophy of these guidelines has been to prohibit any increase in the electric and magnetic fields at the edge of the right-of-way. This would tend to have the effect of requiring a somewhat wider right-of-way for high voltage transmission lines.

It is noted here that the residential and environmental exposures in Connecticut (and other states) are in the range of 0.3 to 10 mG, and quite far below the exposure limits in any existing Guidelines.

For the Council of the Academy:

David M. Wetstone, Secretary

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CONNECTICUT 1998 REPORT ON TASK FORCE ACTIVITIES TO EVALUATE HEALTH EFFECTS FROM ELECTRIC AND MAGNETIC FIELDS

January 1998

PRESENTED TO THE CONNECTICUT GENERAL ASSEMBLY

Energy and Technology Committee
Public Health Committee
Environment Committee

Prepared by

THE INTERAGENCY TASK FORCE STUDYING
ELECTRIC AND MAGNETIC FIELDS

Stephen A. Harriman, Commissioner, Department of Public Health

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EXECUTIVE SUMMARY

The Interagency Task Force Studying Electric and Magnetic Fields (Task Force), in response to a legislative mandate to address concerns of Connecticut residents about the possible health effects associated with exposures to power frequency electric and magnetic fields (EMF), continues in its effort to keep the Connecticut General Assembly informed. The Task Force provided updates about this complex issue to the General Assembly on an annual basis from 1992 through 1995.

This fifth Task Force report highlights major EMF activities nationally and internationally, as well as in Connecticut. These emphases were selected as collectively representing the current status of knowledge about the potential health effects of power-frequency EMF and the range of national and international activities currently devoted to understanding this issue.

Significant funding and coordination is taking place in the United States. This is true internationally as well, partially under the auspices of the World Health Organization. There have been greater than 20,000 studies published to date related to various facets of EMF and its potential health effects. This report focuses on: (1) EMF-related activities in Connecticut and across the nation; (2) the federally-funded EMF Research and Public Information Dissemination Program (RAPID Program) which is jointly administered by the National Institute for Environmental Health Sciences (NIEHS) and the Department of Energy (DOE); (3) the National Toxicology Program (NTP) animal cancer studies; (4) the comprehensive review of the scientific literature by the National Academy of Sciences (NAS); (5) the review of the occupational epidemiology studies by the National Institute of Occupational Safety and Health (NIOSH); (6) the activities of the five-year International EMF Project under the auspices of the World Health Organization (WHO) which began in 1996; (7) the major childhood leukemia epidemiologic study conducted by the National Cancer Institute reported in 1997; (8) anticipated EMF study publications in the near future; and (9) resources available to the public regarding EMF issues.

The **Connecticut Siting Council** published an investigation in July 1996 of the comparative life-cycle costs of overhead and underground 115-kilovolt electric transmission lines, as charged in Connecticut General Statutes Section 16-50r. The analysis modeled electric and magnetic fields for 31 overhead and underground configurations that could be expected within the right of way for the line during expected average and emergency operating conditions. The analysis also showed: that the typical underground line life-cycle cost is three to four times that of an overhead line; well built properly maintained transmission systems are very reliable, whether placed overhead or underground; while there may be a general perception that underground lines result in fewer overall environmental impacts, this is not the case in the construction phase, or for subsequent repairs to the line; overhead transmission lines cannot be replaced with underground transmission lines on a simple one for one basis. On the state level, few statutes have been passed regarding underground transmission lines. These have focused primarily on assessing feasibility.

The **five-year federal RAPID Program** has the central goal of determining if electric and magnetic fields associated with the generation, transmission, and use of electrical energy pose a

risk to human health. The program components include: (1) health effects research; (2) engineering research; (3) hazard identification/risk assessment research; and (4) communication. The program has been extended through the end of 1998 to enable the completion of funded health effects studies and allow time for evaluation of the human epidemiology studies, the animal studies, and the cell and tissue studies. A number of epidemiologic studies, both residential or occupational, have suggested that exposure to EMF may be associated with an increased risk of certain types of cancers, primarily leukemia and brain cancer, while other studies have reported no such risk. NIEHS has undertaken a review of methodological issues and factors which can plausibly explain these observations. In the interim, NIEHS recommends that anyone concerned about the possible health effects of magnetic fields may take specific actions under their control to reduce personal exposures.

The **NAS published a comprehensive review** of the EMF literature in October 1996. The NAS Committee stated in its Executive Summary: "*Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee was that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.*"

A principal conclusion of the NAS review of the epidemiologic literature was that: "*An association between residential wiring configurations (called wire codes)... and childhood leukemia persists in multiple studies, although the causative factor responsible for that statistical association has not been identified. No evidence links contemporary measurements of magnetic-field levels to childhood leukemia.*" The NAS Committee's general conclusion, within the report, from their review of studies with cultured cells, is "power-frequency electric and magnetic fields are not directly a genotoxic agent." Nevertheless, the NAS Committee identified areas where fruitful research could be conducted. Promising lines of research on mechanisms of action, such as studies of the possible role of melatonin in the development of breast cancer, may yield results in the future.

The **NTP has conducted five animal studies** to assess the carcinogenicity potential of 60-Hertz magnetic fields, including three related to breast cancer promotion. The results of these are available, and are currently being assessed. A Technical Report is in preparation, and a review of the findings will be conducted at an open public hearing on March 11, 1998. They will be further reviewed during the RAPID Program's Symposium on animal studies in April 1998, along with other animal studies which have been published.

NIOSH has published an informational booklet highlighting EMF in the workplace, based on assessment of the occupational epidemiology studies. Although there are inconsistencies among the studies in the findings, including types of cancers found, a number of well-conducted studies with multiple exposure assessments have found associations of occupations that may have high magnetic field exposures with increased cancer risks. While research continues,

NIOSH suggests that concerned workers and employers might consider simple, inexpensive measures for reducing EMF exposures.

The World Health Organization is coordinating a five-year EMF Project which began in 1996. Some of its member agencies, such as the International Agency for Research on Cancer (IARC) are planning to issue monographs on EMF within the next several years.

The NCI published a major childhood leukemia epidemiology study in July 1997. The study was one of the largest to date, provided magnetic field measurements for many of the case and control homes, and received wide public attention. The authors reported no statistically significant association of childhood leukemia with either wire codes or with measured magnetic fields in the homes in which mothers resided when pregnant with the subjects, for its predetermined exposure comparisons. The authors reported that some data in the study showed a tendency for risk to be higher (a statistically significant association) for higher measured magnetic fields (greater than 3 mG), but the authors felt that there was not a consistent pattern or a significant trend. The authors commented that their results "provide little evidence" that the risk of leukemia is increased among children living in homes with high magnetic fields or high wire codes. The authors further commented: "We disagree that this conclusion is 'completely negative' and believe it conveys our view that the results are reassuring rather than alarming."

The **NCI has been conducting research on adult brain tumors**, which is expected to be reported in 1998, and has been sponsoring a number of additional studies on childhood or adult brain tumors. NCI is also sponsoring a number of breast cancer studies and a lymphoma study. Three major childhood leukemia epidemiology studies, in Canada, New Zealand, and Great Britain, are expected to be completed in 1998.

Resources available to the public now include public and private agencies, newsletters, journal articles, brochures, and internet websites devoted to EMF.

Based on review and assessment of these findings, the Task Force believes continued **monitoring of the science by the Departments of Public Health and Environmental Protection** is an appropriate approach. The Task Force recommends continued allocation of resources to study and follow this issue. There is support for a continuing policy of communication to the general public about EMF, including measures individuals may take if they are concerned about potential health effects. The Task Force does not recommend changes to the present electrical supply system in Connecticut, but continues to endorse the Connecticut Siting Council's Best Management Practices for utilities making changes to electrical generators, substations, and transmission facilities. Finally, the Task Force does not recommend any health-based EMF power-frequency exposure standards at this time.

The present report re-enforces the education-oriented policy previously adopted by the Task Force. As new compelling evidence emerges or as studies begin to reduce the levels of uncertainty, the implications of this information may be incorporated into future policy recommendations.

GLOSSARY OF TERMS AS USED IN THIS REPORT

Any discipline has its own special terms and terminology. Epidemiology and the study of electric and magnetic fields are no exception. A few often-used terms which are employed throughout this report have been included to assist the reader. For additional information or further explanation of words or terms, please refer to many of the resources identified in Appendix G of this document.

CONFIDENCE INTERVAL. Confidence Interval is a statistical measure in an epidemiology study which shows the range of values for a relative risk or odds ratio. The range has a specified probability, usually 95 percent, of including the true value of the variable of interest. If the confidence interval includes 1.00, the result could be due to chance.

EMF. Electric and Magnetic Fields. Electric fields result from the strength of electric charges and magnetic fields arise from the motion of electric charges. Taken together, these are often referred to as electromagnetic fields. A time-varying electric field produces a magnetic field and vice versa. In this report, where EMF refers to low frequency (such as 50 or 60 cycles per second [Hertz]) fields, to an excellent approximation the fields may be considered separately. They are characterized as *non*-ionizing fields since they *lack* sufficient energy to remove electrons from atoms. The intensity of the field drops off as distance from the source increases. EMFs are emitted from devices that produce, transmit, or use electric power. These include power lines; common household items, such as electric clocks, shavers, computers, televisions, electric blankets, and heated waterbeds; and occupational sources, such as sewing machines, electric drills and other machinery with motors. Higher frequency electric and magnetic fields are generated from microwave ovens, "Ham" radios, and cellular telephones, which are *not* included in this report.

IN VITRO. Meaning "outside the living body," as measured in tissue or cell culture.

IN VIVO. Meaning "in the living organism," as measured in animals.

KILOVOLT. A measure of electric potential, or field strength.

META-ANALYSIS: Meta-analysis is a way to combine the results of several epidemiologic studies. This technique is usually applied in epidemiology to increase statistical power (ability to detect an actual effect or difference) by increasing the sample size; or to improve estimates of the size of the effect. Findings of the meta-analysis are based on data from the primary studies and the extent to which these studies failed to take into consideration confounding factors would be reflected in the meta-analysis. It is believed that it is easier to publish studies based on "significant results" than studies with negative findings. The results of the analysis could be confounded, therefore, by a publication bias.

MILLIGAUSS (mG). A unit of magnetic field intensity, most commonly used in the United States. To convert a measurement from microteslas, as reported in international epidemiology studies, to milligauss, divide by 10.

ODDS RATIO: The odds ratio is an *estimate* of the relative risk calculated in case-control studies. It is the odds that a patient was exposed to the risk factor divided by the odds that a control was exposed. See "relative risk."

RELATIVE RISK: The term relative risk (RR) is used in epidemiologic studies to quantitatively characterize the risk of disease or death in a population exposed compared to a population unexposed. In EMF studies, because it is difficult to identify a truly "unexposed" population, researchers must compare groups who are "less exposed" to those who are "more exposed." When a study reports that "for children exposed to 3 mG or greater, the relative risk of leukemia is 2.5," it means that for children whose exposure experience is on average 3.0 mG or greater, their risk of contracting leukemia is 2.5 times greater than children who were not exposed to those fields.

STATISTICAL SIGNIFICANCE: Statistical significance means that the finding is unlikely to be the result of chance. Statistical significance is generally interpreted as a result that would occur by chance less than 1 time in 20, with a P value (probability) of less than or equal to 0.05.

WIRE CODE: A surrogate means of assessing electric- and magnetic-field exposure on the basis of well-defined wiring configurations. Usually Very High Current Configurations (VHCC) are contrasted with other types, such as Ordinary High Current , Ordinary Low Current, Very Low Current or Underground configurations, or various combinations of these.

INTRODUCTION

1.1 BACKGROUND AND REPORT CONTENT

This is the fifth report to the Connecticut General Assembly by the Connecticut Interagency Task Force Studying Electric and Magnetic Fields (Task Force) to keep the legislature abreast of the science surrounding this environmental issue. Although more information is available, uncertainties regarding the occurrence of adverse health effects and reasons for inconsistencies in studies in different scientific disciplines, such as epidemiology, animal studies, and cell and tissue studies, still remain. A major national effort authorized by Congress, known as the EMF Research and Public Information Dissemination Program (RAPID) program sponsored by the National Institute for Environmental Health Sciences (NIEHS) and the Department of Energy (DOE), is scheduled for completion in 1998. This may yield information valuable to states in planning appropriate policies.

1.2 PUBLIC HEALTH POLICY

The policy formulated by the Task Force employs public education to inform people about the issues surrounding EMF and its controversies. This allows them to choose whether or not to reduce or avoid personal exposure to EMF when it is within their capacity to do so. The Task Force recognizes that choosing not to use an electric blanket is voluntary, while living near a newly constructed transmission line may not be. However, the Task Force is not recommending specific action or advice for any population group, nor does the policy recommend changes to the current electrical supply system.

The policy is consistent with Electric and Magnetic Fields Best Management Practices adopted by the Connecticut Siting Council in 1993, which considers EMF in the siting of electric generation, substation and transmission facilities. Up-to-date information, technology and field management techniques are applied on a project-specific basis to reduce EMF exposures where feasible. The approach adopted by the Task Force is dictated by the level of uncertainty surrounding the EMF science. While there has been no definitive cause and effect relationship demonstrated by the body of research to date, there is enough evidence to suggest that scientists need to study a possible association thoroughly. The Task Force is committed to keeping abreast of the science as it emerges through attention to major EMF conferences, EMF newsletters and specialty journals. The current policy should be viewed as flexible, intended to be adaptable as new scientifically-sound information becomes available.

1.3 TASK FORCE RECOMMENDATIONS FOR 1998

The Task Force recommends the following:

1. Continued allocation of resources to study and follow this issue;

2. Support for a continuing policy of communication to the general public about EMF;

3. Continuation of the public health policy of making recommendations for individuals as to means to reduce magnetic field exposures under their control if individuals are concerned about potential health effects;

4. No recommended changes to the present electrical supply system in Connecticut;

5. Continued endorsement of the Connecticut Siting Council's Best Management Practices for EMF (see Appendix A), with consideration of the results of the Life-Cycle Analysis; and

6. No recommendation for EMF exposure standards at this time.

2. EMF ACTIVITIES, STATE, NATIONAL AND INTERNATIONAL

2.1 CONNECTICUT LIFE-CYCLE ANALYSIS PROJECT

The Connecticut Siting Council published an investigation in July 1996 of the comparative life-cycle costs of overhead and underground electric transmission lines, as charged in Connecticut General Statutes Section 16-50r. The purpose of the investigation was to address all relevant life-cycle costs of typical 115 kilovolt (kV) transmission lines, including reliability, constraints on access and construction, potential effects on the environment and compatibility with existing electric supply systems. Life-cycle costs included all capital and operating costs that occur over the expected operational life of such transmission lines. Environmental effects included an assessment of electric and magnetic field levels using profile curves to 200 feet on both sides of the centerline of overhead and underground transmission lines.

The analysis modeled electric and magnetic fields for 31 overhead and underground configurations that could be expected within the right of way for the line during expected average and emergency operating conditions. The analysis also showed: (1) that the typical underground line life-cycle cost is three to four times that of an overhead line; (2) that magnetic fields surrounding underground circuits decrease more rapidly away from the center line than for comparable overhead circuits; (3) well built properly maintained transmission systems are very reliable, whether placed overhead or underground; (4) while there may be a general perception that underground lines result in fewer overall environmental impacts, this is not the case in the construction phase, or for subsequent repairs to the line; (5) overhead transmission lines cannot be replaced with underground transmission lines on a simple one for one basis. Further findings are described in Appendix B.

2.2 OTHER STATES/MUNICIPALITIES

Several states and/or municipalities have enacted legislation or developed guidance documents pertaining to electric and magnetic field exposure from transmission lines or substations, or from cellular telephone facilities, during the past three years since the Connecticut 1995 report. Some

states, including Maryland and Virginia, provide annual reports prepared by state agencies that monitor current research. A number of utility companies have adopted policy statements on electric and magnetic fields. This report provides a sampling of such activities, as compiled in *The Environmental Law Institute's Electric and Magnetic Fields Law and Policy Database,* and is not intended to be a comprehensive listing or imply a recommendation of any specific activity. In particular, in Connecticut, placement of transmission lines underground has been a suggestion in at least a couple of communities to reduce magnetic field exposures. This approach has been adopted only on a very limited basis around the country, and for a variety of reasons, including aesthetics, effects on tourism, and safety hazards in areas where there are low-flying aircraft.

LEGISLATIVE ACTIONS

- **Burying of Lines Underground**

  In 1994, Rhode Island House Resolution 148 was enacted, which requested that the state study the feasibility of burying power transmission lines in connection with a particular road project. Of note, Rhode Island found that burying the lines was not feasible. In 1996, Hawaii Senate Bill 2999 required the state, when federal highway funds are available, to arrange for the installation of all utility cables and facilities underground when undertaking federally-aided highway projects, except if environmental concerns precluded it. Two municipalities, Camas, Washington, (Ordinance 2030 in 1995) and Sandy City, Utah (Ordinance #96-9 in 1996) similarly required burying of lines underground for most new electrical transmission and/or distribution facilities. In Camas, this was subsequently dropped for economic reasons. In Sandy City, an unresolved disagreement as to the entity that would pay for the cost of such underground burial of lines led to a stalemate and power outages, so further legislative activity is being proposed.

- Wireless Telecommunications Facilities

  Rather than consideration of the magnetic fields from 60 hertz (Hz) transmission lines, several states focused on legislation involving wireless or telecommunications providers, which are at considerably higher frequencies than the EMF considered in this report. The states in which actions occurred included Vermont H.B 795 (1996), Pennsylvania H.B. 1868 (1996), Florida Administrative Code, section 62-17.510 (1995), Tennessee Senate Joint Resolution 462 (1996), Ohio Substitute H.B. 291 (1996), and Colorado S.B. 95-010 (1996). Under the federal Telecommunications Act of 1996, "no facility shall be denied based on health concerns so long as the facility is in compliance with the standard."

- **Exposure Limits**

California Code of Regulations, Title 8, section 5085 (1995) sets exposure limits for employees to various types of radiofrequency (RF), electric field, and magnetic field energies. It requires employers to display warning signs in areas where exposure may exceed set limits. The California Public Utilities Commission (as part of its $7 million California EMF Research, Education, and Technical Assistance Program, see 1995 CT EMF report) issued an order in 1995 that addressed EMF and RF fields generated by cellular utilities as part of the two-part investigation of EMF issues. It concluded that it is not appropriate to adopt specific standards regarding cellular utilities' EMF and RF measurements until a firm scientific basis is established.

PUBLIC UTILITIES POLICY STATEMENTS

In Connecticut, Northeast Utilities has issued policy statements on Electric and Magnetic Fields, the most recent of which is dated 1997. It states that the company's policy on EMF is to provide information to the public, establish an internal EMF Task Force to monitor developments, provide EMF testing to customers, fund EMF research, and consider alternatives in construction and siting of facilities to reduce EMF exposure to the public. Although United Illuminating has no formal policy "statement," it nevertheless has a similar policy, and provides measurements and other services to customers. Other utility companies with similar policy statements included Boston Edison (1995), Monongahela Power in West Virginia (1995), Illinois Power (1995), Minnesota Power (1996), and Pacific Gas & Electric (1995).

2.3 EMF RAPID PROGRAM

The RAPID Program was established as a result of section 2118 of the National Energy Policy Act, signed into law in 1992. This is a five year, federally-coordinated effort to evaluate developing technologies and research on the effects on biological systems of exposure to 60 Hz electric and magnetic fields produced by the generation, transmission and use of electric energy and to communicate these results to the public sector. The DOE is responsible for the overall administration of the 5-year program, which is jointly funded by both Federal and non-Federal sources, at a level of approximately $46 million. DOE is also responsible for developing technologies to characterize and mitigate these fields, while the NIEHS is responsible for the coordination and conduct of studies to evaluate the possible adverse health effects related to exposures to these fields. DOE and NIEHS share the responsibility for communication of research findings and scientific knowledge to policy makers and the public.

A nine-member EMF Interagency Committee comprising representatives from a wide range of regulatory agencies is responsible for making recommendations. Assisted by the National EMF Advisory Committee (NEMFAC) with representation from public interest groups, academia, industry, etc., the Interagency Committee is responsible for two congressional reports: an interim report released in late 1995 and a final report, initially due in 1997. In July 1997, President Clinton signed into law an extension of the RAPID program to allow for completion of studies. The final report is now expected in 1998.

The RAPID Program has the central goal of determining if electric and magnetic fields associated with the generation, transmission, and use of electrical energy pose a risk to human health. The fact that 20 years of research have not answered that question is clear evidence that health effects of EMF are not obvious and that risk relationships, if risk is identified, are not simple. Because epidemiologic studies have raised concerns regarding the connection between certain serious human health effects and exposure to electric and magnetic fields, the program adopts the hypothesis that exposure to electric or magnetic fields under some conditions may lead to unacceptable risk to human health. The focus of the RAPID program is not only to test, within the statutory time limits, that hypothesis for those serious health effects already identified, but to identify as far as possible the special conditions that lead to elevated risk and to recommend measures to manage risk.

The RAPID Program complements other Federal and non-Federal EMF research, and the results of these other programs will be considered in light of the new data obtained from the RAPID Program. The program components include: (1) health effects research; (2) engineering research; (3) hazard identification/risk assessment research; and (4) communication. These are described in more detail in Appendix C.

In the interim while these studies are being conducted, "the NIEHS recommends that anyone concerned about the possible health effects of magnetic fields may do the following to reduce exposure:

* Increase the space between a person and devices that may emit magnetic fields.
* Avoid standing too close to computers, microwave ovens, or televisions.
* Reduce the time of exposure to possible magnetic fields by turning off devices such as electric blankets when not in use.
* Avoid keeping such devices as electric alarm clocks too close to the bed.
* Discourage children from playing near high power lines or transformers.
* Avoid activities near magnetic field sources."

2.4 INTERNATIONAL EMF PROJECT INITIATIVE

The World Health Organization (WHO) formally established the International EMF Project during the first International Advisory Committee (IAC) meeting held at WHO in Geneva in May 1996, which brought together relevant international organizations, national scientific agencies, and member countries. Funds for about the first two years of operation for what is anticipated to be a five-year project were received or committed, and the Project formally commenced on 1 January 1996. Additional support is needed to complete the five-year period. This effort is testimony to the international concern still being focused on this issue. Conclusions will not be available until at least 2001.

Much effort has been devoted to establishing a network of national and international collaborators. In addition, agreement has been reached with the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the formally recognised non-governmental organization that works with WHO on non-ionizing radiation (NIR) protection, to support the extensive scientific effort needed to complete the Project objectives. ICNIRP will be supported by WHO collaborating institutions in France, Germany, Japan, Sweden, the UK and the USA.

The Project has a management advisory arm, the IAC, and a scientific arm, composed of ICNIRP and WHO collaborating institutions. Activities of both arms are coordinated by the WHO Secretariat. The IAC:

- Provides a forum for a coordinated international response on the health concerns raised by exposure to EMF fields;
- Reviews and communicates scientific information related to public and occupational health, and environmental management of the EMF issue;
- Recommends research in areas required for improved health risk assessments;
- Provides oversight on the conduct of the Project; and
- Reviews output from the Project.

The Project will be managed from the WHO Office of Global and Integrated Environmental Health, Geneva. The Secretariat will facilitate all activities and provide regular reports to the International Advisory Committee and contributors to the Project. WHO Regional Offices will participate where possible and facilitate communications with countries in their regions.

The following international organizations are collaborating with WHO on the Project:

International Commission on Non-Ionizing Radiation Protection (ICNIRP)
International Agency for Research on Cancer (IARC)
United Nations Environment Programme (UNEP)
International Labour Office (ILO)
International Telecommunication Union (ITU)
European Commission (EC)

The activities of these organizations pertaining to the project are more fully described in Appendix D.

Independent scientific agencies currently collaborating with WHO on the International EMF Project are:

National Radiological Protection Board (United Kingdom)
Bundesamt für Strahlenschutz (Germany)
Food and Drug Administration (United States of America)
International Centre for Radiopathology (France)
National Institute for Environmental Studies (Japan)

Karolinska Institute (Sweden)

Countries with representation at the WHO International EMF Project meetings currently include: Australia, Austria, Belgium, Canada, Czech Republic, Finland, France, Germany, Hong Kong, Hungary, Indonesia, Israel, Ireland, Italy, Japan, Kuwait, Malaysia, The Netherlands, Norway, New Zealand, Poland, Russian Federation, Slovenia, South Africa, Sweden, Switzerland, United Arab Emirates, UK, USA.

3. MAJOR LITERATURE REVIEWS AND STUDIES

3.1 THE NATIONAL ACADEMY OF SCIENCES (NAS)

In 1991, Congress had asked the National Academy of Sciences (NAS) - National Research Council (NRC) Board of Radiation Research "to review and evaluate the existing scientific information on the possible effects of exposure to electric and magnetic fields on the incidence of cancer, on reproduction and developmental abnormalities, and on neurobiologic response as reflected in learning and behavior." The NAS-NRC Committee on Possible Effects of Electromagnetic Fields on Biologic Systems (NAS Committee) was asked to focus on exposure modalities found in *residential* settings, thus the NAS Committee only briefly evaluated the numerous occupational epidemiologic studies which have been published. The review included studies published primarily through 1994. The NAS published the review conducted by the NAS Committee in November 1996.

The NAS Committee stated in its Executive Summary: "*Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee was that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.*"

The NAS Committee also noted: "At exposure levels well above those normally encountered in residences, electric and magnetic fields can produce biologic effects, ... but these effects do not provide a consistent picture of a relationship between the biologic effects of these fields and health hazards." Examples of these potential effects discussed in the body of the NAS report include cell metabolism and growth, gene expression, hormone signaling changes, learning and behavior, and promotion of tumors. The NAS Committee's general conclusion, within the report, from their review of studies with cultured cells, is "power-frequency electric and magnetic fields are not directly a genotoxic agent; if they were, a wider range of positive responses would have been observed."

Certain lines of evidence could provide possible mechanistic links between magnetic field exposures and changes in pathways known to regulate cell proliferation, differentiation, and

tumorigenesis. The steps in these various processes need more detailed study, as well as confirmation by being replicated in different studies. The results from some cellular and molecular effects studies were considered of great potential interest by the NAS Committee.

A principal conclusion of the review of the epidemiologic literature was that: "*An association between residential wiring configurations (called wire codes)... and childhood leukemia persists in multiple studies, although the causative factor responsible for that statistical association has not been identified. No evidence links contemporary measurements of magnetic-field levels to childhood leukemia.*"

The body of the NAS report provides carefully reasoned, detailed analyses to support its conclusions. It also provides a framework for further study, showing promising lines of evidence and areas where replication of results could lead to a strengthened conclusion. Discussion in the Task Force report is primarily extracted from the body of the NAS Committee report.

The NAS Committee suggested that certain avenues of research, within existing funding streams, could be pursued to resolve uncertainties that remain in the epidemiologic and laboratory findings. The sample-size analyses show that a study would be unlikely to change markedly the existing pattern of results unless hundreds if not thousands of leukemia cases were included in the study. In conducting future epidemiologic studies, the NAS Committee stated that it might be particularly fruitful to consider the study of children in very-high-current configuration homes. Combining more advanced methods of characterizing home exposure (integration over time and consideration of grounding currents) with complete coverage of homes of cases and controls would yield important insights into the possibility that magnetic fields account for the wire code and cancer association.

Description of the major areas of the NAS Committee review may be found in Appendix E.

3.2 THE NATIONAL TOXICOLOGY PROGRAM (NTP)

Approximately five years ago, the National Toxicology Program (NTP) was asked to investigate the question of potential human risk through a series of animal studies. The results of the effects of the first 2-year study, exposure of rats to 60 Hz magnetic fields, have been received at NTP, as have the results of a 2-year mouse study. In addition, as part of a Congressional Mandate, NTP also studied promotion of breast cancer in rats by 50 Hz (European frequency) and 60 Hz magnetic fields. The results of these initiation/promotion studies have also been received. NTP is now beginning the large task of reviewing all of the pathology specimens, other laboratory results and the pathology diagnoses from these studies involving over 3,000 animals. Quality assurance reviews will be conducted, and draft study reports will be available in February 1998. The five animal studies (two-year rat and mouse studies; three breast cancer promotion studies) will be peer reviewed March 11, 1998 by the NTP Board of Scientific Counselors' Technical Reports Review Subcommittee in an open public meeting, and further evaluated at a RAPID Program Symposium in April, 1998, along with other animal studies. It is anticipated that these

studies will contribute significantly to assessing the potential human health effects of exposure to electric and magnetic fields associated with the generation, transport and use of electricity.

3.3 NIOSH EMF IN THE WORKPLACE REPORT

The National Institute for Occupational Safety and Health (NIOSH) developed the September 1996 report, *Questions and Answers: EMF in the Workplace, Electric and Magnetic Fields Associated with the Use of Electric Power* in conjunction with NIEHS and the U.S. Department of Energy. The report provides a summary of research relating to exposure, biological effects and health effects. It highlights the major occupational EMF studies, summarizes current research efforts in the United States, and provides an extensive listing of studies and reviews.

The report provides important background to understanding exposures of workers in the various occupational EMF studies which have been conducted, the most recent of which have involved extensive exposure measurements.

NIOSH noted that the data from the many occupational studies reviewed are too limited for scientists to draw firm conclusions. Because of the scientific uncertainty, no Federal limits for worker exposures to EMFs have been recommended or established in the United States. NIOSH and other government agencies do not consider EMFs a proven health hazard. The NIOSH review did not find reproductive risks. However, because some studies have associated high magnetic field exposures with increased cancer risks, NIOSH and other agencies will continue studying EMFs. While research continues, NIOSH suggests that concerned workers and employers might consider simple, inexpensive measures for reducing EMF exposures.

The major areas and conclusions of the NIOSH EMF Report are described in Appendix F.

3.4 NATIONAL CANCER INSTITUTE EPIDEMIOLOGIC STUDY

The major childhood leukemia residential epidemiologic study conducted by the National Cancer Institute (NCI) was published in the New England Journal of Medicine (NEJM) in July 1997, after the NAS Review. The study was one of the largest to date, provided magnetic field measurements for many of the case and control homes, and received wide public attention. The authors reported no statistically significant association of childhood leukemia with either wire codes or with measured magnetic fields in the homes in which mothers resided when pregnant with the subjects, for its predetermined exposure comparisons. The authors reported that some data in the study showed a tendency for risk to be higher (a statistically significant association) for higher measured magnetic fields (greater than 3 mG), but the authors felt that there was not a consistent pattern or a significant trend. The authors commented that their results "provide little evidence" that the risk of leukemia is increased among children living in homes with high magnetic fields or high wire codes. In further published commentary on their study, the authors noted: "We disagree that this conclusion is 'completely negative' and believe it conveys our view that the results are reassuring rather than alarming." The NCI study methods, findings, and conclusions are detailed in Appendix G.

3.5 SECOND WORLD CONGRESS FOR ELECTRICITY AND MAGNETISM IN BIOLOGY AND MEDICINE

The scientific work of the International EMF Project is taking place through (1) scientific review meetings; (2) Environmental Health Criteria reviews; and (3) risk issues and health policy meetings.

An important initiative pertaining to scientific review was the Second World Congress for Electricity and Magnetism in Biology and Medicine, held on June 8 - 13, 1997 in Bologna, Italy. Over 600 papers were presented on research pertaining to electric and magnetic fields, including epidemiologic studies, animal studies, cell and tissue studies designed to elucidate mechanisms of action, and research on magnetic field exposure metrics. Attention was also focused on issues related to cellular telephones and emerging telecommunications technologies.

Research presented at the Second World Congress addressed some of the issues discussed in the National Academy of Sciences report, including further work related to the melatonin hypothesis, exposure studies, and epidemiologic work to facilitate insight as to alternate explanations of why childhood leukemia appears to be more closely related to wire codes than to the (incompletely) measured magnetic fields. Conferences of this calibre serve to provide a focus for the many research questions being considered, although scientific concensus awaits the critical assessment of the many lines of evidence.

4. FUTURE EMF ACTIVITIES

In addition to the above-mentioned activities in association with the RAPID Program, i.e., the series of EMF symposia and reports, the NTP review of five studies on animals involving magnetic field exposure, and the WHO International EMF Project, with reports by its member agencies such as IARC and ICNIRP, a number of additional major studies can be expected to be reported during the next several years. There are three major childhood leukemia studies nearing completion in Canada, New Zealand and Great Britain. A number of occupational epidemiologic studies are currently being conducted by several research groups. In addition, there are three major areas of epidemiologic study underway under NCI auspices or sponsorship.

4.1 NATIONAL CANCER INSTITUTE BRAIN TUMOR STUDIES

National Cancer Institute Adult Brain Tumor Study

Peter Inskip, Sc.D., of NCI's Division of Cancer Etiology is heading a comprehensive study, similar to the NCI childhood leukemia study, of malignant and benign adult brain tumors to identify environmental and genetic causes for these serious but poorly understood diseases. The causes of tumors of the brain and nervous system are largely unknown, but genetic factors and a variety of environmental exposures have been implicated to varying degrees. Certain inherited syndromes, such as neurofibromatosis, predispose persons to developing tumors of the nervous

system; however, such syndromes are rare. Parents and siblings of children with brain cancer appear to have a slightly increased risk of developing brain tumors.

Epidemiological studies have linked central nervous system cancers with a variety of environmental exposures (including physical, chemical, and biological agents. Public concern recently surfaced over the possibility that hand-held cellular telephones, as well as other sources of magnetic fields, may cause brain cancer.

While there is strong evidence that high doses of *ionizing* radiation, such as that received from radiotherapy, can increase the risk of tumors of the central nervous system, the picture is less clear concerning possible risks posed by low doses of ionizing radiation or magnetic fields (which are *not* ionizing). Most studies of groups occupationally exposed to low doses of ionizing radiation have not found an increased risk of brain cancer.

The few studies of magnetic fields and cancer of the nervous system have focused on low-frequency (50-60 Hz) fields, such as those associated with electric power lines and household appliances. There is very little information available concerning possible risks associated with microwave frequencies, such as those emitted from hand-held cellular telephones (800-900 MHz). While the possible health hazards of magnetic field exposure remain an active area of research, expert panels that have reviewed the existing evidence have judged that available data are insufficient to support the conclusion that magnetic fields cause cancer.

To address this problem, NCI and extramural researchers will examine numerous factors that may affect brain cancer incidence, including residential appliances, cellular telephone use, occupational exposures, diet, vitamin supplements, reproductive and medical history, inherited susceptibility, and other factors. This NCI case-control study is being conducted at hospitals in Phoenix, Pittsburgh, and Boston, and will include 700 newly diagnosed brain tumor cases and an equal number of matched controls. The controls will be patients admitted to the same hospitals with any of a variety of non-cancerous diseases or conditions.

Researchers are gathering information about possible risk factors through personal interviews, self-administered questionnaires, and biochemical and molecular genetic analyses of blood samples. The occupational component of the study will improve on previous efforts to evaluate occupational risk factors for brain cancer by asking job-specific questions about tasks performed, specific chemicals and equipment used, and whether or not protective gear was worn. The early identification of brain tumor cases will provide the opportunity to interview brain cancer patients directly, rather than having to depend on a family member for the needed information.

Researchers will also look at family histories of brain tumors and other cancers; consumption of vitamins, fruits, and vegetables; consumption of foods and beverages containing N-nitroso compounds or their precursors; medical and dental exposures to ionizing radiation; reproductive histories; exposure to viruses; and pre-existing medical conditions. Data collection, which began

in June 1994, will finish at the end of 1998. Separate analyses will be conducted for the different types of brain tumors.

NCI Grants to Study Brain Tumors in Children or Adults

In addition to the above study, conducted directly by NCI, the NCI is also supporting a number of external grants to determine whether magnetic fields are associated with cancer risk. Listed below are descriptions of a few NCI-funded studies investigating the relationship, if any, of exposure to magnetic fields and specific types of cancer. These projects will be funded for four more years.

The University of California, San Francisco, will enroll approximately 15 percent of the projected 450 newly diagnosed cases of brain cancer patients and 450 controls needed for a large-scale study of brain cancer. Patients from the San Francisco area will participate in this study, which is jointly funded by NCI and the NIEHS, which is the nation's principal agency for environmental health research and information.

In addition, NCI is also supporting several studies by the American Health Foundation in New York. A case-control study of brain cancer is identifying over 150 cases and controls in five collaborating hospitals in New York, Rhode Island, and Ohio. Information on magnetic field exposures, cellular telephone use, and other potential risk factors will be examined.

The American Health Foundation is also conducting a study to see how many New York State cellular phone subscribers were diagnosed with cancer from 1990 through 1993, as recorded by the New York State Cancer Registry.

NCI is funding two epidemiologic case-control studies: one at USC that includes 500 children with brain tumors, and one that includes 300 children in Israel with brain tumors. These studies assess whether exposure to magnetic fields or radiofrequency radiation, among other possible risk factors, is associated with an increased risk of brain tumors.

4.2 NCI-FUNDED BREAST CANCER RESEARCH

Several studies are investigating the association between magnetic field exposure and breast cancer. An NCI-supported case-control study of breast cancer (800 cases) is in progress at the Fred Hutchinson Cancer Research Center in Seattle, and another case-control study of breast cancer, supported by NCI and NIEHS, is being conducted by the University Medical Center at Stony Brook, New York. This study is part of NCI's Long Island Cancer Study, which is investigating environmental factors and breast cancer. Both studies will measure in-home magnetic field exposures and proximity to power lines as possible risk factors.

Through a grant to the University of North Carolina at Chapel Hill, NCI will support the development of a new program of research on the environment and breast cancer, including a national conference on magnetic fields and breast cancer. (Magnetic field exposure may lower

melatonin, a hormone found in the pineal gland. Melatonin may be protective against breast cancer.)

A project at Brigham and Women's Hospital, Boston, is evaluating whether electric blankets are associated with breast cancer in a group of 121,700 nurses studied since 1976. These projects, together with research being conducted by intramural researchers at NCI, and grants supported by NIEHS are expected to provide a comprehensive evaluation of cancer risks from magnetic field exposures.

4.3 NCI-FUNDED RESEARCH ON LEUKEMIAS AND LYMPHOMAS

An NCI grant to the University of Torino, Italy, is supporting a case-control study of 3,400 Italians with leukemia or lymphoma to assess magnetic field exposures, as well as exposure to solvents and pesticides.

Appendix A: Electric and Magnetic Field Best Management Practices

The Connecticut Siting Council adopted the following statement and list of Electric and Magnetic Field Best Management Practices on February 11, 1993.

Electric and Magnetic Field Best Management Practices
February 11, 1993

Although scientific knowledge does not at this time permit firm judgments about possible health effects of 60 hertz electric and magnetic field (EMF) exposures from electric generation, substation and transmission facilities, the Connecticut Siting Council has adopted a cautious approach to the issue by adopting the following Best Management Practices. These practices are intended to recognize the latest information as well as effective technologies and management techniques on a project-specific basis to protect the public and maximize the efficiency of the electric generation, transformtion, and transmission industry.

1. Administratively notice and recognize completed and ongoing scientific EMF research.

2. Require individual project-specific assessments of EMF.

3. Require detailed project-specific assessments of need and non-structural alternatives.

4. Require EMF assessments for project alternatives.

5. Require EMF assessments toconsider exposure levels and durations with respect to existing and planned land uses.

6. Require baseline,, preconstruction measurements of EMF during siting of new facilities.

7. Require post-construction measurement of EMF to extrapolate values for normal, peak, and maximum allowable continuous operating levels.

8. Require adoption and use of a uniform measurement protocol.

9. Solicit specific comments from the DEP, DPUC, and [DPH] regarding EMF exposure during siting of new facilities.

10. Require consideration of low-EMF designs during the siting and construction of new facilities, including use of:

    a. Compact spacing;
    b. Optimum phasing of conductors; and
    c. Applicable and apprpriate new field management technologies.

11. Consider project-specific exposure limits for EMF.

12. Recognize the possibility for future standards and consider conditioning approval on retrofitting or elimination of facilities to meet future federal and State standards.

All council proceedings are conducted at publicly noticed meetings and hearings offering full opportunity for participation and due process as afforded by federal and State law.

Appendix B: Connecticut Life-Cycle Analysis Project

The Connecticut powerline life-cycle analysis project showed in particular:

Life-Cycle Costs:

- The typical 115-kilovolt underground line life-cycle cost is three to four times that of an overhead line. Life-cycle costs are very dependent on the first cost of construction. For underground lines the first cost is five to six times that of an equivalent overhead circuit.

Magnetic Fields:

- Magnetic field values for both above ground and underground lines are very dependent on the current in the circuit. Long-term average currents result in fields well below the values that briefly exist when high emergency currents flow.

- Magnetic fields decrease rapidly with distance. Under conditions of expected average current, the fields at 50 ft from the center line of the right-of-way are as low as one-third of the maximum value.

- Magnetic fields surrounding underground circuits decrease more rapidly away from the center line than for comparable overhead circuits.

- The lowest overall magnetic fields, irrespective of whether the lines are overhead or underground, are produced by the underground pipe type fluid-filled or gas-filled cables.

- Highest field exposure within the center of the right-of-way would occur immediately above a solid dielectric underground line.

Reliability:

- Well built properly maintained transmission systems are very reliable, whether placed overhead or underground. However, these two systems are not equal in all circumstances for the following reasons:

- Overhead lines are more susceptible to interruptions from external forces such as inclement weather, but problems are easier to find, and repair.

- Underground lines are less susceptible to inclement weather, but problems take longer to find and repair.

Environmental Impact:

- In the environmental investigation, no available data provided a direct, comparative evaluation of the environmental effects of overhead versus underground transmission lines on a project specific basis. Significant issues are:

- Single overhead lines typically require a 100 foot right-of-way, double overhead line normally require 150 feet, and underground lines require 25 feet.

- While there may be a general perception that underground lines result in fewer overall environmental impacts, this is not the case in the construction phase, or for subsequent repairs to the line.

- Overhead lines are an important factor in scenic quality.

Compatibility with the Existing Electric System:

- Overhead and underground systems are not electrically equivalent due to differences in current carrying capabilities, load sharing, charging currents, fault currents, system restoration and losses. Overhead transmission lines therefore cannot be replaced with underground transmission lines on a simple one for one basis.

Appendix C. *EMF RAPID Program*

Health Effects Research

The key questions for health effects research are:

- Are there robust bioeffects (any change in living tissue or in animals, related to exposure to electric and magnetic fields, that can be replicated in other laboratories)?
- What are the relevant biological measures of an effect?
- What are the relevant dose measures?
- Are the observed bioeffects related to human health effects?

The RAPID Program has implemented a multi-disciplinary program of applied and basic biomedical research complemented by appropriate expertise in engineering and the physical sciences to address these questions. Due to the RAPID Program's financial and time constraints, initial research has been directed toward health effects already highlighted in human epidemiology studies that are the focus of the public concern. Research efforts have been focused on childhood leukemia, brain cancer, breast cancer, and certain adverse neurological and reproductive effects. No conclusions are yet available from this research.

Health effects research has been funded through research grants to non-Federal scientists, research and development contracts, and support to Federal scientists for studies conducted in government laboratories and clinical research facilities. Research grants have been and will remain the largest proportion of total program expenditures. Scientists participating in the RAPID Program will be required to share their findings in a timely manner.

Engineering Research

Engineering Research on technologies to characterize and reduce the levels of power frequency fields includes the following areas of research:

- Exposure Assessment and Source Characterization
- Quality Assurance
- Field Management
- Dosimetry

Progress has been made in these areas, and guidance documents are available. An EMF Measurements Database, an ongoing project sponsored by the U.S. Department of Energy through the RAPID Program, will make measurements of electric and magnetic fields available to the public.

Hazard Identification/Risk Assessment Research

Assessment of the risk, if any, to human health posed by 60 hertz electric and magnetic fields will be addressed partially in conjunction with a series of three EMF Science Review Symposia sponsored by NIEHS to discuss the results of the RAPID Program health effects research. Major EMF studies conducted outside of RAPID will also be included. The first symposium, Theoretical Mechanisms and *In Vitro* Findings, was held March 24-27, 1997 in Research Triangle Park, North Carolina. The preliminary report is available, and its findings are summarized below. Although no epidemiology has been funded by RAPID, a science symposium to review the results of major epidemiological studies was held January 11-14, 1998. The final symposium, on *in vivo* effects (animal studies), is scheduled for spring 1998. This will include review of the NTP studies (3000 animals), a major Canadian study of 300 animals (Mandeville et al), and studies conducted in Germany. The results of all three symposia will be reviewed by an EMF Science Working Group in 1998. In addition, NIEHS has recently commissioned a new meta-analysis of the association between EMF exposure and childhood cancer, which will be considered in its review.

Communication

A number of activities have taken place to date to further communications concerning the RAPID program.

NIEHS administers an EMF InfoLine at 1-800-363-2383 to distribute information for the RAPID program. In addition, the RAPID Program now has a World Wide Web site. The RAPID home page can be found at: http://www.niehs.nih.gov/emfrapid/home.htm. The web site contains program information, research information, and RAPID Program documents, as well as a link to the RAPID Program EMF Measurements Database at: http://www.emf-data.org.

A booklet, *Questions and Answers About Electric and Magnetic Fields Associated with the Use of Electric Power*, has been developed, and is available to the public. A new booklet, *EMF in the Workplace,* similar in format to *Questions and Answers*, is the result of a team effort by the RAPID Program and the National Institute for Occupational Safety and Health, and focuses on issues related to workplace exposures. See Appendix . Other public information projects currently in progress include an EMF Handbook containing research results and other informational materials designed to be of assistance to state and local officials.

The National Academy of Sciences Committee to Review the Research Activities Completed under the Energy Policy Act of 1992 published an interim report to the EMF Interagency Committee in 1995. Following this, the EMF Interagency Committee delivered its interim report to Congress and to the Secretary of Energy in December 1995. The report is entitled *Progress Report on the Electric and Magnetic Fields Research and Public Information Dissemination Program (DOE/EE-0088)*. The report is available through the EMF information lines and on the RAPID Program's web site.

First EMF Science Review Symposium, Theoretical Mechanisms and *In Vitro* Research Findings

NIEHS sponsored a workshop in March 1997 which brought together over 100 experts, including physicists, biologists, engineers, mathematicians, and epidemiologists, as well as journalists, governmental officials, representatives from industry, and the public. As reported in the introduction to the preliminary report, general overviews of selected areas were presented as lectures in plenary sessions. Breakout group sessions provided time for in-depth, small group discussions and evaluations of the quality and reproducibility of experimental findings and biophysical observations and of the degree to which they can support a causal linkage between EMF and biological and/or health effects. An expert, scientific panel debated the scientific evidence based upon theoretical mechanisms and *in vitro* research findings for whether exposure to power line frequency EMF is a human health risk.

The breakout group discussions of EMF effects covered ten research areas under three major categories: biophysical mechanisms; cellular growth, differentiation, and control of gene expression; and enzymes, intracellular pathways, and signal transduction. In addition, sessions were held on the roles of *in vitro* assays and physical theory in understanding and quantifying human health risk.

In general, attendees agreed that additional research is needed especially with regard to predicting *in vivo* human hazard from *in vitro* research findings. There also appears to be a need for alternative, physical,mathematical models that can better explain some in vitro observations. While the mechanistic findings discussed at this symposium can be used as qualitative support for a decision about whether a hazard exists from exposure to power line frequency EMF, the conveners stated that it is not clear that these data provide quantitative information for describing the magnitude of any identified hazard.

Second EMF Science Review Symposium, Epidemiological Research Findings

NIEHS sponsored a second EMF Science Review Symposium on January 12-14, 1998 in San Antonio, Texas. Scientists with expertise in epidemiology, exposure assessment, and laboratory studies were requested by the National Institute for Environmental Health Sciences to assess the quality of epidemiology studies pertaining to EMF, to examine methodological issues which might bear on the findings, and to assess to what extent the data support a causal association between some aspect of electric power use and various disease endpoints. Key studies pertaining to EMF and childhood cancer, breast cancer, other adult cancers, neurological effects and reproductive effects were considered. A final report to Congress, which incorporates the input from this technical conference, is due by the end of 1998.

Appendix D. International EMF Project Member Agencies

Two of the agency members of the International EMF Project have a specific health-related focus.

(1) The International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an independent scientific commission established by the International Radiation Protection Association (IRPA) to advance non-ionizing radiation (NIR) protection for the benefit of people and the environment. It provides science-based guidance and recommendations on protection from NIR exposure, develops independent international guidelines on limits of exposure to NIR and represents the radiation protection profession world-wide through its close relationship with IRPA. ICNIRP is the formally recognized nongovernmental organization in NIR for WHO and ILO. ICNIRP will serve the International EMF Project by the provision of specific expertise for the evaluation of scientific literature, involvement in the evaluation of topics such as dosimetry, laboratory and epidemiologic studies, health risk assessment and standards development. ICNIRP would provide input into the drafting of WHO Environmental Health Criteria monographs. Both IRPA and WHO have previously published guideline and criteria documents on EMF.

(2) The International Agency for Research on Cancer (IARC) studies the carcinogenic effects of radiation as a function of exposure pattern, radiation type, and environmental effect modifiers. The aim of IARC's work is to strengthen the bases of radiation protection and to increase understanding of biological mechanisms of carcinogenesis. In particular, IARC plans to review the results of published epidemiologic studies critically, and discuss their consistency and the need for further work. An IARC monograph on electromagnetic fields will be prepared and published, although the timeline has not yet been published.

The other member organizations in the International EMF Project have participated in activities specifically related to EMF.

(3) The United Nations Environment Programme (UNEP) has jointly sponsored environmental health criteria monographs on electromagnetic fields, including higher frequency RF fields, with the WHO and IRPA/ICNIRP.

(4) The International Labour Office (ILO) has published documents related to electromagnetic field exposure and occupational health in the ILO Occupational Health and Safety series.

(5) The International Telecommunication Union (ITU) has established a working committee to compile appropriate information on this subject. ITU has much information on current and future communications systems that will greatly assist the EMF Project.

(6) The European Commission (EC) has several Directorates General involved in activities related to EMF. These involve the following : Employment, Industrial Relations and Social Affairs (DG V); Science, Research and Development (DG XII), and Telecommunications,

Market Information and Research Exploitation (DG XIII). DG V has supported publications by ICNIRP on EMF protection for many years. DG XIII is interested in research on possible health effects of RF fields, especially from those emitted by mobile telephones. In addition, DG XIII supports communications among European scientific researchers through the COST 244 initiative entitled "Biomedical effects of electromagnetic fields". Within this forum European scientists communicate their research results, suggest research needs, and discuss the results of research through special meetings.

Appendix E. National Academy of Sciences Report

Epidemiology:

The NAS Committee reviewed 16 studies of residential magnetic field exposures and childhood cancers. Of these, 11 provided information which could be used in a pooled analysis. The Epidemiology chapter presented information in terms of risk ratios (*i.e.*, if a relative risk is 1.5, this means that the most exposed persons could potentially be at a risk 1.5 times higher for cancer than less exposed persons, whose baseline risk is considered to be 1.0). The chapter on Epidemiology and its respective Appendices in the NAS report present 16 Tables that summarize information from these studies, and the analyses of these data. Based on its analysis, the NAS Committee concluded in the Epidemiology chapter:

- **"Wire codes are associated with an approximate 1.5-fold excess of childhood leukemia, which is statistically significant."** The NAS Committee's meta-analysis showed that living in homes classified as being in the high wire code category is associated with a 50% increase of childhood leukemia. The NAS Committee noted that this association (of a rare cancer) has been replicated with increasingly sophisticated study designs. There is a preponderance of positive associations across exposure metrics (except for spot magnetic-field measurements) and exposure cut points, which speaks to the overall consistency of the data. The pattern is not random. In its analysis of the robustness of the results, the NAS Committee calculated that to change the results of the meta-analysis, a study with hundreds, if not thousands, of cases would be needed. Based on the observation of various researchers that the individuals with the highest exposure often seem to drive the study results, the NAS Committee noted that one could draw the inference that if another study were to be conducted, it would be most informative if it focused on individuals with high exposure. The NAS Committee concluded that the association between the wire code and the risk of leukemia warranted further research because no common pattern of confounding, recall bias, measurement error, or other factors provides an easy explanation of the association and that the ubiquity of electromagnetic fields warrants continued careful consideration.

[The Connecticut Task Force notes that the observation of an association with living in homes with high wire codes should be considered in the context of the NAS Committee's further observations below.]

- **"Average magnetic fields measured in the homes of children have *not* been found to be associated with an excess of childhood leukemia or other cancers."** The basis for this assertion comes from only three case-control studies that reported spot measurements of magnetic fields. The NAS Committee noted that the percentage of case and control residences where magnetic field measurements were able to be made in these studies was quite low (in terms of allowing for possible bias), ranging from 36% to 63% in case residences, and from 42% to 75% in control residences. They conclude that: *This situation calls for refined study of the issue.*

- **"Studies that have examined average magnetic fields measured in homes after a diagnosis [of leukemia] has been made have all been severely limited by missing data, and no firm conclusions can be drawn from them."** The data that have been generated do not support an association between childhood leukemia and magnetic fields, in contrast to the data generated from wire codes. The committee noted two possible explanations (assuming that association with other metrics is true) of this lack of association: (1) The surrogate exposure metrics (wire codes) might be markers for the true risk factor and the true risk factor might not be related to magnetic-field strength. (2) The other surrogate exposure metrics might be more biologically relevant measurements of magnetic-field exposure than spot measurements. The surrogate metrics might be more representative of long-term integrated averages of magnetic field strength or of some other aspect of magnetic-field exposure that is related to the cause of the disease (*e.g.*, peak field strength, field variability, or time above a specific threshold value).

- **"The factors that explain the association between wire codes and childhood leukemia have not been identified."** A number of plausible risk factors have been investigated, such as traffic density and housing density or housing mobility, but none can be used at present to explain the observed association.

- **"Epidemiologic evidence of an association between magnetic fields and childhood cancers (other than leukemia), adult cancers, pregnancy outcomes, and neurobehavioral disorders is not [taken as a whole] supported."** The NAS Committee observed that the epidemiologic studies of potential adverse reproductive effects of exposure to electric and magnetic fields are limited in quantity, and, to some extent, in quality. Most of the areas have been addressed in fewer than three studies, the exception being Video Display Terminals (VDTs) in relation to spontaneous abortions. The absence of efforts to replicate these studies is the predominant source of uncertainty in this literature. In the VDT literature, which is large and of reasonably high quality, the evidence is clear that VDT use *per se* is not associated with increased risk of adverse reproductive outcomes, such as spontaneous abortion, congenital defects, or intrauterine growth retardation. However, the use of VDTs is not synonymous with exposure to extremely-low-frequency electric and magnetic fields, thus it is of little value in addressing questions concerning prolonged exposure to increased power-frequency electric and magnetic fields. Regarding neurobehavioral effects, the scientific literature includes a series of studies that related exposure to a wide range of outcomes, including suicides, depressive symptoms, headaches, and neuropsychologic performance. In general, the NAS Committee found the studies of behavioral outcomes used potentially biased designs and obtained results that are inconsistent and of poor quality. Nonetheless, the NAS Committee found the consistent lack of association seen in this set of studies to be notable.

Occupational Epidemiology:

Often occupational studies of more highly exposed populations can yield useful information in generating hypotheses about associations of health effects and exposures. The NAS Committee noted that on average in the occupational studies, a modest increase in brain cancer and

leukemia, particularly acute myeloid leukemia, is found, with relative risks on the order of 1.2 - 1.5.

In recent years, there have been clear improvements in classifying exposures more accurately and taking potential confounders into account. In spite of these refinements, the patterns of association have not become more consistent and pronounced, nor have they gone away. The NAS Committee stated that relative risks on the order of 2 - 3-fold, which have been reported in some high quality studies, cannot be ignored. However, the inconsistency in which cancer types show increased risks, the presence of contradictory studies, and the irregular dose-response gradients make the interpretation problematic. The NAS Committee observed: "Overall, the most recent studies have increased rather than diminished the likelihood of an association between occupational exposure to electric and magnetic fields and cancer, but they have failed to establish an association with a high degree of certainty."

The NAS Committee also highlighted another avenue of research, which is the concern with occupational exposure to electric and magnetic fields and breast cancer. There were three studies, similar in character to the initial studies of leukemia and brain cancer, which reported an association between electrical occupations and rare *male* breast cancer, followed by another study which reported no such association. An evaluation of *female* breast cancer in relation to electrical occupations among a large number of decedents in the United States found a modest increase in risk, particularly in telephone workers, encouraging further evaluation of a potential link between high level exposure and this common cancer.

Risk Assessment

Risk assessment is a four-stage process. The goals of the **first** stage, known as hazard identification, are to catalogue situations in which an agent can pose a risk to human health and to predict all possible adverse health effects. It is meant to address a hazardous agent regardless of the amount present and to characterize all possible health end points. The **second** stage is dose-response assessment -- determining how much exposure to a given hazardous agent is harmful to public health. The **third** stage is exposure assessment, whereby investigators estimate the amount of a given agent a typical person is likely to encounter. Finally, in the **fourth** stage of risk assessment, risk characterization, information from the three other stages is combined into an overall estimate of risk. The assessments from all these stages are combined with other insights, such as the presence or absence of a biologic explanation for the relationship between exposure and effect, to reach a judgment about the overall concern warranted by exposure to an agent.

In the case of exposure to magnetic fields, the most compelling data available are derived from human epidemiology studies rather than animal experiments. The most reliable positive laboratory data come from studies of mammary-cell tumors in test animals, but, given the particular exposure regimens and that exposure to electric and magnetic fields is not genotoxic, the NAS Committee felt it was premature to use those data.

- After reviewing the available data, the NAS Committee does not believe it is appropriate to perform a complete assessment of the risks of exposure to power-frequency electric and magnetic fields through the four formal stages described above. The NAS Committee believes that the data are too uncertain to result in a meaningful analysis, and it would be misleading to perform such analyses. However, many persons are concerned about the possible risks of exposure to residential electric and magnetic fields, and in light of its examination of the entire body of evidence, the NAS Committee wished to contribute to a better understanding of the risks by assessing them in a more limited context so that it can be considered for possible personal actions or government policies.

Research Needs And Research Agenda

The NAS Committee concluded the power-frequency electric and magnetic fields of the strength found in residences have not been shown to constitute a threat to public health that would warrant an adjustment in national research policy. However, within the range of funding that might be available for issues relating to the biologic effects of electric and magnetic fields, the NAS Committee suggested certain avenues of research could be pursued to resolve uncertainties that remain in the epidemiologic and laboratory findings. Some of their particular suggestions are detailed below:

- The epidemiologic research was found to show patterns indicative of associations, but also to show some notable inconsistencies. Additional epidemiologic studies might resolve these concerns. "Countering the claim that epidemiologic studies have gone as far as they can in addressing the potential role of exposure to electric and magnetic fields in cancer etiology, it is quite likely that, at least in the near term, only further epidemiologic research can more strongly implicate or exonerate magnetic fields. That is not to argue for simply conducting more studies to reach consensus, but rather to design studies, some of a purely methodologic nature, that can address the specific gaps in our understanding." The NAS Committee's sample-size analyses show that a study would be unlikely to change markedly the existing pattern of results unless hundreds if not thousands of leukemia cases were included in the study.

- In conducting these epidemiologic studies, it might be particularly fruitful to consider the study of children in very-high-current configuration homes. Perhaps a systematic effort to estimate the prevalence of high-wire code homes in different geographic locations could guide investigators in selecting a more optimal location.

- Another research approach would be to consider different exposure regimes, such as is shown in the high-frequency variation (i.e., on and off switching) of distribution lines (versus the more consistent fields in transmission lines).

- As part of a broader research agenda, more knowledge of the causes of childhood cancer would be of great benefit in evaluating the role of exposure to electric and magnetic fields. Delineation of risk factors allows control for them as potential confounders.

- The relationship between magnetic fields and childhood cancer is the single issue of greatest uncertainty and importance in regard to future research. The fact that relatively small percentages of homes received magnetic field measurements in past studies calls the largely negative results into question. Combining more advanced methods of characterizing home exposure (integration over time and consideration of grounding currents) with complete coverage of homes of cases and controls would yield important insights into the possibility that magnetic fields account for the wire code and cancer association.

- Areas of biologic research that seem most likely to be productive in elucidating a plausible physical mechanism to account for the possible weak connection between human health and exposure to extremely-low-frequency electric and magnetic fields in residences include the following:

- Bone healing and other therapeutic applications.
- Characterization of the dose-response relationship for *in vitro* effects.
- Signal-transduction events.
- Gene expression.
- Biophysical mechanisms
- Cocarcinogenesis.
- Magnetic-field-exposed initiated animals.

Appendix F. NIOSH *EMF in the Workplace* Report

Exposure Issues. The report provides important background to understanding exposures of workers in the various occupational EMF studies which have been conducted, the most recent of which have involved extensive exposure measurements. Median magnetic fields and ranges for 90% of workers in various industries are presented, such as electrical engineers, welders, telecommunications, auto transmission manufacturing, nurses, and sewing machine operators. Of these, sewing machine operators had the highest median exposures averaged over a workday (22.0 milligauss, mG), while welders had the greatest average range (1.7 - 96.0 mG, between the 5th and 95th percentiles of daily average measurements.

Cancer and EMF. The report highlighted the major studies of utility workers and railway workers which have been conducted since the pioneering 1982 study of electrical workers in Washington State, which found a significantly higher proportion of leukemia deaths than was expected. Since that time, a review of data from 16 states (1990) based on job titles (but not measurements) found a higher incidence of brain cancer, but not leukemia. The large scale California (1993), Canada/France (1994) and North Carolina (1995) studies of utility workers are considered to be among the best EMF epidemiologic studies conducted, mainly because they included large numbers of workers and because the researchers estimated the workers' magnetic field exposures based on measurements made in the workplace, rather than solely on job titles. Nevertheless, these studies had findings inconsistent with each other.

The California researchers studied 36,000 workers and reported no strong, consistent evidence of an association between magnetic fields and any type of cancer. Because there were relatively few cases of leukemia and lymphoma, the study was not capable of detecting very small risks, if present. The Canadian and French researchers conducted a study of 223,292 workers. They reported that workers with acute myeloid leukemia were about three times more likely to be in the half of the workforce with higher cumulative exposure to magnetic fields. Because there was no clear sign that the risk of cancer increased as the level of exposure increases, the researchers concluded that the study did not provide clear-cut evidence that magnetic fields caused the elevated risks found for leukemia and brain cancer. In contrast, in the North Carolina study of 138,000 utility workers at five electric utilities in the United States, the researchers concluded that the results "do not support an association between occupational magnetic field exposure and leukemia, but do suggest a link to brain cancer." Of note, a recently published (1997) extension of the North Carolina analysis of 138,000 utility workers found an association with non-Hodgkin's lymphoma and duration of employment in a magnetic field-exposed job, with a relative risk of 3.7, but only up to 20 years.

Cancer and magnetic field exposure has also been studied across broader ranges of occupations in the United States and Europe. The NIOSH report details several large studies which variously suggest an association between estimated EMF exposure and increased risk for chronic lymphocytic leukemia, brain tumors, or male breast cancer. The report also describes studies that report no such association. The results of these studies disagree in important ways - such as the type of cancer associated with EMF exposures.

Other Illnesses and EMF. The report mentioned several studies of overall health of high-voltage workers that found no untoward effects. A significant new line of investigation is that of the possibility of increased incidence of Alzheimer's disease in workers with higher than typical exposure to EMF (primarily seamstresses, dressmakers, and tailors in this study, which had about three times the risk as other workers). Other studies have examined possible "electrosensitivity" in workers, who have reported skin problems or other symptoms.

EMF and Miscarriages/Birth Defects. Following reports of miscarriages and birth defects at several workplaces in the United States and Canada, more than 10 epidemiologic studies that focused on VDTs were completed in the following decade. These included exposures at higher frequencies than the EMF in this report. Most of the studies reported that work with VDTs did not affect the risk of miscarriage or birth defects, but in only three studies were VDT exposures measured. In 1991, NIOSH conducted a study of VDT users that measured power-frequency magnetic fields. In this study there appeared to be no relationship between the amount of time a woman used a VDT and her chance of having a miscarriage.

Recent Related Connecticut Studies (not in NIOSH Report). A large study at Yale (Bracken *et al*, 1995) focused on the effects of EMF exposure on the growth rate of the unborn child. The researchers obtained information from power line and home sources. VDT use over 20 hours a week was not found to affect the weight or growth rate of the baby, nor did the mother's exposure to higher magnetic fields or to "high" field sources such as electrically heated beds. Another Yale study (Belanger *et al,* 1998) evaluated the relation of spontaneous abortion with use of electric blankets and heated water beds during preganancy. Electric blanket use at conception was associated with an increased risk of spontaneous abortion in the unadjusted analysis [relative risk (RR)= 1.84; 95% confidence interval (CI) = 1.08-3.13], but adjustment for other factors reduced the risk slightly (RR=1.74; CI = 0.96-3.15). Heated water bed use was not associated with an increased risk of spontaneous abortion at conception (OR = 0.59; 95% CI = 0.33 - 1.07). Wire code data were also obtained in this study. Women living in homes classified as 'very high' or 'ordinary high' current configuration were not at greater risk than women living in homes with buried wires. The authors concluded: "This study does not support the hypothesis that use of electric beds or residence in a high current configuration home increases the risk of sponstaneous abortion; however, it indicates that electric blanket use at the time of conception and in early pregnancy may be associated with a slight increase in risk of pregnancy loss."

Conclusions. The data from all of these occupational studies are too limited for scientists to draw firm conclusions. Because of the scientific uncertainty, no Federal limits for worker exposures to EMFs have been recommended or established in the United States. NIOSH and other government agencies do not consider EMFs a proven health hazard. Because some studies have associated high magnetic field exposures with increased cancer risks, NIOSH and other agencies will continue studying EMFs. While research continues, NIOSH suggests that concerned workers and employers might consider simple, inexpensive measures for reducing EMF exposures, such as to: inform workers and employers about possible hazards of magnetic fields; increase worker's distance from EMF sources (about three feet from strong sources); use low-EMF designs where possible; and reduce EMF exposure times.

Appendix G. National Cancer Institute Childhood Leukemia Study

Publication. Linet, M.S., E.E. Hatch, R.A. Kleinerman, L.L. Robison, W.T. Kaune, D.R. Friedman, R.K. Severson, C.M. Haines, C.T. Hartsock, S. Niwa, S. Wacholder, R.E. Tarone (July 3, 1997). "Residential exposure to magnetic fields and acute lymphoblastic leukemia in children." New England Journal of Medicine 337(1):1-7.

Responses: Wartenberg, D.; R.G. Stevens; P. Levallois, D. Gauvin; M. Gochfeld; H. Funk; R.R.Neutra; G.C. Kabat; *M.S.Linet, R.E.Tarone, L.L. Robison*; E.W. Campion (November 13, 1997). Leukemia and exposure to magnetic fields. Letters to the Editor. ***New England Journal of Medicine***. 1997:**337**(20) p.1471-1471.

Methods. In the NCI study, Martha S. Linet and colleagues enrolled 638 children with acute lymphoblastic leukemia (ALL) from nine states. The children were under 15 years of age, registered with the Children's Cancer Group, and were matched with 620 telephone controls in a study of residential exposure to magnetic fields generated by nearby power lines. The patients and controls who participated in the residential measurement program represented 78 percent of a larger group of eligible patients and 63 percent of eligible controls. In the subjects' current and former homes, data collectors who were unaware of (i.e., blinded to) the subjects' health status, measured magnetic fields for 24 hours in each child's bedroom and for 30 seconds in three or four other rooms and outside the front door. A computer algorithm assigned wire code categories, based on the distance and configuration of nearby power lines.

Results. All estimates of risk were adjusted for the age of the subject at the reference date, the subject's sex, the mother's educational level, and family income.

The risk of childhood ALL was not linked in a statistically significant manner to summary time-weighted average residential magnetic field levels, categorized according to *a priori* criteria (above the equivalent of 2 milligauss [mG], compared with lower than 0.65 mG). The odds ratio for ALL was 1.24 (95 percent confidence interval, 0.86 to 1.79) at exposures of 2 mG or greater in their *unmatched* analysis. Their analysis that *matched* cases and controls showed an odds ratio of 1.53, with a 95% confidence interval of 0.91 - 2.56.

The risk of ALL was also not increased among children whose main residences were in the highest wire code category (odds ratio as compared with the lowest category, 0.88; 95 percent confidence interval, 0.48 to 1.63). Furthermore, the risk was not significantly associated with either residential magnetic-field levels or the wire codes of the homes mothers resided in when pregnant with the subjects.

- Risk was higher with estimated summary exposures of 3 mG or more (odds ratio in the *unmatched* analysis, 1.72; 95 percent confidence interval, 1.03 to 2.86 [a statistically significant result]; 45 case patients and 28 controls); however, risk did not increase in a statistically significant manner with increasing exposure when exposure was evaluated as a continuous variable (P for trend = 0.09 for the matched analysis). The NCI study authors

have since provided the odds ratio for the *matched* analysis, 1.82, with a 95% confidence interval of 0.92 - 3.60. The increase in risk seen here derived from a significant excess incidence of ALL at the intermediate level of 4.0 to 4.99 mG; however the odds ratios were close to unity for estimated exposure levels of 5 mG or greater. The authors stated that *they cannot exclude the possibility of a small increase in risk among children in homes with very high magnetic-field levels, as suggested in studies using historical estimates of residential magnetic-field exposure.*

Conclusions. The authors stated in summary, "our comprehensive case-control investigation did not find significantly increased risks of ALL associated with time-weighted average summary residential magnetic-field measurements or with residence in homes characterized by a high wire code category during the five years immediately preceding the diagnosis of ALL or during the index pregnancy. The finding of a tendency for risk to be higher at measured magnetic-field levels of (3 mG) or greater was based on small numbers and was not characterized by a consistent pattern or a significant trend." Their abstract concluded: "Our results provide little evidence that living in homes characterized by high measured time-weighted-average magnetic-field levels or by the highest wire code category increases the risk of ALL in children."

Commentary. It is generally agreed that the study conducted by Linet *et al* for the National Cancer Institute was well designed and conducted. Responses to the NCI study were printed in the New England Journal of Medicine (NEJM), as well as responses to the NEJM editorial that accompanied the study, which opined that "it is time to stop wasting our research resources." Many researchers who commented noted that the NCI study, while characterized as a negative study (*i.e.*, one not showing an effect of magnetic fields), actually contains some positive data, as noted above.

The author of the meta-analysis in the NAS review described above (Daniel Wartenberg) noted in his letter to the editor that the statistically significant odds ratio in the analysis for exposures greater than 3 mG is a robust result, and one that is rarely considered small in epidemiology. Even when the negative results obtained with the use of wire codes to categorize exposure are included in the meta-analysis he originally conducted for the NAS, *the combined result is still positive and statistically significant.* He further notes that the interpretation of the results is limited by possible biases. Although ALL is associated with higher socioeconomic status, the case patients in the study had markedly lower family income than the controls. Given these limitations of the study, as well as the positive results, abandoning research on exposure to magnetic fields on the basis of this study is premature.

Appendix H. REFERENCES AND FURTHER INFORMATION SOURCES

The following is a list of pertinent additional readings listed by topic: literature reviews, epidemiology studies, general information, measurements, and journals and newsletters devoted to research and news about EMF. Note that the extensive literature on this topic could not be reviewed for this report. For many of the documents, telephone numbers or addresses are printed so that anyone interested can obtain a copy of the report or article. For further assistance contact DPH at (203)509-7744.

5.1 *RECENT LITERATURE REVIEWS*

Committee on the Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. ***Possible Health Effects of Exposure to Residential Electric and Magnetic Fields.*** National Academy Press, Washington, DC. October, 1996.

Monitoring of Ongoing Research on the Health Effects of High Voltage Transmission Lines (Twelth Annual Report). K. Wasti. Virginia Department of Health Bureau of Toxic Substances. March 1997. [VA DOH, Bureau of Toxic Substances, 1500 East Main Street, P.O. Box 2448, Richmond, VA 23219 (804) 786-1763].

National Institute of Environmental Health Sciences. **EMF Science Review Symposium. Breakout Group Reports for Theoretical Mechanisms and *In Vitro* Research Findings.** March 24-27 Symposium, Regal University Hotel, Durham, NC. [Available at the Rapid Program website: www.niehs.nih.gov/emfrapid/home.htm or (919)541-7534.]

Residential Proximity to Electricity Transmission and Distribution Equipment and Risk of Childhood Leukemia, Childhood Lymphoma, and Childhood Nervous System Tumors: Systematic Review, Evaluation, and Meta-Analysis. Edward P. Washburn et al. ***Cancer Causes and Control.*** 1994:(5) p. 299-309.

5.2 *RECENT EPIDEMIOLOGY STUDIES*

K. Belanger, B. Leaderer, K. Hellenbrand, T.R. Holford, J-e. McSharry, M-E. Power, M.B. Bracken. Spontaneous abortion and exposure to electric blankets and heated water beds. ***Epidemiology.*** 1998: 9(1).

M.B. Bracken, K. Belanger, K. Hellenbrand, et al. Exposure to electromagnetic fields during pregnancy with emphasis on electrically heated beds: Association with birth weight and intrauterine growth retardation. ***Epidemiology.*** 1995;6:263-270.

B. Floderus, S. Tornqvist, and C. Stenlund. Incidence of selected cancers in Swedish railway workers, 1961-79. ***Cancer Causes and Control.*** 1994: (5) p. 189-194.

P. Guenel et al. Brain tumor risk from electric fields for electric utility workers. ***American Journal of Epidemiology.*** 1996. December 15.

J.G. Gurney, S. Davis, S.M. Schwartz, B.A. Mueller, W.T. Kaune, R.G. Stevens. Childhood cancer occurrence in relation to power line configurations: a study of potential selection bias in case-control studies. ***Epidemiology.*** 1995;6:31-5.

M.S. Linet, E.E. Hatch, R.A. Kleinerman, et al. Residential exposure to magnetic fields and acute lymmphoblastic leukemia in children. ***The New England Journal of Medicine.*** 1997:337(1). p.1-7.

S.J. London, J.D. Bowman, E. Sobel, et al. Exposure to magnetic fields among electrical workers in relation to leukemia risk in Los Angeles County. ***American Journal of Industrial Medicine.*** 1994:26.p.47-60.

D. Loomis, D. Savitz, and C. Ananth. Breast cancer mortality among female electrical workers in the United States. ***Journal of the National Cancer Institute.*** 1994: 86(12) p. 921-925.

R. Mandeville, E. Franco, S. Sidrac-Ghali, L. Paris-Nadon, N. Rocheleau, G. Mercier, M. Desy, L. Gaboury. Evaluation of the potential carcinogenicity of 60-Hz linear sinusoidal continuous-wave magnetic fields in Fischer F344 rats. ***FASEB Journal.*** 1997:11:1127-36.

J. Michaelis, J. Schuz, R. Meinert, E. Zemann, J-P. Grigat, P. Kaatsch, U. Kaletsch, A. Miesner, K. Brinkmann, W. Kalkner, H. Karner. Combined risk estimates for two German population-based case-control studies on residential magnetic fields and childhood acute leukemia. *Epidemiology.* 1998:9(1).

T. Tynes, T. Haldorsen. Electromagnetic fields and cancer in children residing near Norwegian high-voltage power lines. ***American Journal of Epidemiology.*** 1997:145:219-226.

J.D. Sahl, M.A. Kelsh, and S. Greenland. Cohort and nested case-control studies of hematopoietic cancer and brain cancer among electric utility workers. ***Epidemiology.*** March 1993:4(2) p. 104-113.

D.A. Savitz and D.P. Loomis. Magnetic field exposure in relation to leukemia and brain cancer mortality among electric utility workers. ***American Journal of Epidemiology.*** 1995;141:123-134.

J.C. Schroeder and D.A. Savitz. Lymphoma and multiple myeloma mortality in relation to magnetic field expposure among electric utility workers. ***American Journal of Industrial Medicine.*** 1997;32(4):392-402.

E. Sobel et al. Elevated risk of Alzheimer's disease among workers with likely EMF exposure. *Neurology*. December 1996.

G.P. Theriault, M. Goldberg, A.B. Miller, et al. Cancer risks associated with occupational exposure to magnetic fields among electric utility workers in Ontario and Quebec, Canada and France: 1970-1989. ***American Journal of Epidemiology.*** 1994:139(6) p. 547-572.

T. Tynes, H. Jynge, and A. I. Vistnes. Leukemia and brain tumors in Norwegian railway workers, a nested case-control study. ***American Journal of Epidemiology.*** 1994: 139(7) p. 645-653.

5.3 *GENERAL INFORMATION*

EMF Infoline. Maintained by the National Institute for Environmental Health Sciences. (800) 363-2383.

NATIONAL CANCER INSTITUTE CancerNet. Toll-free telephone number: 1-800-4CANCER (1-800-422-6273). Internet: http://cancernet.nci.nih.gov.

NATIONAL TOXICOLOGY PROGRAM. NTP Liaison Office, P.O. Box 12233, MD A3-01, Research Triangle Park, NC 27709; (919)541-0530.

NIEHS EnviroHealth Information Line. Toll-free telephone number: 1-(800)-NIEHS-94 [1-800-643-4794]. NIEHS World Wide Web server: htt:://ntp-server.niehs.nih.gov.

Questions and Answers About Electric and Magnetic Fields (EMF). EPA Office of Radiation and Indoor Air. (EPA #402-R-92-009) December 1992. [Center for Environmental Research Information (CERI) (513) 569-7562].

Questions & Answers About Electric and Magnetic Fields Associated with the Use of Electric Power. January 1995. National Institute of Environmental Health Sciences (NIEHS) U.S. Department of Energy (DOE).[NIEHS (919) 541-5085: DOE (202) 586-5575]

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5.4 *MEASUREMENTS*

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Measuring Power Frequency Fields. Carnegie Mellon University. 1993 [Carnegie Mellon University, Department of Engineering and Public Policy, Pittsburgh, PA 15213 Attn: EMF; $2.50 each].

What Can We Conclude from Measurements of Power Frequency Fields? Carnegie Mellon University. 1993 [Carnegie Mellon University, Department of Engineering and Public Policy, Pittsburgh, PA 15213 Attn: EMF; $3.00 each].

5.5 *JOURNALS AND NEWSLETTERS*

Bioelectromagnetics. Journal of the Bioelectromagnetics Society. John Wiley & Sons, Inc., Subscription Department, 9th Floor, 605 Third Ave, New York, NY 10158-0012 [(212) 850-6543].

EMF Health and Safety Digest. P.O. Box 14501, University Station, Minneapolis, MN 55414-0501 [(612) 623-4600]. [http://www.rsba.com/hsd/hsd_highlight_f.shtml].

EMF Health Report. Information Ventures, Inc., 1500 Locust Street, Suite 3216, Philadelphia, PA 19102-4321 [(215) 732-9083].

EMF RAPID Program. National Institute for Environmental Health Sciences (NIEHS), National Institutes of Health (NIH). P.O. Box 12233, MD EC-16, Research Triangle Park, NC 27709. [(919) 541-7534. http://www.niehs.nih.gov/emfrapid/html].

Electric and Magnetic Fields, Law and Policy Databases. The Environmental Law Institute, Center for Public Health and Law, 1616 P Street, N.W., Suite 200, Washington, D.C. 20036. [(202)939-3800; eli@eli.org (e-mail)].

Microwave News. P.O. Box 1790, Grand Central Station, New York, NY 10163 [(212) 517-2800]. [http://www.microwavenews.com/index.html].

VDT News. P.O. Box 1799, Grand Central Station, New York, NY 10163 [(212) 517-2802].