New Brunswick Board of Commissioners of Public Utilities

In the Hearing of an application by NBP Distribution and Customer Service Corporation (DISCO) for changes to its Charges, Rates and Tolls - LOAD FORECAST

Trade and Convention Centre, Saint John, N.B.
November 28th 2006

Henneberry Reporting Service

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Undertakings

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CHAIRMAN:	David S. Nelson
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BOARD COUNSEL:	Ellen Desmond
BOARD STAFF:	John Lawton
BOARD SECRETARY:	Lorraine Légère
ASSISTANT SECRETARY	Juliette Savoie

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CHAIRMAN: Good morning. This hearing arises from the application made by DISCO with respect to a request for a change in its rate -- charges, rates and tolls.

The original application was made in March of 2005 but it is agreed that this portion of the hearing, specifically the load forecast methodology hearing, would be conducted after a decision has been issued on appropriate rates.

Could I have appearances, please, for the Applicant?

MR. MORRISON: Good morning, Mr. Chair, Commissioners.

Terry Morrison on behalf of the Applicant and again with me at counsel table is Lori Clark and Mike Gorman.

CHAIRMAN: Thank you. Canadian Manufacturers and Exporters? New Brunswick Conservation Council?

MR. COUTURE: Toby Couture representing the Conservation Council of New Brunswick.

CHAIRMAN: Thank you. New Brunswick System -- JD Irving Limited? New Brunswick System Operators?

MR. ROHERTY: Good morning, Mr. Chair, Commissioners. Kevin Roherty for New Brunswick System Operator. With me today are Margaret Tracy and Ian MacPherson.

CHAIRMAN: Vibrant Communities Saint John? We will record Mr. Peacock when he comes in, recognize him. Public Intervenor?

MR. HYSLOP: Good morning, Mr. Chair. Peter Hyslop. With me today is Mr. O'Rourke, Ms. Power and our witness who we will be hearing from later today, Mr. Wayne Olson.

CHAIRMAN: New Brunswick Power Generation Corporation? Municipal Utilities?

MR. YOUNG: Good morning, Mr. Chairman, Commissioners. Dana Young for Utilities Municipal and with me is Marta Kelly again.

CHAIRMAN: And Board staff?

MR. DESMOND: Good morning, Mr. Chair. Ellen Desmond as

Board counsel and with me is John Lawton and Dr. Jerry Jackson.

CHAIRMAN: Thank you. Preliminary matters?

MR. MORRISON: Nothing at this point, Mr. Chair, but we expect that we will have at least three of the undertakings ready by lunch time or shortly thereafter.

CHAIRMAN: Thank you. Is there any other preliminary matters?

The Panel has decided that we will take written final submissions and the final -- the submissions be in by noon, December 15th, with rebuttal from the Applicant at noon December 20th.

MR. MORRISON: That's fine, Mr. Chair. Thank you.

CHAIRMAN: Is that fine with the other participants in the room?

MR. ROHERTY: That's fine with NBSO.

MR. HYSLOP: It will just be the written submissions, Mr. Chair, is that the intention?

CHAIRMAN: Yes.

MR. HYSLOP: The 15th is acceptable.

CHAIRMAN: Thank you. Do we have any exhibits to mark at this point? Okay. So, Ms. Desmond, would you like to carry on with your --

MR. DESMOND: Thanks, Mr. Chair.

CROSS-EXAMINATION BY MS. DESMOND (continued):

Q.288 - Mr. Larlee, when we spoke yesterday we talked about the CDA study that was conducted in 1990 by DISCO. And I believe it was your evidence that that hadn't really worked out for DISCO, that they didn't find it useful. Are you aware, sir, that most end use models apply CDA for their own service areas, using data from their own service areas?

A. No, I wasn't aware of that. My research has indicated that the CDA studies that I have seen appear to be for only much larger utilities or even groups of utilities, in other words, entire jurisdictions or service areas.
Just to perhaps provide a little bit more information on the work we did do on conditional demand analysis back in 1990, that was around the same time frame as there was a lot of work going on in DSM, there were several studies underway including the Marbeck study which I think everyone is probably familiar with.
So when we didn't get terribly favourable results out of our analysis in using conditional demand analysis we opted to use the figures that were available through the demand side management work that was being done at the time.

Q.289 - You talked about the fact that when you conduct your

surveys there are a number of questions. Have you considered adding just even a few questions to address some of the difficulties that arose from the 1990 study?

A. Well I think as I mentioned yesterday, every time we do a study there is always interest in finding out more, and we are always concerned about lengthening the study affecting the response and the rate of response.

This last study, even though we knew that natural gas penetration would likely be very low, we felt that it was still prudent to add questions about natural gas usage.

So that was sort of really the limit of what we wanted to do as far as adding questions to the questionnaire.

But whether or not we considered adding specific questions to the questionnaire as a result of the conditional demand analysis work we did in the early '90s, I really don't know.

Q.290 - Sir, I understand from your evidence that you use Natural Resource Canada information when you look at efficiency increases, is that accurate?

A. Yes, that's accurate.

Q.291 - And, sir, I provided your counsel with a document that outlines the efficiency usage that's provided by Natural Resources Canada. Have you had a chance to look at that?

A. Yes, I have.

Q.292 - I just wanted to identify, on that document the NRC shows stock you receive of 778 for refrigerators and 572 for freezers for the 2004/2005 year. Would you agree with that?

CHAIRMAN: Ms. Desmond, where do we find that?

MR. DESMOND: Sir, that has not been submitted as part of the evidence but I can certainly undertake to provide you with a copy of that.

CHAIRMAN: Please. Thank you.

A. The document I was given, I'm sorry but I can't find those numbers. The document I was given shows total energies in what I believe are pentajoules. So I'm not sure that I was given the correct document.

Q.293 - My apologies, Mr. Larlee. I think I gave you the other document with the other information, but I believe you have that now in front of you?

A. Well I have a document that we have been looking at over the last little while. I guess I'm not 100 percent convinced that we are all looking at the same document.

Q.294 - Is that a -- does it show for 2004/2005 stock UEC of 778 for refrigerators and 572 for freezers?

A. Yes, it does.

Q.295 - And, sir, if I could bring you to your information that was filed under LFIR-1, that's a PUB IR, it's in

exhibit A-5 --

A. Yes, I have that IR.

Q.296 - Thank you. Can I bring your attention then to 2004/2005. And with respect to refrigerators the number that DISCO has used is 960, and I believe for freezers 617. Would you agree with that?

A. My apologies. What year are we looking at again?

Q.297 - The same year we had looked at with respect to the NEC, the 2004/2005.

A. Yes, I see the 960.

Q.298 - And the 617 as well?

A. Yes.

Q.299 - And, sir, you would agree that's a difference then of 227 kilowatt hours per household for just those two appliances?

A. There is a difference in the numbers. I guess what I'm working through my mind making sure that we are comparing apples and apples. So if you could just give me one second, I just want to make sure I know what I'm looking at here in this IR.

So what we are looking at in table 1 is -- I believe it's the stock UECs that are in the model. Again, just give me one second. Okay. I'm glad I looked that up.

So what we are looking at here is the end result of

the appliance efficiency model. So this is what the forecast would be based on. So it's a blend of the stock and the new appliances coming on line as the old stock has aged. So that's what -- that's what is coming from the forecast. Now if we look at what we are looking at for UECs from Natural Resources Canada, I guess it's not clear to me whether these are looking at an average of the stock or old stock.

Q.300 - So is it fair to say that the average stock and the older stock would be the same thing?

A. Well the way the model works that we are using is that we set -- we set the stock numbers at a certain point in time, which I believe it's part of an undertaking I was going to confirm that, but it was in the early '90s. Again, it would have all been part of the DSM work that was done back there. We would have set levels of the existing stock.

And then in each successive forecast going forward we would have updated numbers for what the new stock values were and continued to age the old stock. So that we have in this table, table 1 in the IR response, we have what our estimates are for essentially the average of all the appliances.

Q.301 - But, sir, you are relying on this data from Natural Resource Canada and it's my understanding that they do that same analysis, that same comparison, is that fair?

A. Well we are relying on Natural Resources Canada to give us the number for the new stock. So every time we do a forecast we would look at what their estimates are for the new stock and include that into the forecast.

We now -- obviously we see numbers here from Environment -- sorry -- from Natural Resources Canada of the average blend of the stock, and I would agree with you. I think that we are probably at a point in time where we should go back and look at these numbers for the entire average stock and see how they compare to our numbers.

We have talked about the possibility of contacting Natural Resources Canada and seeing if they have any New Brunswick specific data and -- or if they can develop New Brunswick specific data for us. But I think that's just part of the evolutionary process of trying to improve this model.

Q.302 - If you would just bear with me, I would like to walk through another sort of set of data. If we are looking at the Natural Resource Canada residential UEC for 1990 for refrigerators, I believe there is a UEC of 1525?

A. Yes, I see that.

Q.303 - And in 2004 a UEC of 778. And that would be -- would you agree, sir, that that's a drop of approximately 50 percent?

A. Yes, I would agree.

Q.304 - And again now if we look at DISCO's information for 1989/1990 there would be a refrigerator UEC of 1228.

A. Yes, I see that.

Q.305 - And in 2004/2005 with DISCO there is a drop of only 20 percent. It's down to 960. And that's in the same time period. Would you agree with that?

A. Yes, I would agree with that. Let's keep in mind that when this forecast would have been prepared we would have been using the new appliance UECs that were likely available in the 2002 column. So I mean, we are sort of mixing up actuals and forecasts, but -- and your comparison is what it is.

Q.306 - Could I bring your attention to LFIR-5 PUB. Sir, in your response you have indicated that DISCO does not have sufficient information or sample points to gain further information from the results. Is that an accurate reflection of your answer there?

A. Yes.

Q.307 - But, sir, would you agree that with respect to the

number of sample points isn't it true that with a load research sample of approximately 200 customers and with 8,760 hours in a year, you actually have in excess of 1,700,000 hourly kilowatt observations on dwelling unit electricity use?

A. That sounds like a, you know, a fair multiplication. The point here is that any sample design is only as good as what it's intended to do. And this sample design was intended to provide peak hour load for the residential rate class.

It was specifically designed for winter peaking utility and we targeted the winter months to do that design. And knowing full well that the precision level of the results were going to deteriorate as we moved away from those winter months.

So I guess it's beyond me how we could hope to get really useful results not only at a sub-class level but at months other than the peak months.

Q.308 - So you would agree that you can do more than one exercise with the same set of data, would you agree with that?

A. Well there is no question, and I'm all for trying to suck as much out of the data as you possibly can, but I think we have to be realistic and we don't want to go on a

whole bunch of wild goose chases either.

Q.309 - Has there been any effort to engage in any other exercise with that data?

A. Yes. Yes, there has been. When the load research sample was undertaken, every customer was visited by an energy advisor and they were interviewed, and we collected as much data as we could on those customers.

However, we found a lot of difficulties with the data when we tried to work with it and really ended up that the only piece of information we were able -- we felt we were able to use to give us reasonable results was whether or not they were electrically heated or not.

And as I have indicated in several IRs that we ended up restratifying the sample based on those responses along the lines of whether the customer was electrically heated or non-electrically heated.

Q.310 - Sir, can I bring your attention to page 45 of your residential load research preliminary report which I believe is at Appendix 1.

A. I have that.

Q.311 - Sir, did DISCO estimate the temperature effect as a function of temperature in this particular setting? And don't those relationships provide information that could be used to estimate space hitting UECs for the sample of

customers?

A. Well, this is an example of an exercise that we undertook to try and get as much information out of this program as we possibly could.

This particular exercise was undertaken really to compare the load research results against our weather effects analysis that we would do at the total class level, which essentially is part of load forecasting to adjust our load to weather sensitive loads and normalize them. So it wasn't undertaken for any end use analysis.

Q.312 - Sir, couldn't similar graphs and estimated relationships reveal useful information on overnight standby water heating use and reveal hourly energy use profile differences reflecting differences in appliances and usage across the sample of load research customers?

A. Well, I will just draw your attention to this figure on page 45, figure 25. You will note that it is only for January. Other winter months have been done as well, as you can see on the table below.

But we didn't feel that we could extend the analysis beyond the winter months. I would be very, very hesitant to lean too heavily on this data in the non-winter months.

Q.313 - Sir, could you advise the Board what you do need then to estimate KWH in the summer months?

A. Well, my understanding is in talking to other load researchers is what utilities do, if they peak both in the summer and the winter, they are dual-peaking utilities, which in some of the midwestern states that happens, is they actually essentially have two separate samples. So they will have -- and some of the customers, and perhaps even all of the customers are in both samples. So they will -- they would do a sample for the winter months, then restratify, essentially mix all the customers up again and create new stratifications and then use a new sample for the winter months.

Larger utilities will actually do that 12 times. So they will do it for every month. So it can be quite an exercise. But it can be done.

Q.314 - Mr. Larlee, I believe that yesterday you indicated that basically you used data with less than 5 percent error at the 95 percent confidence level. Or that may have been in your written testimony. Is that accurate?

A. Yes. That's the design precision of the sample.

Q.315 - If I could just bring your attention then again to PUB, our interrogatory number 1, table 1. And in particular to the miscellaneous category, years 2001/2002 and then to 2002/2003.

A. Yes, I have that.

Q.316 - In light of your evidence could you answer then how much of the increase in that category was to adjust for a parameter error?

A. Well there wouldn't be any adjustment for parameter error. What is happening here is every time we do the forecast we recalibrate and we reset the values for electric heat and water heat -- I think I explained this yesterday -- and the base load.

Then the model goes through and using the appliance efficiencies estimates the effect of appliances becoming more efficient. What isn't picked up in appliance efficiencies is the miscellaneous. So what you are seeing here is the change in the calibration is being picked up in the miscellaneous load.

Q.317 - So is it fair then that the true value of that parameter change or the recalibration for that particular year was 34 percent?

A. I guess the math looks right, yes. But if you look at the stream of numbers in general, what you are basically seeing is you are seeing that miscellaneous sector growing, and I don't think that should be surprising to anyone.

We tend to call it plug load because that's exactly what it is. These are things people plug in. And I don't

know if anyone has experienced what I have experienced in my household, but we are constantly plugging in new technologies. If it's not a computer or a printer or a new TV or a cordless phone -- it just -- it seems endless. And this is a phenomenon that is occurring across North America, if not the world.

Q.318 - Sir, could you just enumerate again what type of appliance would have resulted in a difference of 724 kilowatt hours? You indicated that there has been some shift or change.

A. Well I can't nail it down to an appliance. What is happening here is that we are -- when we do the forecast, we are using the best data we have available. And we start with the number of customers. Then we look at the sales and we weather adjust those sales.

Then we estimate the base load and estimate the electric heat consumption and the water heat consumption, and what is left over then basically gets moved into this model that we are looking at now.

So it is simply a recalibration of the numbers that we are using. On a go forward basis we are trying to use the best available data we have.

Q.319 - But, sir, would you agree that -- I mean, that's a significant jump in any one year. And how is it that you

would have used, you know, a number for quite a long period of time and not have noticed that it was too large?

A. Well, you know, we noticed as soon as we redid the forecast. It's a function of the methodology we are using. It's providing reasonable results overall.

Q.320 - Would you agree that there is a bit of an element of judgment or discretion that might play a role in making that change?

A. Well the actual calibration analysis which is on the record as well doesn't have a lot of room for judgment. I mean, forecasting in general there is going to be judgment and if there is judgment at play here the judgment would be, does this particular area of the model deserve some attention and deserve to be reviewed and possibly refined? And I think everyone would agree here that that is the case.

Q.321 - You would agree, Mr. Larlee, that by adding 724 kilowatt hours to that miscellaneous category is as a result of that magnified in the forecast, because in your forecast the miscellaneous UECs seem to grow at 4 percent compounded annually, isn't that correct?

A. Yes. The miscellaneous is -- does have a growth factor to it, but let's not forget that the entire calibration is based on actual sales. So the total amount

-- what we are talking about here is how are we slicing up the pie. The total amount is based on actuals. So as a starting point we know we are not out of whack because we actually had those sales.

Q.322 - Can I ask, Mr. Larlee, by adding that 724 to the miscellaneous category, what is the result in the 2015 forecast? What is the difference in kilowatt hours? Would you agree that it is approximately 1,100 kilowatt hours once it is compounded annually?

A. Yes, we are in the right ballpark.

Q.323 - And if we took that same 724 kilowatt hours and shifted that to water heating, and assuming the efficiency increases of water heating were a factor, then would you agree that that kilowatt hourage would actually shrink from 724 to 607 by 2015?

A. Yes, it would. But you would have no basis for shifting it to any particular category. We know -- we know there is going to be a decline in water heating because household size is declining.

We know people are insulating their homes continuously and improving the thermal envelope of their homes so heating load is going to decline continuously.

We know appliances are getting more efficient and the appliance efficiency model decreases same.

So the only place left really is the miscellaneous category, that we would logically put those kilowatt hours. And it is a well documented fact that this is a particular category of electricity sales that is growing.

Q.324 - But if I could just be clear, when you are doing that calculation and you are putting those kilowatt hours in miscellaneous, you actually took the information to make that decision from other jurisdictions. Is that correct?

A. Well I'm not sure I follow you, but I mean, the process we go through when we do a forecast to calibrate water heat, space heat, and base load is entirely New Brunswick based information.

The UECs is -- are based on information both from outside New Brunswick and inside New Brunswick.

Q.325 - But I understood that the UECs, a big piece of your information was from outside of New Brunswick? And really, aren't those a function of income and demographics when we look at calculating the miscellaneous UEC?

So how can we be sure, Mr. Larlee, that this is actually appropriate data for New Brunswick?

A. Well the UECs that come from outside New Brunswick are the new appliance UECs. And I honestly don't know why New Brunswickers would be buying different appliances than anywhere else in the country. So I think using UECs,

national UEC numbers is a reasonable response.

Q.326 - But sir, where does the stock average of UECs come from, the data?

A. The stock average would have been developed, as I said, early in the 90s and has been aged ever since then. And I think we agree that we can look at those -- there is work to be done here to look at those UECs and update them.

Q.327 - Sir, on what basis have you determined that the miscellaneous UEC category is likely to grow at a 4 percent compound annually instead of 2 percent, as an example?

A. Well that 4 percent was based on an analysis that was done sometime ago. And believe me, I have tried to put my hands on it and have been unable to. But it was based on an empirical analysis.

Q.328 - Are you able to give any additional information with respect to that analysis even if you don't have it today? Can you recall or provide any further information on that for the Board?

A. No, I'm sorry, I can't. It is before -- it was before my time and any of my staff that it would have been done.

Q.329 - Is it fair to say then that it hasn't changed in the past number of years then that you have been with DISCO?

A. Yes, that is fair.

Q.330 - Sir, could I bring your attention to LFIR-5, that is PUB-5.

A. I have it.

Q.331 - And sir, in your response you believe that DISCO's approach to changes in forecast has been one of evolution not revolution. Is that a fair statement?

A. I'm sorry. Did you say PUB IR-5?

Q.332 - Just one sec'. I will find the correct reference there.

I could simply ask you, sir, do you recall making the statement that DISCO's approach is one of evolution instead of revolution?

A. Yes, I do recall making that statement.

Q.333 - And sir, with respect to the load forecast document that is exhibit A-6 issued in May of 2005, does that document -- can you tell us does that document present saturation in UEC forecast details for the individual end use?

A. No, it doesn't. It just discusses the methodology used and presents the results of the forecast, which is a common approach in other utilities' forecasts, that I have seen.

Q.334 - And sir, where in the document are the impacts of

changes like the changes made in 2003 to the space heating and the miscellaneous category? Is it particularly described in that forecast document?

A. No. The particular years or the details of the calculations aren't part of the document.

Q.335 - Would it be fair to say that much of that information would normally be included in an appendix or appendices?

A. Not in the utility forecasts that I have seen.

Q.336 - So based then on the document that is available for review, would you agree that the average person or an intervenor would have to know the right question to ask and have the knowledge really of end use modeling issues to understand the particular forecast, given that those details are not available?

A. Well, I think it's fair to say that utility forecasting in general is probably specific enough that, you know, it would help if the intervenor had certain knowledge about it for any questioning. I don't know if I would zero in on the end use modeling.

I mean, if you don't know anything about regression analysis you can't ask a whole lot of questions about the general service econometric model. It's a nature of the undertaking.

Q.337 - But sir, the critical assumptions, are they even clear

in the forecast document? Would you agree that the critical assumptions upon which people would base their questioning is not available?

A. Well, I mean, my understanding of the regulatory process and the reason why we have the interrogatory process is so that people can get all the information they need.

And I certainly hope that everyone feels as though DISCO has provided all of the information freely. Because I have strived very hard to do just that.

Q.338 - Sir, are you familiar with the first residential end use model that was developed in 1976 at Oak Ridge National Laboratory?

A. No, I'm not.

Q.339 - If I suggested to you that that model included price impacts explicitly in the model structure and permitted historical forecasting capabilities, would you have any argument with that?

A. I guess I would have no basis to argue.

Q.340 - So using that model then, would it be fair that DISCO might want to explore incorporating energy prices directly in the end use model or use a structure that permits the historical forecasting?

A. Well, the point of historical forecasting, I think we

answered some IRs, that we think that that's a very good suggestion on the part of Dr. Jackson.

And we are planning to look at that and incorporate that in the model. And preliminary indications are that that should be something that can be done without a whole lot of work.

On the point of pricing, we do have an adjustment to the model for price in the residential -- in the residential model. Can that be improved? There has been -- believe me, there has been a lot of discussion in my group about how best to do that.

And certainly if the parties here can bring forward some better ways of including price into the end use model, I'm all ears. Because as I said, it has been a topic of some heated debate.

Q.341 - So I take your evidence to mean or suggest that it would be prudent to have price impacts explicitly in the model if that was possible?

A. Well, I think it would be prudent to examine it. I mean, I'm not going to sit here and say that it's the right way to do it without taking a look at it and having my staff take a look at it and see how it can be done, what would be required to do it and what results we can get.

Q.342 - Sir, would you agree that most end use models do have the price explicitly in the model?

A. I can't say.

Q.343 - Sir, has DISCO incorporated DSM or alternative pricing relationships explicitly in the residential end use model to evaluate the costs and benefits of these programs?

A. Well, we talked a fair bit about DSM yesterday. And I tried to make it clear that DSM basically does a separate step outside the load forecasting process.

There is efficiencies built into this end use model as a result of more efficient appliances coming on line. And there are reductions in the space heating load as a result of people improving their insulation. But beyond that there is no other DSM effects.

Q.344 - Sir, I just want to ask you a couple of questions around natural gas.

Does DISCO plan to incorporate a space heating and water heating fuel choice component in the model, so that the assumptions or the judgment that is currently used can be replaced with a modeling approach that responds to relative electric and natural gas prices?

A. I guess the answer is no. At this point we think that we are getting good results from the adjustment module that we are using for natural gas in residential.

I'm not sure replacing that model with any other type of model would reduce or remove judgment from the process. This is a greenfield introduction of natural gas. And determining how it gets penetrated into the market is not an easy thing.

We obviously -- you know, we relied on Enbridge Gas New Brunswick's estimates early on. They were very aggressive. We have had to back away based on actual experience from those early on estimates. There has been a large increase in the price of natural gas in this entire period.

So I really -- I fail to see how switching out one model for another is going to remove judgment from the process.

Q.345 - But sir, how do you handle a situation where natural gas prices perhaps dropped dramatically? How would you respond to that kind of scenario? How does your model respond to that?

A. Well, we would respond when we saw the uptake in natural gas, the activity in the natural gas sector increase.

I mean, just because the price of natural gas changes in the short-term doesn't mean that within days or months that people are going to run out and get natural gas

installed.

I mean, there is a lot of factors at play, and not the least of which is how rapidly Enbridge expands their network.

Q.346 - So sir, you would agree then that your response would be sort of reactionary, that it would not -- the model doesn't allow for forecasting or incorporating the possibility of a significant change in natural gas pricing?

A. Well, any model would be reactionary as the price changed. If you could just input the price you are still reacting to price change.

But when we saw that natural gas wasn't going to reach the penetration levels as quickly as originally forecasted, we immediately made the change to the very next forecast. And I think since those -- I guess it was the second year we had natural gas, the forecasts -- since then our estimates have been relatively steady. So I'm not sure I would characterize it as reactionary.

Q.347 - Could you speak just for a few moments around the sensitivity analysis that DISCO conducts with respect to their modeling?

A. Are you referring to the table in the load forecast

document? There is a sensitivity table. Maybe I will take you to it. It's on page 40.

Q.348 - We don't necessarily need to refer to the table. I'm just asking generally, you know, what testing DISCO does to get a sense of the uncertainty in your forecast.

If you could basically outline for the Board how that happens?

A. Well, the uncertainty in the forecast is going to be driven by several things. And they are shown in the table really. The largest of them are shown in the table on page 40 of the load forecast document.

But the largest of which are temperature, heating degree days essentially, the temperature over the course of the year and the loss of any large industrial customer. So those are really what's going to drive changes in the forecast.

Obviously if there is a change in GDP growth or a sudden change in natural gas penetration, those will affect the forecast as well.

In the past, in past forecasts we have attempted to do a statistical sensitivity which essentially is what is called the Monte Carlo simulation. And a Monte Carlo simulation -- the reason why it's called Monte Carlo is because it's like rolling the dice.

What you do is you look at all of the inputs, your forecast. And you try to predict a probability that those inputs are going to change. So you actually have to build a little -- or essentially estimate the statistical quantities around every variable.

I guess the best example is is it going to follow a normal curve like the bell curve? Or is it going to follow some other type of probability? Maybe it's shaped like a pyramid or it's shaped like a ramp.

Then once you have got all that figured out -- and as you can imagine, there is a significant amount of judgment -- you would throw all this into a computer program which would then run up to -- I think when we did it we did 10,000 runs.

So it goes in essentially, like I said, rolls of the dice on all of these variables with their different probabilities, and gives you a band.

Well, when we did that we found out that, you know, the most likely things that are going to change the forecast is weather and large industrial customer variation. We essentially didn't learn a whole lot.

And the end result is, depending on how you define the changes of these variables and how you apply your judgment in that regard, you are going to get different results.

So we essentially stopped. We did it just one for forecast. And we didn't attempt to do it again. Because we didn't see a whole lot of value in it. And as you can imagine, it's very time-consuming as well.

So the sensitivities that we are showing in the forecast now I think are as good as reasonably we can get. And as I mentioned yesterday, during the integration process, when we are capacity planning and we are integrating the demand side management options and the supply options, there is sensitivities applied at that point as well.

If you go back and look at the integrated resource plan from the Point Lepreau study, you will see that at that point in the process they did apply a plus or minus 10 percent bandwidth to the forecast to test their capacity planning options.

So it's not that there isn't some type of a band put around the forecast for planning purposes. It's just we are not doing it specifically in the forecast itself.

Q.349 - Mr. Larlee, if I could just speak for a moment about the GS econometric model. And my question to you is could you advise the Board are the GS 1 and 2 sales estimated together in that same econometric model?

A. Yes, they are.

Q.350 - And are price responses likely to be the same for customers in GS 1 and GS 2 classes?

A. Probably not. The GS 2 class is electric heat. And the GS 1 class, the larger customers are not electric heat. And the smaller customers would be a mix of both electric heat and nonelectric heat. So there would be a difference in price response.

But we felt that it was best to model -- well, we have modeled that class as an entire class for forecasting purposes, simply because the actual customers themselves are all the same.

I mean, whether or not they are electric heat or nonelectric heat, they are either institutional or commercial customers.

Q.351 - Although, sir, you put them in the same class, would you suggest to the Board that a school would respond the same at pricing as perhaps an office building would respond to pricing? Is that your suggestion?

A. No, I'm not suggesting that. But what we are trying to do here is forecast the class. And I think when it comes to trying to estimate elasticities, which is not a particularly easy thing to do, you are just as well off in an aggregate sense as you are trying to -- as trying to refine it down into a very fine level.

For instance, if we tried to estimate the elasticity of an individual home, there are so many other factors involved when you get down to a very fine level, that I can't imagine it making any sense.

Q.352 - I guess just as a follow-up though, it seems like that GS I and GS II represent very different subsectors. And could I suggest that perhaps a single econometric model is not necessarily appropriate to represent these two different -- distinctly different classes?

A. Well I would -- I would disagree. They are essentially the same customers. They are schools, they are warehouses, malls, retail, office buildings.

Q.353 - Sir, with respect to the small industrial econometric model, there are four subsectors I believe in that category. My question to you is have you tested the econometric model to verify that each of those subsectors have the same price or whether GDP coefficient values?

A. No. We have done the industrial class as a total class. And your comment about there being four subsections, I'm just trying to look for the pie chart here in the report. I believe there are many more than four subsectors to that class.

The reason why we have identified -- it's on figure 8, page 20 of the report. The reason why we have identified

four is because for the reporting purposes it effectively divides the pie up into four relatively equal pieces. But if you were to look at the sic codes under the industrial there is certainly many, many more than just four. So we come to the question of, well where do you draw the line and at what point? I mean we have drawn the line at the class level because that's really what we are trying to forecast.

Q.354 - Sir, have you econometrically tested GS space heating and non-space heating to determine if the structure is similarly -- statistically similar?

A. Just so I'm clear, you are talking about general service?

Q.355 - Yes.

A. And when you say structure, the structure of?

Q.356 - What I mean to suggest there is the same coefficient values?

A. No. We haven't -- we haven't separated those classes for forecasting purposes. The classes are separate for rate purposes -- for ratemaking purposes, but for forecasting purposes they are considered a single sector.

Q.357 - But, sir, you haven't tested that approach?

A. No, we haven't. And now that the general service II class is closed, I am not sure there would be a whole lot

of value in separating it on a go forward basis either.

Q.358 - Mr. Larlee, could you describe the analysis, the GS and small industrial peak demand and hourly load analysis that was undertaken with information on the 650 GS interval meter customers? What specifically has DISCO done with that information?

A. We have about 650 interval meters on larger commercial and industrial distribution customers that these meters can basically provide low profile data. Those meters were installed on those customers either for reasons of market research, initially they were installed it would have been in the mid '90s and there was a firm belief that retail competition was imminent.

And that as everyone knows because of the general service class, the rates are above cost, that that particular group of customers would be considered the low hanging fruit by any competitor. And so there was a push to get load profile data on those customers, particularly the larger ones, as quickly as possible.

Since then the meters have been deployed and either based on requests from account managers, because customers had particular concerns, having some difficulties at their site, or on the customers themselves because the customers wanted the load profile data for their own purposes,

whether it be to improve their energy efficiency or for other reasons -- other production reasons.

The data -- we have the data and it resides with us. At various times we have looked at particular groups of customers. We have used it to sanity check some of our rate design studies. But it's important to note that there is not a statistical sample for the class, either general service I, general service II, the two combined or small industrial.

Q.359 - Mr. Larlee, I believe that yesterday you indicated to the Conservation Council that one of the large industrial customers in the pulp and paper sector had shut down its manufacturing operation and was not a load customer at present. Could you indicate to the Board the annual load reduction in gigawatt hours as a result of the loss of that customer?

A. I don't have that information with me.

MR. MORRISON: There is one other issue, Mr. Chairman. We have run into it before. It's the confidentiality issue. And I know we can provide the data without the name, but because there are so few large industrial customers I think anybody knew the gigawatt hours they would be able to identify the customer. So I don't know. We could provide the information in a confidential fashion.

CHAIRMAN: Mr. Morrison, I have to -- I think we can guess which customer it is.

MR. MORRISON: I think we can as well, Mr. Chair.

CHAIRMAN: I think there would be a little bit of an issue -- or I would say it would be a little bit more complicated than that, because where they had their own generation, wouldn't that sort of convolute any answer?

MR. MORRISON: I don't profess to be able to answer that, Mr. Chairman. You are probably correct. I think the operation -- I think we all know what we are talking about -- did have some cogen.

CHAIRMAN: Yes. And right now DISCO is buying the generation that is coming from there now, from their hydro operation?

MR. MORRISON: That's correct.

CHAIRMAN: Okay. I think we will pass on that one.

MS. DESMOND: Thank you, Mr. Chair.

Q.360 - Mr. Larlee, in your PUB LFIR-15, and that's with respect to the transmission losses -- if you want to flip to that response.

A. Yes, I have it.

Q.361 - I believe in that response you indicate that the system losses are now calculated at 2.5 percent versus the 3.3 percent that was stated in your earlier evidence, is

that correct?

A. Yes, that's correct.

Q.362 - And can you confirm just for the benefit of the Panel that as a result of this forecast reduction, that there is a load reduction of 120 gigawatt hours per year. Is that correct?

A. Yes, that's the estimate. I mean it's obviously a high level estimate. You can see the numbers right there. But in future forecasts we will be using this loss factor, 2.5 percent.

Q.363 - In the load forecast document itself, sir, if I could bring you to page 19.

A. Yes, I have that.

Q.364 - I believe in the first paragraph, the third line, there is a reference there to 34 -- the 34 KV. And I'm wondering -- I think in previous history DISCO has used a 69 KV and I'm wondering why there is a difference now? Why has that been reduced?

A. Well there is a very short transmission line of 34 KV. I'm not sure it's still in service but it has been in service in the past and we did consider that transmission. And it may be actually owned by a customer.

Q.365 - Sir, if I could bring you to page 30 of the load forecast.

A. Yes, I have it.

Q.366 - And my question is, what rate classes -- what rate class increases are used in load forecasts, because I believe you reference here that there are anticipated real price increases? What are you referring to there?

A. Well at the time the load forecast was prepared, we were in the midst of the business planning cycle. So I used the most up to date information from the business planners that I could get my hands on, and that was used as the rate increases outing time.

If you want the specific rate increases, they are on the record in the previously filed information and I can take a minute or two here and dig them out.

Q.367 - Perhaps we might ask your counsel to provide that information on a break.

A. Sure. I mean it will take me 30 seconds here, but -- yes, no problem.

Q.368 - Can I bring your attention now to PUB interrogatory 17. Sorry, Mr. Larlee. That's actually in A-4, not A-5. That's in the previous evidence. So, Mr. Larlee, I believe that that document includes a table comparing the annual operating cost for different types of home heating?

A. Yes.

Q.369 - And that response by DISCO clearly shows that heating

with electricity is the most cost effective, is that correct?

A. Yes. When this analysis would have been done -- it looks like it's using July 7th, 2005, electricity rates, and June 2005 natural gas rates -- that was our conclusion, yes.

Q.370 - And, sir, I believe that that response was not updated for this proceeding, is that correct?

A. No. No one asked for this particular IR to be updated.

Q.371 - So that this document then would not include or reflect the latest rate increase by DISCO, is that correct?

A. That's correct. It would not and it would not include changes in oil prices or changes in natural gas prices.

Q.372 - Am I correct in saying that the rate for electricity does not produce enough revenue to cover the cost of generation, delivery and other costs that Disco incurs, is that an accurate statement?

A. You want to talk on an embedded cost basis or a marginal cost basis? No. The revenue cost ratio is below one on an embedded cost basis.

Q.373 - And would it be fair to say that the electricity represented in this response would also be calculated

using the existing decline block rate structure, so that in effect part of the projected cost of the electricity would be effectively subsidized by the declining block structure, is that accurate?

A. Well there is no question that this analysis is done using the rates in effect at the time, which was the declining block structure. The declining block rate is about 20 percent lower than the front block rate.

Q.374 - Sir, as an engineer are you familiar with the Ashrae Handbook?

A. I'm an electrical engineer. That would be a mechanical engineer's domain. So other than the name of it I don't know if I have ever even opened it.

Q.375 - Are you aware that it lists -- that that particular document does list the average life of heating boilers, ducting, that type of information? Can you speak to that?

A. No, I can't.

Q.376 - Are you able to tell us why DISCO would not use the average life terms for depreciation purposes when considering the comparison that is brought forward in this particular answer?

A. I'm just looking for the length of time that we did use. I know it's here somewhere. Just give me one second, please. Yes. We annualized everything over 15

years, and the reason being is because we wanted to make it represent a typical mortgage as much as we could.

Q.377 - Mr. Larlee, given the difference in pricing now, how would -- how would this chart be changed or how would it look now given the different pricing that we have seen in the natural gas and wood, et cetera?

A. Well all of the pricing has changed. I mean the electricity prices have increased. If you turn to page 5 of that, you can see where all the prices are. The electricity prices have increased since then by 8 percent.

I can't speak to oil prices relative to the 65 cents that is shown there but I think that 65 cents is probably lower than where they are today. Natural gas -- I have a note here that natural gas jumped at one point to $20 a gigajoule. We are showing 16. I believe they are down from that now.

Propane -- I personally bought propane last summer at $1 a litre. So I doubt it has come down to 87 cents. So everything is up. And relatively speaking we would have to run the analysis really to look and see where everything stands.

But this would be the type of analysis we do going forward when we were looking at our natural gas adjustment assumptions to see whether or not there was a valid reason

for changing those assumptions.

Q.378 - Mr. Larlee, are you aware that natural gas is now at approximately $11 a gigajoule and that Enbridge has recently appeared before the Board to change its rate structure for residential customers?

A. Yes, I saw that notice in the newspaper. The $11 figure you quoted -- I know I'm not supposed to ask questions, but did it include delivery?

Q.379 - No, it did not.

A. These numbers are all in and include delivery.

MS. DESMOND: That concludes all of our questions. Thank you, sir.

WITNESS: Thank you.

CHAIRMAN: Thank you. We will take our morning break at this point. And I think the Panel has some questions for Mr. Larlee when he comes back.

(Recess - 10:45 p.m. - 11:00 p.m.)

CHAIRMAN: Ms. Desmond?

MS. DESMOND: Thank you, Mr. Chairman. I do have a copy now of the document from Natural Resource Canada that we made reference to and to which Mr. Larlee answered some questions. And I would ask that that be marked as an exhibit.

CHAIRMAN: Okay. This will be marked as PUB-4.

MR. MORRISON: Mr. Chairman, there was one -- I guess it was an undertaking, the table with the real price increases in the forecast, which Mr. Larlee referred just before the break.

CHAIRMAN: Yes.

MR. MORRISON: That can be found at exhibit A-4. It's PUB IR-100 at page 3. A-4 PUB IR-100, page 3.

CHAIRMAN: And also I would like to make a clarification, it wasn't based on confidentiality that I asked Ms. Desmond to move on. I thought it would be a poor example, where they produced their own generation and put it into the system, too.

MR. MORRISON: No, I understand, Mr. Chairman. After our discussion, even though the name has never been spoken, I think it's hardly confidential.

CHAIRMAN: Confidential. And the fact is it's gone. So, I don't think -- I think Commissioner Sollows has a few questions for Mr. Larlee.

MR. SOLLOWS: No surprise there.

CHAIRMAN: No. And then two engineers together.

BY COMMISSIONER SOLLOWS:

Q.380 - Mr. Larlee, I would like to take you to your load forecast document, which is marked I guess A-6 in the original proceedings and it's in binder A-4. Figure 4 on

page 10. And that is the persons per household data.

Can you explain briefly how that is used in your modelling?

A. Well the persons per household essentially drives the changes in the water heating forecast -- the water heating energy forecast. So the water heating energy number in the forecast is fixed at a point in time and then we decrease it relative in direct proportion to this number as person per households decline and that's to reflect the decreased use of hot water within the home.

Q.381 - So it doesn't have any impact on any terms in the load forecast other than the hot water heating? I am thinking if and when -- hold my fingers together -- my children move out, I will have -- be able to turn the heat down in their bedrooms and I will anticipate a savings in space heating in addition to the very obviously hot water use with two young men. But it's only hot water use that it has an impact on?

A. Yes, it is. We don't assume any changes in heating. Now the same effect is present in our number of customers. But the way -- in other words, so that as the population either stays stable or decreases, we are still seeing an increase in the number of customers. The reasoning is because there is fewer people within each home -- each

residence, whether it be an apartment or detached home.

But we don't use the forecast of persons per household. We forecast it directly from the past trend. In other words, we regress the number of customers we have versus population. And then we use that to project our number of customers in the future. So that's a direct forecast. Whereas with the water heating, we use the persons per household.

Q.382 - I guess the reason I am focusing on this is when I looked at the -- when I looked at the figure and one thing I almost always do with these things is sort of look at them in an oblique way. It seems that the forecast doesn't seem to follow the historical trend.

The forecast looks like it's declining at a fairly constant rate, but the history shows a declining rate of decrease. So it's more concave up. And I am just wondering why we wouldn't have the same shaped curve both in the history and in the forecast region of the figure?

A. Well, we have used our forecasting tool. The software to develop basically -- to develop the equation to forecast this out. So it isn't a straight line. It is based on an equation. Prior to that we actually were using a -- we were using a StatsCan forecast, but they stopped providing it. And after we extended it for a few

years, we decided that that probably wasn't wise. So we basically developed our own trend line using forecast pro.

Q.383 - But the trend line that you are using is discontinuous with respect to the history looking at the line that you have drawn at 2005 I guess would be my concern. And is there a physical -- a physically reasonable explanation as to why it should be discontinuous -- this slope is discontinuous?

A. I am just going to have a look here.

Q.384 - I would have brought a mirror, but I figured that was too much.

A. Well, I will agree with you if you go back far enough, prior to 1993, you do see a change in slope. But certainly the more recent information does look like -- very much like a straight line. So without having the details of the model right in front of me, I assume what the model is doing is just weighting the more recent trend more than the earlier trend.

Q.385 - Okay. So it's perhaps an exponentially weighted moving average --

A. Yes.

Q.386 - -- or something like that?

A. Yes.

Q.387 - Okay. Thank you. What would be -- you said that

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would impact domestic hot water heating. If the historic trend were projected out, I would get a number -- I was just looking at it by eyeball of 2.25 instead of 2.14. And that's about a 5 percent higher number of persons per household.

Would that -- if that were the outcome would that cause a similar reduction in the domestic hot water forecast load, or what would the impact be?

A. Well as I mentioned it is linear based on the original number which is in the order of 4800 kilowatt hours per water heater. So it would be whatever percentage that is.

Q.388 - Thank you. So it would be about 5 percent. Now I want to take you to -- in the same document, figure 12 on page 34. So when I look at figure 12, it shows relatively rapid growth in the late 1980s and slower growth from 1989 to 2005.

Then the forecast period to 2009 shows growth that is slower than the recent history. And then we see growth occurring from 2009 onwards faster than recent history from 2010 out to 2015.

I guess I'm curious as to what is going to happen in New Brunswick from 2010 to 2015 that would cause such a significant increase in the load as opposed to the recent

history, going back to 1989? - 214 - Mr. Larlee by Commissioner Sollows -

A. Well I think first off we have got to look at what is happening in the period from 2005 to 2010. There is -- we have our natural gas impact penetrations into existing load, which is going to be more rapid in that period than in the period after. So that's tending to keep that line flat.

Then in 2008 there is -- in this forecast there is a scheduled shut down. At that time Brunswick Mine was scheduling the closure or wind-down of their mine in that time period, and that is actually spread over two years. They were telling us that they were going to close their mine mid fiscal year, and so that we would have basically loss of half the energy in one year and then the other half would show up in the other year. So that's giving us that flat line between 2008 and 2009.

Q.389 - I got you. Okay.

A. And then after that, all of those effects are gone. I shouldn't say -- there is one other, NB Coal Midlands was also scheduled for a shut down there, which is -- that's keeping the line down in 2010. And then after 2010 all of the effects are gone and we are basically into full growth.

So we have got little or no penetration of natural gas

into existing load and we have got the econometric growth

for general service and residential -- or general service and industrial going full bore.

Q.390 - But then that's what is confusing to me, because then I would expect having got to where you are in 2009, I would expect to start at that point and see a slope of a curve that is consistent with the history from 1989 to 2005, which is substantially less than what you are forecasting.

A. I think what is probably contributing -- well what is contributing to that is the increase in residential customers. So we have a population that's relatively stable, but if I recall correctly, this forecast has an increase in residential customers in the order of 3,000 customers per year. So that combined with the economic growth is what is giving us that growth in that period.

Q.391 - Thank you. I want to take you now to A-4 IR-17 and that I think you -- Ms. Desmond directed you to just before the break, the one on heating systems.

Now just so I'm clear, you identified the fact that the electricity prices were not based on a revenue cost ratio equal to 1.

So to some extent that would be expected to underestimate the fuel cost for the electric baseboard heating system,

is that correct? - 216 - Mr. Larlee by Commissioner Sollows -

A. I'm still working on turning that up. That was in A-5?

Q.392 - In A-4 I think.

A. A-4?

Q.393 - Yes. PUB IR-17.

A. Yes. I have it.

Q.394 - I think I heard you suggest that this is something that you would be looking at as you go forward.

And I'm wondering if you would be undertaking to -- or you could undertake to conduct these analyses at fuel costs representative of a revenue cost ratio equal to 1 for electricity, so that we have a fairer basis of comparison with the fuels that you are comparing it with?

A. Yes. I mean, that could be done. But the purpose of this analysis really was to examine what customers are exposed to and then make some judgment calls on just how rapidly natural gas would move into the market.

Q.395 - But again my understanding of the outcome of the last hearing and the decisions and Board orders that were made is that certainly they are going to be exposed to this before the 15-year period is up, that you are using in your calculation.

If I recall correctly, we determined in the last hearing that your own board of directors had indicated

that you would be going to a flat rate by 1999. And I think we ordered that you would be there within five years. So if you are doing an analysis out 15 years, shouldn't it really reflect that reality?

A. Well, that's captured in part in the rate assumptions that we put in the elasticity adjustment. So that in the elasticity adjustment I have actually negative real increases to general service to reflect the reduction in their rate and then higher than average real increases to residential to reflect an increase in that rate up until -- through enough number of years to get to a revenue to cost ratio of 1.

Q.396 - Okay. All right. So I also want to just ask you briefly about these -- in response to the question Ms. Desmond posed about the 15-year annual payments. You said that was trying to put it on a typical mortgage footing to see what the payments would be, is that right?

A. Yes. The idea being is that typically when a person builds a house, the costs of the equipment is just all built into the mortgage.

Q.397 - So how did you account for the remaining value in the equipment that has a life longer than 15 years?

A. There is no accounting for it. Basically this analysis looks at a 15-year period. There is no end effects added onto that --

Q.398 - Then that is problematic for me. Because I certainly -- I understand the notion of a fixed term analysis period in an engineering economic study.

But I also understand that where material or components have a life at the end of the study period, you have to credit the life into the overall calculation in order to get a fair assessment.

And it would seem to me that since that hasn't been done, this produces a somewhat biased assessment of the value or the cost to the customer, does it not?

A. I would agree with you. On an economic basis, yes, there is probably some bias there. But everything I have read is that residential customers in particular require very, very short paybacks.

They are really interested in getting their money back in a couple of years. So that --

Q.399 - This is not a payback analysis?

A. -- they are probably quite generous in spreading these costs over 15 years when it comes to how customers make their decisions.

Q.400 - But I didn't understand you to say you were doing a

payback analysis. You are doing a discounted cash flow analysis here?

A. Yes. You are right. We are trying to compare on an even footing.

Q.401 - So would I be correct to assume that when you go and revisit this -- I understood you were looking at this when you came to update your model -- that you would do a more appropriate discounted cash flow analysis that would either use the estimated life for the various components, or in doing an annualized cost, or if you are going to use a 15-year term, you would include the credits for the net values at end of term?

A. I will certainly take your comments into consideration I think --

Q.402 - Thank you.

A. -- in net value.

Q.403 - Now IR-18, the following IR in that document. I'm looking at page 2. And in particular I'm looking at the table of numbers labeled "Variable Specification Test Battery" and the last variable on the list labeled, underscore "Trend".

Can you explain the significance of that trend variable that shows a Chi squared of 3.65 and a percentile of 944?

A. If you bear with me, I can give you my sort of high-level understanding.

.404 - Yes.

A. But the details of the statistics, I will have to get back to you if you want to delve into that. But what this program is doing essentially is it has run the model which is defined in the table up above.

And then it's doing some what-if for us, just make sure I guess, as an assist, to make sure we haven't missed something that could be useful.

So it's taking the Ln of the price and delayed it a year and tested that with Chi square and percentile and so on.

And it has also done a constant and also a trend.

So the trend I believe would be an internal function, that it has developed a trend line. The specifics of it I guess I'm not familiar with. But these are all tests to see if these things would actually help improve the model.

Q.405 - Right. And am I correct in assuming that the fact that the -- for example, the percentile number for the trend of being .944, because that is -- I think it is less than any of the other numbers that we see up above under "significance", is that -- am I correct to compare those? I guess my question is what do I conclude, knowing that I have a high percentile on the trend variable as

compared to the others in that list?

A. Well, subject to check, I think you conclude that if any of these were going to be of any use, the trend number would be the most -- the one that would be most likely useful, because it has the higher percentile.

But it's still well below the significance of the actual terms in the model up above.

Q.406 - And so that trend variable was put in the model and then eliminated because it was not as significant as the others?

A. I assume that's probably how the program is exactly doing it, yes.

Q.407 - Okay. Thank you. I want to go then to page -- IR-98 in the same document and page 4.

Now in this -- there was the general service model specification. I see in the notation under the table with the terms for the forecast model that the Ln GDP term is marked as insignificant. Was that insignificant term removed from the model and then the analysis re-run?

A. I can't say for sure.

Q.408 - Can you undertake to find out?

MR. MORRISON: I think we can provide that in a reasonably timely fashion, yes.

Q.409 - Thank you.

A. Well I may not be able to determine one way or another, but I will certainly attempt to.

Q.410 - Okay. Thank you. Now when I go down and look at the variable specification test battery numbers, I see Ln GDP minus 1. I take that to be a one year time lag variable. It has a percentile of .7705. And here I see the constant has a percentile of .7785.

Based on the understanding that I took from you in the previous discussion, it would seem to me that then -- if we understand this correctly -- then the constant it would be preferable to include in that model compared to the time lag GDP number, is that right?

A. Yes, that's my understanding.

Q.411 - But none of them were included. The model consists just of what we see up there including the Ln GDP which is marked as less than significant?

A. Yes. And I can't remember what the model uses to determine the significance, whether it's .95 or something higher --

Q.412 - That would be my guess, yes.

A. -- but there is some threshold that it's using to raise that flag.

Q.413 - Okay. Thank you. Now I want to go to IR-99 on page 2. Well I guess there are two page 2s. I want to go to

the second page 2, the one that has the handwritten letter -- number page 2 on the bottom right hand corner, and that is table of numbers, that's the independent variable, dependant variable, natural log real goods producing gross domestic product or Ln GDP. Is it clear which one I meant?

A. Yes. Just before we continue, the dependent variable should also be Ln bracket --

Q.414 - Yes.

A. -- and then total. Yes.

Q.415 - Okay. Thank you. What 20 years or which 20 years of data were used in this? There are 20 years of data?

A. That's right. Subject to check, it would have been the most recent 20 years available.

Q.416 - Can you provide the data? What seems to be missing from this is the table of residuals and a plot of the data with the curve that you fitted through it, so we can judge the goodness of fit. Can you provide that?

A. Yes.

Q.417 - Thank you.

MR. MORRISON: I understand that that can be provided.

COMMISSIONER SOLLOWS: Thank you.

CHAIRMAN: Thank you, Mr. Morrison.

Q.418 - Now page 4 I'm assuming it's the same 20 years of

data, and I'm wondering if you could provide the same thing there?

MR. MORRISON: Yes.

Q.419 - Thank you. Now I want to go to page 21 of IR-102. These are population projections for New Brunswick. And I guess the question I have is have you compared the population projections to the outcomes for the period I think of '93 onwards? I think these were prepared -- yes -- in September 1994.

So have you compared those projections to the actual outcome to determine the -- sort of the record for the projections, how reliable the projections are?

A. No, we haven't. We don't generate our own forecast in population. We work with the province and through consultation --

Q.420 - I see that it says it's prepared by the NB Statistics Agency. I went to the provincial government phone book and couldn't find that. Can you give me some idea where we would find it?

A. I believe there was an NB Statistics Agency at one time and now they are part of the Department of Finance.

Q.421 - So you can put on the record at some point the source of the information in the Department of Finance?

A. We can put on the record the name of the particular

group or --

Q.422 - Sure.

A. -- sub-department, yes.

Q.423 - Thank you. And this is data from 1994. Where in the evidence do I find the projections that -- in a similar form that you used for the most recent forecast?

A. We filed that in response to an IR most recently. Give me two minutes and I can dig it up.

Q.424 - Well no need to do it right now, but if you could just let us know after the next break.

A. Yes. It is in A-5.

Q.425 - I'm sure it is. I just couldn't put my hands on it. Now I want to go to IR-102, page 22, the very next page, which is -- well I know I asked you a question and you had a chance to respond before. This is where we have a comparison between the StatsCan household size and what is labelled NB Power household size. Why is the NB Power household size lower?

A. I'm sorry, but I don't see the comparison. You are on --

Q.426 - I'm sorry. On page 22 of the same IR, just --

A. I changed pages and didn't realize it. 22.

Q.427 - It was IR-102, handwritten page 22.

A. Okay. I have the reference now. I will take a second

to look at it. I believe what is going on here is that, as I mentioned earlier, we had some information from StatsCan and they had a forecast but it only went so far.

And so what we were left with was we had a choice. We could extend their forecast, which I believe StatsCan household size column represents, or develop our own forecast. So what you are seeing here is a comparison of the two. Since then we now use our own forecast because of course the StatsCan forecast is so old and they don't update it any more, that we were left to use our own forecast.

Q.428 - I see. And in any case your own household data is the number of households that you have divided into the population, is that the way you develop it?

A. I would assume so, yes.

Q.429 - Yes. How do you account for things like people that own a summer cottage but keep it on a regular rate so they don't -- they keep it connected and keep it on the full time tariff, so they are not a seasonal customer? How would you correct your numbers to account for that?

A. Well we would -- we would use year round customers, and if there are year round customers that are in fact coded as either urban and rural, they would be picked up and treated just like other year round customers.

But even customers who do not disconnect -- seasonal customers who do not disconnect are coded, or should be coded, as seasonal customers.

Q.430 - Okay. So then you -- in order to determine whether they are seasonal or not, is the billing record analyzed or is it a declaration?

A. Basically it's a declaration, based on customer information and -- yes, it would be based on customer information. Of course when an agent is connecting a property and it's in Shediac, you know, it starts to get obvious or near the lake.

Q.431 - Thank you. I want to move now to page 94 of the same IR-102. And here we see a progression again for the Ln of the real GDP versus Ln of goods producing GDP, and it has 22 years of data. And I'm curious as to which 22 years of data that would be, and if you could provide that?

A. Again it would most likely be the last 22 years. This analysis is 13 years old.

Q.432 - Okay. So it would be prior.

A. Yes, it would be prior to that.

Q.433 - Okay.

A. But I honestly doubt that I would be able to provide you with the background details.

Q.434 - Presumably the data then given where we are now and

the most recent one and this one, there would be some overlap in the data then?

A. Yes.

Q.435 - Okay. I guess what made me curious about this is when I looked at the regression results for your intercept and your coefficients basically, the intercept and the Ln GDP term, here we see a number that is .877 plus .026. And if we go back to IR-99 where we were before, the corresponding coefficients were .596 and 2.45. And I guess what leaves me wondering is why such a significant change in these coefficients? What is going on?

A. So just so I can get the comparison right --

Q.436 - Sure.

A. -- we are in IR-102, page 94?

Q.437 - Yes.

A. So we are comparing the Ln of real GP versus the Ln of goods producing GDP?

Q.438 - Right. And you also had data for your more recent analysis I think at IR-99, page 4, if my notes are correct.

A. At this point I can't offer an explanation.

Q.439 - Okay. Perhaps when you provide the additional data, if there is some insight that comes to you when you look at it, maybe you could provide it at that point.

I also want to look for a moment at the residual output that is given on page 94. And when I look at those residuals, they don't seem to be randomly distributed about zero.

When I look at them for observation, 9 through 14, they are negative. And they switch to become positive from 15 to 20. And then they are going negative again from 21 to 22. And it looks almost more cyclic, as if there is some underlying process that is predictable.

Was there any work -- now I understand this is ancient history and we don't have the residuals for the more recent one.

But do you investigate those sorts of things when you conduct the analysis? Or do the people working for you analyze the residuals to make sure that they are indeed randomly distributed about zero?

A. Yes. I mean, that's the underlying reason why this table would have been produced, was to do just type of analysis.

Q.440 - Okay.

A. I guess given the time frames involved here, a quick look at it, it almost looks as though it might be related to cycles in the economy.

Q.441 - All right.

A. But I'm just speculating.

Q.442 - So perhaps when you provide the new data for the most recent analysis, the one that supports this load forecast, if there is such cyclic behavior you will make some investigation or comment upon it?

A. Yes. We can comment on it.

Q.443 - Thank you. Now I want to move to page 96. And I guess here, same, it is ditto, same sort of issues. I'm seeing residuals that don't seem randomly distributed. And I'm wondering. When I looked at this and I compared it back to what I saw for the current forecast, you had introduced a lag variable.

And my question is was the lag variable introduced in order to correct for this cyclic behavior in the residuals?

A. You are referring to the new model when you say the lag behavior?

Q.444 - Yes. The new model as opposed to the model that is given on page 96?

A. It may well have been.

Q.445 - Okay.

A. This particular model, as I'm sure you are aware, we are not using anymore.

Q.446 - Right.

A. It was used to develop a forecast of PDI based on GDP. And then PDI was --

Q.447 - Yes.

A. -- inserted into the general service model. Now we are doing that directly through the new model that includes GDP.

Q.448 - Okay. Because again when I look at the results here, I'm seeing -- no, this is another one.

If I understand correctly, the new analysis has -- as we looked at the summary data with the Public Intervenor yesterday, we saw that your more recent results in terms of the errors in more recent years are very much reduced over what they were historically.

And would it be fair to attribute that this change in modeling has contributed to that reduction in the error?

A. I would like to think so.

Q.449 - Okay. Yes.

A. I think it probably has more to do with some of the more normal weather we have had. Other than last year, the previous two years were probably the closest to normal that we have had in quite awhile.

Q.450 - Okay. Then I guess the question that I get to with this is we are fairly confident that the modeling you are doing is better for the short-term now.

But do you have any analysis to support that the new model will be better for the long-term, the 10-year forecast, or as you pointed out, a five or a six-year forecast?

A. Other than the statistics from the model itself, no. I mean, the model seems to give relatively good statistics. And I guess that's what we are basing its usage on.

Q.451 - And when you did that did you go back say and take a 20-year period and use 15 years and predict five that you already knew and go forward, step forward on that basis to make the projection?

Have you in a sense used much older data and your methodology to forecast data that has already been measured and try to predict the error that way?

A. No, we haven't.

Q.452 - Okay. I know you can't do it for this hearing. But is that something that you would do in order to test?

A. Well, I think Dr. Jackson has suggested that we include that capability. And that's one of the areas that I think we will be investigating.

Q.453 - Thank you. I want to move now to page 98. And again this is related to the industrial modeling. And correct me. Have you changed radically this modeling compared

to -- this is the older version.

This is Ln of real GDP versus Ln of total industrial requirements. And I assume the 10 years that are there, because they are in this section, are somewhat ancient history.

Is it the same analysis that supports the current load forecast but with new numbers?

A. Yes. It's the same -- we are using the same model.

Q.454 - Okay. Where -- and I think I have found that I guess on page 1 of IR-99. You are using -- here we have 10 data points. There you have 20.

So would I be right to assume that you have -- there is again a lot of overlap? Or it is completely different data sets?

A. No. I think there is a lot of overlap. I'm not sure why we only use 10 here in this year. But it may have to do with at the time there may -- it seems to me there might have been a restructuring of the rate class in the early '80s.

So it may not have had comparable data over a period longer than 10 years.

Q.455 - Okay. I guess the reason why it jumps out at me is again for this modeling, if I go and direct my attention to the coefficients, you have an intercept of 2.627 and a

coefficient of a long-term of .744.

And when I get back and checked on the response to IR-99 with 20, the intercept had flipped over. And it was minus 2.4. And the coefficient was up from .74 to 1.33.

And again it just raises an issue for me in terms of continuity, that there seems to be something going on here, that there is some discontinuity in the data that may be significant.

And I'm wondering if, as you have undertaken to do previously, you could look at this and maybe comment upon it?

A. When you look at this, you mean look at the more recent data?

Q.456 - Yes. Look at the fact that -- comment upon the fact that the coefficients are radically different with the more recent data compare to the older data.

There doesn't seem to be any kind of a trend illustrated here that would carry over one to the other.

A. Yes. We can look at that.

Q.457 - Thank you. I now would like you to look at IR-109, page 1. And I would like to be able to tell you where that is. Yes.

Next one along, PUB IR-109. This is August 5th 2005. Its response is a end use profile for residential class on

a peak day, January of 2004, January 16th.

Now I understood from our previous hearing that you had segmented the data into space heating, domestic hot water and all other uses. But in this graph I see only space heating, electric heat and all other uses.

Why is the domestic hot water not split out here?

A. This graph is based on the residential load research data. So the residential load research data, as I mentioned earlier, we post stratified based on nonelectric heat and electric heat customers.

So what we did is we inferred from that what the electric heat load was and plotted it on an hourly basis. So we don't have hourly load data for water heat.

Q.458 - So how do you get the -- in terms of the hearing we had before -- could you clarify for me how we got the separation between space heating, all other uses and domestic hot water there, just so that it is clear?

A. You are referring to the numbers we put in the cost allocation study?

Q.459 - Yes.

A. What we did there is we used the energies that would have come about from our calibration that's used in the load forecast.

And because the cost allocation study only requires

coincident peak and noncoincident peak data, we used an estimate of 600 watts per heater on peak, which is essentially what the DSM analysis was concluding. And it seems to be on par with what other utilities are finding. The number generally goes between 500 watts and about 800 watts depending on the utility. So we think 600 watts is a reasonable estimate.

Q.460 - So you are basing it on integrated data over a month or a year rather than the hourly measurements that you had in your sample set?

A. Yes. We couldn't tease it out of the load research information. We tried. But we weren't getting -- we didn't get anything reasonable. So basically we went back to engineering analysis that came out of the DSM screening work.

Q.461 - Thank you. I would like to take you to IR-115 now. I would like to find it myself. There we are. And page 3. On this page you have presented hourly demand patterns for an urban substation and hourly demand patterns for a rural substation. And I note in them that there are -- the urban substation has about ten times the connected load as the rural substation.

Do you have urban and rural substations that have about the same amount of connected load?

A. I guess I would have to talk to some of our distribution engineers on that. When I asked for this data from them, I basically asked them for -- you know -- give me data from the most typical urban and the most typical rural substation that you know of.

So the urban substation is what we would call our Church Street substation in Moncton, and the rural substation is from Riverside/Albert, our Albert substation.

Q.462 - Okay.

A. So --

Q.463 - So I guess the problem I'm having in terms of trying to -- looking at the two pictures and trying to make any inference about them, because they are different scales, makes me worry that I might jump to a conclusion that I would otherwise not want to jump to, although I am often very willing to jump to conclusions.

Is it possible to easily get either another rural or another urban that would match in terms of total connected load?

A. I can investigate it but --

Q.464 - If it's difficult don't bother.

A. Well it's not that -- it's just that I'm afraid it would be highly unlikely just because of the type of loads

you have in an urban substation, it would be much larger.

Q.465 - All right. Thank you. And now I want to take you to tab 3 of -- I think it's the same binder, and it's marked -- the tab is marked exhibit A-61, undertaking number 3, from November 21st 2005. What do you know, a year ago. I want you to -- this is where you took the tracking signal analysis that I think the Public Intervenor had presented and -- if I understand it -- recalculated it using weather adjusted data. Is that right?

A. Yes, that's correct. You want to remember these are revenues, so --

Q.466 - Understood.

A. -- it's adding a little twist to it.

Q.467 - Yes. And so because they are revenues, implicit in them are any effects of rate changes that would have occurred over the time period?

A. That's right.

Q.468 - Yes. I want you to go to page 7 which is the residential weather adjusted forecast error. And I wanted as much as anything to have you look at each of these graphs and have an opportunity to comment upon them, because I know it was an issue the last time we dealt with this.

And I think you had indicated that the weather adjustment would make a significant difference. And am I correct in concluding from the one on -- the residential one on page 7, that it is -- with the weather corrections that you have done, it is staying within this band of plus or minus five reasonably well?

A. Yes.

Q.469 - And that's sort of the goal here, is it not?

A. Yes. That's my understanding of the purpose of using the tracking signal as a measure.

Q.470 - Okay. And this does include the effect of whatever price adjustments you might have had. So if I go on now and look at the next graph which is on page 13. This is the general service weather adjusted.

It seems to have been well below the five line -- the minus five line for most of the '90s, and it came up only gradually to somewhere around that boundary around the year 2000.

What would cause that? What explains the relatively slow trend upwards and the fact that it's not moved up relatively quickly as we saw the changes in the residential?

A. Well I think if you look at the early -- I guess it looks like the first year, year-and-a-half, where the

tracking signal is going continuously down, that period of time I assume that would be a downswing in the economy that wasn't being captured in our model.

Then if you go from then on from sort of January '95, I think from then on we were probably -- we were doing quite well as far as staying into the plus or minus range. So, you know, we are seeing effects of the load forecast errors as a result of economic activity and we are also seeing effects of any errors that we would have had in pricing the value of those sales.

Q.471 - I guess what is striking to me in the difference between the previous one we looked at and this is this sort of much more evident trend here upwards towards the bottom, but none of the rapid changes that seemed to occur on the residential graph. And I'm just wondering why the big difference?

A. I guess I can't really comment on that --

Q.472 - Okay.

A. -- other than the last five or six years of this chart shows a very tight band.

Q.473 - Yes. And still a trend somewhat upwards. Okay. Now I want to go to the next one which is on page 19, and it is wholesale weather adjusted forecast error for the wholesale customers. Here things don't seem to be so

positive.

A. No. And we have struggled somewhat with this forecast. And I think it's the nature of what goes on in Saint John here, in that a lot of activity around shipbuilding, a lot of activity around industry at particular times, and when there isn't any activity there is a quick -- very quick change, and it's -- it can make forecasting a challenge.

Q.474 - Okay. It's just that again when I look at this I see not as much point to point variability, month to month I guess it is, but on a load that's certainly not as large as your overall residential load. So I'm just trying to understand why I got such high variability on the residential side. Part of it is perhaps scale here. The scale is smaller.

But it still seems -- it gives the impression of being a much smoother curve and well below targets. And I'm just wondering why that would be. For basically three customers I would expect it to be noisier than for the residential which is a large number of -- very large number of customers.

A. Yes. I mean, I'm not -- I'm not as familiar perhaps with the tracking signal measure as I would like to be, but all I can say is that it's the nature of the activity

within the wholesale -- the wholesale boundaries that has made it difficult.

Q.475 - Okay. We can't blame it on Dick Burpee any longer, but -- thank you very much. I have a few that we may want to do after lunch. They are my notes from yesterday and this morning, I would have a chance to look at. Half hour tops. 15 minutes to a half hour.

(Recess - 12:00 p.m. - 1:15 p.m.)

CHAIRMAN: Good afternoon. Do we have any preliminary matters before we start?

MR. MORRISON: Just one, Mr. Chairman. We do have one undertaking response that has been provided for the Board Secretary. And we hope to have a few more done before the end of the day today.

CHAIRMAN: Okay.

MR. MORRISON: The others we expect to have done quite shortly, certainly before we file submissions, so --

CHAIRMAN: Okay. Thank you, Mr. Morrison. We will mark that as A-6.

MR. MORRISON: Thank you, Mr. Chairman. That is all for the time being.

CHAIRMAN: Mr. Sollows I think has one last question.

COMMISSIONER SOLLOWS: Thank you, Mr. Chair.

Q.476 - Mr. Larlee, does DISCO or do Transco or to your

knowledge the NBSO collect substation data coolant or winding temperatures, that sort of thing, at the substations or anywhere else on the system?

A. I guess I really can't comment on that. I mean, in my previous life we did -- I was involved with implementation of the very first Scata system on the transmission network. So certainly there would be that capability on the transmission network.

Now whether they are actually doing it or not, I don't know. I don't believe on a distribution network there is the capability.

The communication that we have with the substations is pretty well limited to being able to talk to individual meters. I don't think meters can actually collect that information.

Q.477 - Okay. I guess what I'm getting at is if you have the existing Scata system and the option to hang a temperature measurement off of them, you could -- I'm wondering if you had investigated the option of improving your database for temperature measurements.

You had complained -- or you had commented that with Environment Canada reducing the number of places in which they logged temperature.

I wonder if you have investigated compensating for

that by putting your own Met stations up throughout the network?

A. No, we haven't. And I guess largely because the issue really becomes history. In order to produce a good forecast -- it's the history we are looking for. So we don't have the -- we wouldn't have the historical basis upon which to base the future forecast.

COMMISSIONER SOLLOWS: Thank you.

CHAIRMAN: Do you have redirect, Mr. Morrison?

MR. MORRISON: I have no redirect, Mr. Chairman. Thank you.

CHAIRMAN: I guess we can now let you go, Mr. Larlee.

MR. LARLEE: Thank you very much.

CHAIRMAN: Mr. Hyslop, would you like to --

WAYNE OLSON, having been duly sworn, testified as follows:

DIRECT EXAMINATION BY MR. HYSLOP:

CHAIRMAN: The record shows that Mr. Olson has been sworn in.

MR. HYSLOP: Thank you, Mr. Chair.

Q.1 - Mr. Olson, before I ask your information for your evidence, the microphone has a gray button. You press the gray button. A red light is on. And you would be heard over the microphone at that time.

Welcome to New Brunswick, Mr. Olson.

A. Thank you.

Q.2 - Would you state your full name for the record please?

A. Wayne Paul Olson.

Q.3 - And where are you from, Mr. Olson?

A. Boston, Massachusetts.

Q.4 - Thank you very much.

MR. HYSLOP: And I believe, as we have done with most experts, there is no objection to Mr. Olson being declared an expert in the area of the economic regulation of utilities?

MR. MORRISON: I do have a couple of questions about Mr. Olson's qualifications. And I guess that is a fairly broad qualification since it is a load forecast methodology hearing and it really relates to his expertise with respect to load forecasting in particular.

MR. HYSLOP: Well, I'm going to object to any interjection. Because, Mr. Morrison, all the way through this it was clear between counsel that if anyone is going to object in any way to the expertise of any witness, there would be a bit of a heads-up given. And this is the first I have heard of this, so --

MR. MORRISON: I have no objection to Mr. Olson being qualified as an expert witness in DSM and perhaps even integrated resource planning. And that is what I assume Mr. Hyslop is going to have him qualified at, so --

MR. HYSLOP: The area of his expertise is dealing with economic regulation of utilities, Mr. Morrison. And that is the area of expertise he is testifying in.

MR. MORRISON: That is fine, Mr. Chairman. I will save my questions for cross. Thank You.

Q.5 - As part of the record, Mr. Olson, we have had two documents marked as exhibits, PI-1 which is the prefiled evidence of yourself and PI-2 which are the responses to various Interrogatories which were prepared by you or by your supervision.

My question is were these documents prepared by you or under your supervision?

A. Right.

Q.6 - And do you have any corrections or errata with respect to the documents that you would like to put on the record at this time?

A. Yes, I do. On page 8, footnote 12 it says Id. page 70. And it should correctly read Idaho Power 2006 Integrated Resource Plan, page 70. And the docket number is IPC-E-06-24.

And my second errata is on page 9, line 39. And it reads 35,000 residential customers. And it should read 22,000 residential customers.

My third errata is on page 10, line 20. And the

reference to 90A megawatt-hours, MW should be to 88.

And then the fourth correction is on page 14, line 34 where it reads MDSM it should be DSM.

And then my fifth errata is on page 16, line 17. And the reference to 60 percent should be to 50 percent.

And then my final one is on page 6, lines 10 to 14. And line 9, the reference to 313 GWH should be to 282 GWH.

And on the next line, the reference to 82 MW should be 62 MW.

And then the percentages on line 10, the reference to 1.8 should be 1.6 percent. And on line 11 the reference to 2.3 percent should be to 1.74 percent.

And then line 10 it reads, Alternative Fuel Scenario. And it should be the Energy Efficiency Scenario.

Q.7 - Now in reference to that particular paragraph of yesterday's transcript, Mr. Larlee testified as to certain errors that he viewed in it.

Can you comment on the differences between you and Mr. Larlee with respect to that particular paragraph, Mr. Olson?

A. Yes. I did realize in reading the transcript that I was using the wrong column. And it didn't really make sense based on my definition of DSM.

And I would refer you to page 4, line 31 to 33 of my

testimony where I define DSM as covering the complete range of load shape objectives including strategic conservation and load management as well as strategic load growth.

And that definition doesn't include fuel switching. And I do realize that some potential definitions of DSM can in some cases include fuel switching. But that's not the definition I used. And so the discussion on page 6 was an errata.

Q.8 - And you mentioned your definition of demand side management. Does that differ from the definition used by Mr. Larlee? And is that part of why this difficulty resulted?

A. Well, I'm not sure that the load forecast uses the term DSM. It's my understanding that on page 30 of the load forecast 2005 to 2015 that they looked primarily at energy efficiency rather -- passively occurring energy efficiency that isn't affected by DSM programs.

They are just taking what they see already occurring in terms of energy efficiency, and include -- or basically backed that out of their load forecast.

Q.9 - Very briefly -- and I think your previous answers are probably partially the answer. But how does NB Power treat energy efficiency and DSM in its load forecast

study?

A. Well, my understanding is that they reflect passive natural occurring energy efficiency. And it is true that energy efficiency is one type of potential DSM program that a utility could sponsor or some third party could sponsor.

But it's my understanding that they don't expect any of those active DSM programs. And so that's not included in their load forecast in terms of backing out for energy efficiency.

Q.10 - Okay. Now one of the reasons we brought you into these proceedings is we wanted to get some understanding of how utilities in North America that you are experienced with in your background, how they deal with energy efficiency and DSM as part of either their long-range forecasting or integrated resource planning processes.

And again without going too deeply, can you summarize your evidence with regard to that point?

A. Yes. Many utilities do factor both passively occurring and active DSM efforts into their load forecast. Many of them use scenario or sensitivity analyses that look first to see what would naturally occur in terms of energy efficiency and so forth.

But then they also go beyond that to evaluate the

potential for active efforts to pursue DSM programs. And they do need to factor in reliability considerations, you know, trying to evaluate whether the DSM programs will be reliable in terms of, you know, reducing load.

But many utilities have become much more active in evaluating and analyzing DSM programs, both as part of their load forecast and as part of their integrated resource planning efforts.

Q.11 - Okay. There has been some discussion yesterday in cross- examination about whether DSM can at times be a disincentive to utilities.

And I would ask you for your comments on that. And if there is an incentive, how or why does that occur?

A. Generally do have a financial incentive to sell more kilowatt hours. And that's in part due to the fact that their rates that they charge their customers are largely based on through-put. In other words the utility has a lot of fixed costs obviously, but most of those fixed costs end up being recovered through volumetric or through-put charges that, you know, if the utility can sell more kilowatt hours it will produce more revenues and potentially make more money. And so there is a financial incentive that's based on rate design considerations to sell more kilowatt hours.

Now the rate design issues can be addressed by changing the rates design, but there is also ways to deal with the financial incentives through compensation for lost revenues resulting from the DSM and through pass through of the direct cost of DSM programs in rates.

And so there are a number of ways to reduce or eliminate the financial incentive to sell more kilowatt hours.

Q.12 - The -- I understand and I would like you to comment finally -- I guess the second last question -- as to in the North American electricity industry what steps are legislators and regulators undertaking to deal generally with DSM and energy efficiency in terms of utility forecasting and long term planning?

A. What was the question about what policymakers are doing?

Q.13 - Legislators and/or regulators, yes.

A. Okay. In terms of policymakers, in terms of legislatures, recognizing that a number of regions are coming close to the point or are at the point where they need new capacity, many jurisdictions are looking at renewable portfolio standards, integrated resource planning, energy efficiency programs, alternatives where someone other than the utility would provide the DSM

programs, commonly referred to as third party DSM programs.

They are doing a number of things to sort of potentially try to reduce the future costs of electricity by using electricity more efficiently.

They are looking at demand response programs that are very targeted to reducing demand at peak periods, as well as, demand side management which is more focused on broader types of energy efficiency load control and load management.

Now in terms of what regulators are doing, it varies quite widely from state -- from jurisdiction to jurisdiction. But they are grappling with the same issues. Most -- or many I should say -- jurisdictions have integrated resource planning cases every three to five years. So they are looking at all of the issues comprehensively at that time, you know, treating demand side and supply side resources, you know, on a sort of level playing field for planning purposes.

And a number of jurisdictions are looking at rate design, time of use rates, critical peak pricing plans and so on, you know, to work on their rate design issues. And, you know, it goes through a fairly wide gamut of regulatory issues.

Q.14 - Finally, Mr. Olson, what recommendations in dealing

with the issues of demand side management and energy efficiency and how they should be factored into resource planning and long term forecasting -- what recommendations would you make to this Board?

A. I would echo the recommendations or comments I made on page 6 of my testimony, but more broadly I would recommend that the Board require the utility to include both passive energy efficiency and active DSM programs in their next load forecast and also in their next integrated resource planning filing.

I would generally comment also that typically integrated resource planning cases occur every three to five years. So, you know, potentially that might be a consideration as well.

MR. HYSLOP: Thank you very much. That concludes the direct testimony and Mr. Olson is now available for cross-examination. Thank you, Mr. Olson.

CHAIRMAN: Mr. Morrison, do you have questions for Mr. Olson?

MR. MORRISON: Yes, I do, Mr. Chairman. Thank you.

CROSS-EXAMINATION BY MR. MORRISON:

Q.15 - Good afternoon, Mr. Olson. I am going to ask to turn up your report at page 4, and specifically the question starting at line 24 that -- what is the purpose of this

evidence? And in response to that question you say, the purpose of this evidence is to explain the role of demand side management and demand response in the utility resource planning process, including the potential impacts for the DSM and DR in NB Power's load forecast. Would you agree with me, Mr. Olson, that a load forecast is just one step in the integrated resource planning process?

A. Yes.

Q.16 - And if you would turn to page 10 at line 23 of your report. You say that we have not studied the details of the load forecast itself and therefore have no comments on the methodology or results of the load forecast -- do you see that?

A. Yes.

Q.17 - So you understand that this is a load forecast methodology hearing, Mr. Olson. So you are not going to comment on the methodology as I understand it, is that correct?

A. Well, what I am commenting on is the amount or the approach that the company used in sort of backing out energy and capacity related to energy efficiency.

Q.18 - The DSM -- what we are calling DSM generally?

A. Okay. Yes.

Q.19 - Okay. And I understand from a response to an IR that we submitted that you yourself have never done a long term load forecast, is that correct?

A. Yes. And that's part of the reason why we don't have comments on the methodology or results of the load forecast itself. We focus on the energy efficiency that is backed out of the load forecast.

Q.20 - And that's fair enough, and I appreciate that. I would like to turn to page 14 of your report, and I guess it's tied into the -- an exhibit that's attached to it. I don't think you have to turn it up. It's the WPO ADN-5. But generally speaking you outline the cost analysis that must be conducted when you are doing a DSM screening, is that correct?

CHAIRMAN: Mr. Morrison, if Mr. Olson could just -- if he just left his mic on it might be easier because we are -- on that -- go ahead.

Q.21 - Just generally speaking, Mr. Olson, is it fair for me to characterize this screening process as consisting of three general steps, and I will put them out in the high level and you can disagree with me or agree with me as the case may be.

The first step is to identify the potential DSM, the universal potential DSM measures that are out there. The

second step would be to conduct the tests that you refer to, I think it's in relation to the cost benefits to customers, the utility and society at large. And then after that then there is a decision which of the viable DSM options is to be implemented. Is that a fair characterization of what you are saying?

A. Yes.

Q.22 - And would you agree with me, Mr. Olson, that after these steps -- would you say these are the screening steps?

A. Okay.

Q.23 - So after these screening steps are completed it's then that the load forecaster would then incorporate whatever the DSM programs that are viable or selected into its load forecast?

A. Right. And it could look at both a base case of expected DSM and also go beyond that and look at potential DSM, and use some sensitivity or scenario type analysis.

Q.24 - All right. But you would agree with me, Mr. Olson, that it would not be appropriate for a load forecaster to include a potential DSM measure into its forecast until the screening process had taken place, correct?

A. Yes.

Q.25 - In response to an IR -- I think it's IR-1 from DISCO,

which has been marked as A-5, you can turn that up, although I don't believe you have to. Well maybe we should turn it up.

It's DISCO IR-1. Excuse me, it's DISCO IR-2. That would be PI DISCO IR-2. You have that in front of you now, Mr. Olson?

A. Yes. It was IR-2?

Q.26 - IR-2, November 16th 2006. And in response to that Interrogatory you agreed that implementation of DSM programs requires a clear understanding of how those programs will impact a utility's revenue requirement, correct?

A. Yes.

Q.27 - And would you agree with me, Mr. Olson, that that can only be done when the regulator examines the utility's revenue requirement in a rate case for example?

A. No. You know, I would say that the first step in the -- in looking at DSM -- the first step is what I talked about in exhibit WPO ADN 5 which is the efficiency test, are social benefits greater than social costs? And, you know, so I would emphasize there that you do a cost benefit analysis and look at whether the DSM is efficient, and if it is -- and I would agree that inefficient demand DSM or DSR should not be implemented, but if it passes the

cost benefit test, you know, that's a key consideration.

And then after that you have to look at the other tests in terms of whether the -- you know, the DSM measure will benefit the participants using that DSM measure, but you also need to consider how the general body of ratepayers, the ones that aren't using the DSM measure, are affected.

And the consideration there is that the general body of ratepayers shouldn't be harmed by the DSM in a sort of a no losers test. But if all that is the case then the revenue requirement issues are pretty well -- are very well addressed and implemented, and you won't need to do a rate case to find that out. You would just do a proper analysis of the DSM program.

Q.28 - Right. But it's often the case, Mr. Olson, that it isn't a win/win and that -- I think you spoke of a few minutes ago, that sometimes there needs to be a mechanism put in place to address the disincentive to a utility in implementing a DSM measure, correct?

A. Well, you know, need to separate the issue of whether it's beneficial to society versus whether it's beneficial to the utility.

You know, societally beneficial DSM could be available but the utility might not have an incentive to sponsor DSM

programs to achieve that society beneficial benefits absent -- you know, the issue for the utility in terms of its incentive, it's got an -- it's got a fiduciary obligation to provide -- to serve its shareholders. And so it's going to have an incentive. If it can make more money by selling more kilowatt hours it's going to do that.

As a utility it also needs to consider, you know, least cost planning. But -- so the role of -- the issue for the utility is whether it has a financial incentive to sell more kilowatt hours, and if that's the case whether or not regulatory approaches that reduce that financial incentive might be beneficial, because it would give it -- the utility more of an incentive to pursue the DSM program.

Q.29 - I understand everything you are saying. I guess the point I was trying to bring you to and perhaps I didn't do it very skilfully, was that in dealing with DSM measures often the regulator must look at revenue requirement issues, is that correct?

A. Yes. It needs to consider revenue requirement issues in how it affects customers.

Q.30 - Also in that response -- no, it's IR-3, the next response. I asked you whether this -- asked you about

careful cost analysis that you refer to, and I asked you whether this careful cost analysis should include an analysis of the potential increase in rates.

And you gave a fairly lengthy response. I think I concluded that you agreed with me, but I would just like to get it clear on the record.

Should this careful cost analysis that you are talking about include a consideration of the impact on rates, or potential impact on rates?

A. Yes. As I said before, you know, the utility, in evaluating the DSM program, needs to look at the cost benefit analysis of whether it provides net benefits and then also how it affects both the customer participants and the nonparticipants and how they would be affected.

Q.31 - And I have your report, I believe it is at page 15 and right at the top of the page, Mr. Olson. And I think you mentioned it in your direct summary when you were speaking with Mr. Hyslop, about the relationship to rate design.

In any event, at the top of the page you say rate design is a necessary part of any discussion of increasing utility's involvement in DSM or DR.

Do I take it from that, Mr. Olson, that -- well, I will put the question to you. Is it possible to fully discuss DSM and DR without examining rate design issues?

A. Well, I think there needs to be an awareness of rate design and how the rate design might affect the utility's incentives to pursue DSM.

But I think you can look at DSM in a research planning process or a load forecast without a comprehensive rate design review.

MR. MORRISON: Okay. Those are all my questions. Thanks very much, Mr. Olson.

CHAIRMAN: Thank you, Mr. Morrison. Conservation Council of New Brunswick. Mr. Couture, do you have any questions for Mr. Olson?

MR. COUTURE: Perhaps just one.

CHAIRMAN: Okay. Do you want to do it from there?

MR. COUTURE: Sure, if that is okay.

CROSS-EXAMINATION BY MR. COUTURE:

Q.32 - Goodday, Mr. Olson. My apologies. I came in a little late there. So I missed the earlier part of the discussion. But just a quick question, gathering from what I'm reading currently and from what has just been mentioned.

Given the importance, the demonstrated importance of DSM measures and efficiency in addressing load growth considerations, is it intellectually pardonable that the role of Efficiency New Brunswick hasn't been taken into

consideration in this load forecast?

A. Could you repeat the question?

Q.33 - Is it pardonable on intellectual grounds? Just looking at this in terms of its -- taking a look at it more holistically, is it excusable that the impacts of our efficiency agency aren't being taken into consideration in the load forecast?

And when we asked Mr. Larlee about this yesterday he mentioned that at the time of the creation of this load forecast, which if I understood correctly was completed towards the end of 2004 and then it was finalized in the first half of 2005 -- now if that is the case, the knowledge or the agency -- or its creation hadn't been made known.

So given that that is the case, that is perhaps excusable, that these more -- that the current DSM measures or the current efficiency measures that are in place weren't taken into consideration.

But given that they are now in place and that Efficiency New Brunswick is undertaking certain programs to help reduce overall energy demand, can we afford, or is it -- to use my initial phrasing -- it is pardonable that these measures aren't factored in from today on, given that Efficiency New Brunswick is currently functioning?

A. Well, I will say first of all that one of the themes of my testimony was that I tried to describe what the best practice or what I thought were the best practices that utilities around the U.S. and Canada were using.

And my testimony has been that utilities are more and more focusing both on the passive energy efficiency that they expect to occur but are also carefully looking at what potential is out there for DSM programs that might be beneficial to customers and might potentially slow the need for new generating capacity that potentially is, you know, expensive.

And so my testimony focused on what I thought I had observed in other jurisdictions and said that potentially it would be beneficial to apply similar approaches in New Brunswick.

And I haven't done any evaluation of whether -- what the companies has proposed in their load forecasts for energy efficiency beyond that.

Q.34 - Given that you have taken a look at other jurisdictions, then you would have seen that in a number of them, something that is beginning to make its way to the table and is being considered more seriously of late is allowing efficiency or demand side measures to compete openly with generation options when considering addressing

load growth and load energy requirements.

Is that the case? Are you aware that that is the case?

A. Yes. I agree. A number of States where there are, you know, robust wholesale markets are using those markets to -- as part of the design of their demand response programs for example.

Q.35 - So you agree then that in an open market environment that efficiency or demand side measures should compete openly with generation options?

A. Yes. Where there are, you know, robust wholesale markets, demand response programs can be an effective way to reduce demand at the peak periods, and using price signals presented in the wholesale market.

Q.36 - So you would then also support, if I understood correctly from your previous comments, time of day billing and those kinds of rate measures in order to address peak energy consumption?

That these are what you are proposing as policies to address that? Is that the case?

A. Well, I do agree with you. I think that rate designs that provide the correct price signals to guide consumption would be beneficial. And so rate design options like time of use rates or critical peak pricing

and so on could potentially be beneficial.

And they are sort of -- they are sort of part of the process of providing the right price signals to customers. And by doing so that puts DSM demand response type programs in the proper context.

Q.37 - So in which of the two senses do you understand the word beneficial, of the two sense in which you mentioned earlier? Beneficial to the utility or beneficial socially speaking?

A. Well, I think the point there is, you know, societal benefits.

Q.38 - Could it not also be the case that some of these measures could help the utility in the end as well in certain cases where peak is provided by a more expensive energy generation option?

A. Yes, I agree. It can potentially -- DSM programs can potentially benefit the utility. For example DSM or demand response program might potentially delay the need for transmission, infrastructure improvements, and things like that, which could provide cost savings.

And at least in the short run that would benefit the utility if it can -- if it can reduce its cap. ex. budget -- capital expenditures budget.

MR. COUTURE: That's good. Thank you very much for your

time. That will conclude.

CHAIRMAN: Thank you, Mr. Couture. NB System Operator, Mr. Roherty, do you have any questions for Mr. Olson?

MR. ROHERTY: Thank you. No questions.

CHAIRMAN: Ms. Desmond, do you have questions for Mr. Olson?

MS. DESMOND: No questions. Thank you.

BY COMMISSIONER SOLLOWS:

COMMISSIONER SOLLOWS: Yes. Mr. Olson, the issue of the relevance of rate design to DSM and demand response has been put on the table, and in this jurisdiction the residential rate class has a revenue to cost ratio well under one. So it undercollects the revenue for the class as a whole. And it appears that the rate design has smaller residential customers subsidizing larger residential customers.

What would be the likely impact of that rate design on DSM and demand response potential for the province?

A. I think it would reduce small residential customers' incentives to pursue energy efficiency on their own behalf, because their prices are lower than they otherwise would be with a -- I mean, if your facts are correct.

COMMISSIONER SOLLOWS: Just to clarify, I said that it appears under the current rate structure that small residential customers subsidize larger ones.

A. Then they would have an incentive to -- more of an incentive to pursue their own energy efficiency than would otherwise be the case.

COMMISSIONER SOLLOWS: What about the larger customers?

A. And it would reduce the larger customers' incentive because of the opposite effect.

COMMISSIONER SOLLOWS: Okay. Thank you.

CHAIRMAN: Do you want to re-direct, Mr. Hyslop?

MR. HYSLOP: Carrying on with tradition, I have been told by my advisor I have no re-direct and I have taken his advice all the way through this.

CHAIRMAN: Thank you.

MR. HYSLOP: Mr. Olson has a plane. There is no need for him to remain for any further part of the hearing I assume?

CHAIRMAN: No.

MR. HYSLOP: I want to thank Mr. Olson, for coming.

CHAIRMAN: Thank you, Mr. Olson. Ms. Desmond?

MS. DESMOND: Mr. Chair, could I ask just for a five minute recess to get organized at the front?

CHAIRMAN: We will give you ten, how is that?

MS. DESMOND: Right.

CHAIRMAN: We will take a ten minute break.

(Recess - 2:15 p.m. - 2:25 p.m.)

CHAIRMAN: I guess we have an exhibit we have to mark here.

MR. MORRISON: Yes, Mr. Chairman. We have another undertaking response ready and it has been provided to the Board Secretary.

CHAIRMAN: The exhibit will be marked A-7. Would you like to carry on, Ms. Desmond, with your witness?

MS. DESMOND: Thank you, Mr. Chair. We have Dr. Jackson now in the witness panel.

DR. JERRY JACKSON, having been duly sworn, testified as follows:

DIRECT EXAMINATION BY MS. DESMOND:

Q.1 - Sir, for the benefit of the Panel could you provide us with your full name, please, and your residence?

A. Jerry Ross Jackson. I live in College Station, Texas.

MS. DESMOND: And we would like to have Dr. Jackson declared an expert in the field of utility energy modelling. I don't believe there is any issue with respect to his expertise, but perhaps that could be confirmed.

CHAIRMAN: Is there any issue with that?

MR. MORRISON: No, Mr. Chairman.

CHAIRMAN: Mr. Hyslop, is there an issue with Dr. Jackson being sworn as an expert?

MR. HYSLOP: I have none, Mr. Chair.

Q.2 - And, Dr. Jackson, for the benefit of your knowledge

moving forward, yesterday there were three PUB exhibits marked, PUB 1 which is your evidence, PUB 2 is the responses that you have provided to the IRs of the public intervenor, and PUB 3 is the responses you provided to the IRs of the applicant DISCO. Okay.

And I wish to confirm, Dr. Jackson, that PUB 1 was a document prepared by you and if you adopt that evidence for the purpose of this hearing?

A. It was.

Q.3 - And, sir, do you have any corrections you wish to make to your evidence?

A. I have one correction in the item marked final report marked July 3rd 2006, on page 4. The first sentence in the last paragraph. Those first two numbers, instead of 13,445, should be 16,624. The second number, instead of 13,175, it should be 16,930. And the following sentence, rather than 3.5 percent it should be 4 percent. Those are all the corrections.

Q.4 - Now, Dr. Jackson, you had the benefit this morning of hearing the evidence of Mr. Larlee. I'm wondering, before we get into some of the details of your document, if you might comment on a few of his points.

And I will start by asking you with respect to Mr. Larlee's evidence as it relates to the use of load

research data and load forecasting. Could you comment on that?

A. Sure. In terms of utility forecasting essentially the first principle is to utilize all information that is at hand in terms of supporting model development, model parameter estimation. The load research sample, although it consists of only 190 customers, has a wealth of information that relates to hourly variations in electric space heating use for instance. It can be used to estimate kilowatt hour consumption for electric water heating and a variety of other appliances when used in conjunction with the surveys that were administered.

So my opinion is that this data could provide a rich source of information to support the forecasting analysis that is used on the residential sector.

Q.5 - Dr. Jackson, there has been some discussion today on the application of CDA or conditional demand analysis. Could you offer any further comments on that?

A. Sure. A conditional demand analysis is actually a very simple statistical process and essentially what it does is it picks up information across different households and determines how that information is allocated amongst the households.

In the case of electricity use applications, if we for

instance had two households who are identical in every aspect except one had a refrigerator and the other one didn't, let's say, then the difference between the two would clearly be the refrigerator electricities which might be 1,000 kilowatt hours.

Of course in real life and relating here now to the energy survey that DISCO conducts every five years or so, we have 5,000 customers and of those 5,000 customers we have a whole variety of appliance holdings. What conditional demand analysis does is it imputes the amount of energy that is associated with each individual appliance by looking at electricity use across each household and incorporating information on the appliance holdings.

Now the term conditional demand analysis has been around for awhile, but it's widely used in all kinds of applications. For instance many residential valuation applications utilize conditional demand analysis where you are identifying the value that an extra room or a swimming adds onto a home. It's used in the automobile industry to determine the value that consumers place on different kinds of automobile characteristics.

So it's a well known and widely used technique that again can be used with great import in terms of the

residential model. By using conditional demand analysis on the survey data it's possible to estimate electricity use associated with water heating, space heating, refrigerators, essentially every appliance within -- every major appliance within an individual household and often times minor appliances as well.

The importance in terms of this particular hearing is that by applying that data would allow us to incorporate New Brunswick data to represent energy's characteristics in terms of customers and how they change over time, to use New Brunswick data rather than data that was procured from some other service area. The reason that is important is that these conditional demand estimates vary by service area for a number of reasons, part is income, partly the differences in demographics, and a variety of other factors.

So conditional demand analysis is a very -- it's a powerful technique that is widely used to develop these parameters and to provide in my opinion some significant advantages in terms of DISCO's application.

Q.6 - Dr. Jackson, could you comment on DISCO's approach to incorporating natural gas in its forecast?

A. Natural gas -- the discussion on natural gas I found quite interesting, because what it really demonstrates is

the value that these models can have when information is correctly incorporated in the model framework.

For instance DISCO went through a lengthy analysis in terms of evaluating the cost of electric, gas -- with all kinds of electric and gas appliances, wood -- in terms of space heating, wood space heating for instance.

And all of that analysis -- all that analysis is mathematical. It can be quantified and easily incorporated into a model. Once you do that then you are no longer plugging things into a spreadsheet or on a calculator. You actually have it set up. And then what one can do is look at the impact of a change for instance in natural gas price, if gas prices go down, if the market for natural gas drives prices down for the long term. Then we can simply incorporate that as a parameter in the forecasting model and use that to evaluate the impacts of these different parameters.

That fuel choice for space heating, for water heating, for other gas appliances, can be incorporated in the residential end use model and in fact is incorporated in most residential end use models that I am familiar with. So the natural gas forecasting like I say is a good example of how the DISCO model can be improved to provide better forecast, but in addition to answer policy

questions like the kind that came up this morning.

Q.7 - Dr. Jackson, could you comment on the testing for the appropriateness of the GS and small industrial aggregate econometric model?

A. Yes. Currently DISCO's GS forecast is an econometric model, as everyone knows. The issue at hand is whether or not an aggregate model that is including all customers in the GS class are appropriately modelled together or if they should be divided into subsectors.

The reason that is important is that the assumption of that regression model that is being used is that the parameters in those models are constant, constant over time. So in other words if a price elasticity is .18 or .35 the assumption is that elasticity will stay -- is the same over the historical period and will continue to be the same over the future.

Well what happens is that if we have subsectors that respond differently to price, then they have different price elasticities. That's not a problem as long as those subsectors retain the same importance in the future as they have in the past.

So in other words what one has to determine is number one, is it appropriate -- first of all to put those together for the model estimation, and then secondly is it

appropriate to use them together in the forecast period.

Well the first step is to test and see if it's appropriate to put them together. And there is some very simple econometric tests that determine whether or not it's acceptable to include for instance educational, one with retail, one with wholesale, one with a hospital, and I think a miscellaneous retail category.

All one has to do is include a couple of terms in those econometric equations. Based upon the statistics of those individual terms one can say, yes, it's appropriate to have those aggregated for the estimation period. Then the question is will they grow at the same relative rate in the future? That's more problematic of course, but those tests need to be undertaken at the outset to ensure that the models are appropriately specified to begin with.

And I might say the same situation exists with the industrial econometric models as well. There needs to be an exploratory analysis to ensure that assumption in terms of the constant parameters over time does in fact hold.

Q.8 - Could you also comment on incorporating price impacts in the end use model?

A. Price impacts -- when the price of electricity goes up individual households conserve electricity, and they do that by turning thermostats down in the wintertime, by

taking shorter showers and doing lots of other optional kinds of things. And that effect is typically referred to as an utilization impact.

It's usual in end use models to have a utilization parameter in the model that then reflects the impact of price changes. So what happens then is that when the price goes up again we are representing the fact that people turn thermostats down and modify their behaviour. So they are using the equipment less intensely.

The way the current DISCO model is set up that impact is not incorporated. Now they have estimated an econometric model with a price elasticity of .18, and the .18 is comparable to elasticities that exist in other areas.

However, there are a couple of potential difficulties with that. The first is that price elasticity is different for different end uses. And in New Brunswick given the fact that 44 percent of electricity goes into space heating and that space heating peak contribution represents about 21 percent of peak demand, it's important to reflect the impact of prices on the various end uses in an appropriate way.

If one incorporates a price impact in an end use model one can separate those elasticities by end use, and all

the empirical studies that look at end uses and price elasticity show that there is a substantial difference between electric space heating, water heating and other kinds of appliances in terms of response to price. So very important to incorporate those price components. But it's a relatively easy thing to do in terms of the mechanics of the process. It's adding another term and then incorporating elasticity representation and of course backing that up with econometric estimates, which again can be conducted with the energy survey data for instance that DISCO has.

Q.9 - Turning now to your evidence. Could you comment on the highlights of your particular document?

A. I reviewed the documents that were made available by the DISCO and information on the web pages. I -- my basic conclusion is that the models -- the end use residential models, the econometric models for GS small industrial are deficient. There were a whole variety of aspects. And it is my opinion that those models cannot be considered as adequate forecasting tools at this point in time.

My recommendation is that DISCO extend these models to incorporate what I consider best practice in this kind of modelling -- modelling application.

With respect to load forecasting, the residential load forecast effort is industry standard. It reflects good practice. I also believe though that given the importance of electric space heating and water heating in New Brunswick, it is important to develop additional data on those end-uses and perhaps some data with respect to geographic variation.

So my recommendation is that the residential load research survey be expanded and that the GS and -- 1 and 2 and the industrial load research progress be initiated as soon as possible.

It is important to have information on those individual customers with respect to a whole variety of reasons. Number 1) to support the load forecasting process. But also number 2) to prepare to look at issues that we know or expect at some point in the future will become important if they are not right now.

And those relate to DSM programs to innovative pricing approaches and to a variety of issues that we can expect to impact the load forecast in the future.

Q.10 - Now you have spoken to or have addressed a number of recommendations. Can you give the Board any idea of what the cost of those recommendations might be?

A. Yes, I was asked this in the interrogatories from the

Public Intervenor and sat down -- this is kind of a back of the envelope cost estimate. And this relates to what I would expect to be incurred in terms of analyst time.

What my expectation is that the re-estimation and extension of the residential model would cost somewhere between 75' and $125,000.

The extension and analysis of GS 1, 2 and small industrial would be between 30' and 50,000. And the load research would be between about 50' and 70,000 again -- 75,000.

This is for the analysis that's required to take this information and incorporate the load forecasting model.

I actually -- it just occurred to me, I did want to mention one aspect of discussion earlier this morning. And that was with respect to the GS category.

We talked before about the fact that GS 2 I think has been closed for electric space heaters. So GS 2 and GS 1 are together now and are being considered as a single unit in this aggregate forecast.

In order to have separate subsectors together in a forecast, as I said before, they really have to represent either the same parameter of values or the parameter of values can be different, but the relative importance in the sector has to be the same as we move through time.

What we know, if the GS 2 is closed, we know that sector is going to become smaller as we go through time. So a priority -- we already know that we are going to have difficulty if we incorporate GS 1 and GS 2 in the same econometric model in the future even if it turns out that there was no problem with it in the past.

That is doubtful in my mind but in any case, there is absolutely no question that GS 1 and GS 2 need to be separated in terms of future forecast.

Q.11 - Dr. Jackson, you have indicated that the cost of making some of these changes -- and I am just sort of scratching down the estimates, but approximately 130' to $250,000. It could be in that range?

A. Yes. My -- I think what I came up with was something on the order of 150' to 250', I believe.

Q.12 - Okay.

A. Somewhere in that range, I would expect. And again, that is doing everything that I believe should be done. A variety of these can be initiated right away and a variety of them can be done clearly with DISCO staff.

Q.13 - As a result of that expenditure, what difference in the load forecast would we see?

A. In terms -- you know, the question that always comes up is if you spend a certain amount of money, what can you

expect to see for that investment? And that is obviously a difficult question to answer.

It is difficult because forecasting accuracy is a relative term. It depends upon the historical series. If we have got a series that is moving very slowly and changes little year by year, then we should expect to have a very low forecasting error, even with a model that is not very good. Even with semi-log graph paper that we used to use in the electric utility industry a long time ago.

But in situations where things are changing, it is obviously more difficult to come up with an explicit number. The way -- I think the most appropriate way to evaluate this question is to identify the benefits that occur from a single action with respective costs of that action.

And in my opinion, all the suggestions that I have made have clearly exceeded that sort of benefit cost ratio of 1. That is I believe all these extensions will provide greater accuracy in terms of the forecasting, an ability in the future to address DSM and alternative rate structures and different kinds of issues that will arise will certainly provide an ability to incorporate natural gas fuel choice for space and water heating and other

appliances will permit -- and there are a variety of other issues here too here, will permit the ability to do historical forecasting.

It is sort of common practice in end use modelling especially to develop a model that has the ability to do what we call historical forecast.

Historical forecast essentially take us back to the earliest period, maybe 1990 in this case, and start them all on 1990. And then incorporate actual data in terms of prices and households and customers and things on out through our current period.

By looking at that historical period, we can identify how well the model did. Now what we have here are perfect inputs in terms of the fact we know what the prices were and the other inputs but it provides a good test of the model structure and the model integrity. That sort of thing is incorporated -- it increases the transparency of the modelling process.

So that everybody -- so everyone is familiar or fully familiar with the way the model -- with the way the model performs.

And I have provided utility forecasting models in situations where public service commissions actually have had the same model and it has been distributed to

intervenors to analyze the model forecast.

In my opinion, what we want to do in terms of improving the process generally, is to improve the obvious deficits the models have to increase the transparency of the process and provide access in terms of understanding what's going on and why things change the way they do.

Q.14 - Dr. Jackson, could you comment on how the current model being used by DISCO compares to models being used in other jurisdictions?

A. The -- you know, the residential -- obviously there are two approaches. Residential has an end use structure which multiplies the number of appliances times the average appliance used and then sums up across all appliances the GS and Small Industrial use aggregate econometric models.

The residential end use model omits price impacts. It omits the historical validation. The process by which the model is updated, which is sort of part of the modeling process, tends to be sort of an annual judgmental kind of updating process.

The model really doesn't represent current practice, best current practice in my opinion anyway. And I think the same is true of the GS and the Small Industrial. And that is a variety of different kinds of statistical

analyses need to be conducted to ensure the integrity of those forecasts and those models.

Q.15 - Now you have indicated that a number of changes could be made. And I'm wondering if some of those changes could be made on a smaller scale with less cost?

And what -- if those smaller changes were made, would we see any difference in the load forecast?

A. Yes, absolutely. One could prioritize all of these issues and -- starting with a modest change in model structure, incorporating price impacts, providing a historical simulation process.

You know, one of the beauties of incorporating all this information in a single mathematical kind of process is that the process itself and historical data can be used to estimate some of the model parameters.

And that's a process that's called maximum likelihood estimation. What it essentially means is that we put them all together and simulate them all over a historical period of time. And then the estimation process picks out some unknown parameters in such a way that the sum of squared errors over time are minimized.

So what -- which we really do is we take all the information that's available. We incorporate it in every way we can think of. And then we have an entire system

that's validated with historical data. So we can start out by extending the model structure to incorporate that. We can put price impacts in.

The fuel choice in terms of gas space heating, a lot of the structure already exists in terms of the analysis that was done, in terms of those different systems. Again the beauty of that is that if you want to assume a different engineering economic calculation, in terms of depreciation let's say, you put that -- you just modify the parameter. So yes, many of these improvements certainly can be incorporated at relatively small expense. And that can start -- you know, that can start sort of asaps.

MS. DESMOND: Those are all the questions we have for Dr. Jackson. Thank you.

CHAIRMAN: Mr. Morrison, do you have some questions for Dr. Jackson?

MR. MORRISON: I assumed Mr. Hyslop was going first, Mr. Chairman. But that is fine. I can proceed.

CHAIRMAN: Excuse me. Do you want -- I want to go reverse, don't I? Mr. Hyslop?

MR. HYSLOP: Yes. We do have a series of questions for Dr. Jackson. I'm at the pleasure of the Board as to which order we go in. But I think normally the applicant gets

to go last.

CHAIRMAN: No. We can carry on with you, Mr. Hyslop. Conservation Council, yes. I will go to the Conservation Council first and go through that way.

Mr. Hyslop, why don't we go to the Conservation Council and then just work our -- okay. So you might as well come up front here. Okay.

Mr. Couture, do you have any questions for Dr. Jackson?

MR. COUTURE: Perhaps just one.

CROSS-EXAMINATION BY MR. COUTURE:

Q.16 - In the response to the previous question about best practices and about what -- how you viewed DISCO, its current forecast methodology, you mention in your direct evidence on page 3, at the bottom of the first paragraph that I believe that a best standard practices comparison should be applied in these evaluations to ensure that recommended extensions are consistent with accepted practices in the utility industry and in end use econometric energy modeling applications.

Considering some of these -- the best practices that are present in other jurisdictions, how would you -- what would you propose to DISCO further than what you have already mentioned as a way of further sophisticating its

load forecast methodology?

A. Well, there are a number of issues I considered. But given sort of where we are in terms of forecasting and other issues in New Brunswick or my perception of that, I chose not to include those. These are issues that may want to be considered in the future.

For instance end use models are also used in the commercial sector. And one of the great advantages of end use models is that because we are breaking down energy use into the different end uses and making some estimate of efficiency changes, and because DSM programs and alternative pricing can impact individual end uses in a different way, it's often -- it's useful to have that end use detail.

Now a commercial end use model -- and again the commercial end use models have been to some extent used just as widely as residential end use models.

The reason that I didn't suggest that for this particular application, but that DISCO may want to consider it in the even reasonably near future, is that first of all the commercial sector is smaller. Its impact on peak demand is somewhat smaller because of the heavy importance of electric space heating in both KWH and peak demand.

And because it appeared to me, based upon the material that I have read, that demand side management and alternative pricing methods were not on the table currently, I guess is a good way to say that.

If the Energy Efficiency Board and the other issues that are -- or other items that are sort of afoot here become more important, then a commercial end use model may be a useful kind of approach to go to as well.

The other -- I suppose the other issue -- and I didn't address this in my comments or my evaluation -- are the industrial transmission customers. There are 39 customers. A substantial number of those -- or a small number of those represent a substantial amount of energy. It has been my experience that attempting to forecast a number that small in industries that are that specific is extremely difficult.

And DISCO's approach, based upon a discussion in June, appears to be that the forecast is developed econometrically and then adjustments are made based upon input that one gets from industry. That is a common practice in terms of utilities.

Now to the extent that is in the Province's best interest to get a more -- a complete forecast of the industrial customers, one could look beyond New Brunswick

to the export demand that exists for those industries and actually develop a model that utilizes more in terms of economic factors from outside the Province and actually forecast those sectors in somewhat more detail. So that certainly is something that might want to be considered in the future.

But clearly if this demand side management become a larger issue, there are a whole variety of demand side programs that exist in the residential sector and New Brunswick represents an interesting application because of the heavy impact of electric space heating. Electric space heating is very price-sensitive.

There have been a variety of applications that have addressed critical peak pricing and different kinds of issues that would be interesting to take a look at with respect to the situation here in New Brunswick.

To the extent that that exists then -- and oftentimes end use models, like the residential model, are used to look at DSM programs before any analysis is done.

In other words if we know how many electric space heaters are out there, and we have some idea from some other utility about impacts, we can incorporate that end use model and identify what the potential is.

If the potential looks to be -- appears to be

significant or within a range of significant, then one can go ahead and develop an analysis of that program in more detail and in fact use the end use model to screen the DSM program.

So we sort of start at the other end. Instead of sitting down with this menu of DSM programs and figure out which ones would work and which ones won't, we can use the end use models to do that screening.

But anyway -- so I guess essentially then it's those commercial end use models, the industrial -- the extension of the industrial and then the extension of both commercial and end use to represent greater detail in terms of end use technologies.

MR. COUTURE: That is good. Thank you very much.

CHAIRMAN: New Brunswick System Operator. Mr. Roherty, do you have any questions?

MR. ROHERTY: Thank you. No questions.

CHAIRMAN: Mr. Hyslop, do you have some?

MR. HYSLOP: Thank you, Mr. Chair.

CROSS-EXAMINATION BY MR. HYSLOP:

Q.17 - I want to ask a few questions about the residential end use modeling and a couple of the issues associated with it. And it seems I'm still learning.

I'm going to start with a pretty basic question. But

what exactly is end use modeling?

A. End use modeling is a term that grew up in the mid 1970s. And what it reflects is the fact that we are developing a forecast based upon end uses. Now end uses in this case relate to T.V.s and stereos and water heaters and space heaters.

So end uses are appliances. What we are doing then is estimating the total electricity that's being used in electric water heaters. And we are doing the same for space heating and other end uses. Then we sum all those up. So we start at the end use. And we sum up to get the aggregate impact.

Q.18 - Thank you. And what is the role of end use modeling in generating accurate load forecast?

A. End use models are especially important when underlying structure of the energy system changes. And that's clearly important in terms of residential sector, where you have appliance standards which mean that new refrigerators may use 500 kilowatt-hours, when 30 years ago, 35 years ago they actually used 2500 kilowatt-hours. So what end use models allow us to do is to reflect changes in the structure that we know are occurring, because we have got this detailed mathematical representation of the models.

And what it also allows us to do though is to incorporate all the features, all the behavioral components of an econometric model in an end use model framework. So we sort of have the best of both worlds.

The drawback to an end use model of course is it's more resource-intensive. So a greater effort is required to develop the parameters and to estimate the model and to develop the software structure and that sort of thing.

Actually if I can digress one moment. One of the issues that I think is incredibly important in terms of the end use model application here, and that is to use information from the Province of New Brunswick.

I know I have stated it before. But it's -- the information that exists from the energy surveys can be applied with conditional demand analysis. Estimates can be developed. And then those estimates go into the model. It's probably the same energy data system that's incorporated in the billing, in the billing file data and the load research data. It all ties together. And that way we are sure that we are validated and that we are consistent from one end of the spectrum to the other.

Q.19 - And from what you have just told me then, the key or the important limitation in end use modeling is the acquisition and cost of acquisition of accurate input

data. Would that be the major limitation?

A. That is correct. Yes.

Q.20 - Yes. Okay. And the key data inputs, again from your question for end use modeling, would appear to be knowing the state in terms of efficiency of different electrical appliances, the extent that such electrical appliances exist in the service area and some idea of the amount of use that the electrical appliances would get at different points of time. Would that be correct?

A. That's correct.

Q.21 - Now I expect that to have an efficient and effective end use model, these inputs have to be reviewed and updated on a fairly regular basis. Would that be correct?

A. That is correct. If the data are all incorporated in the same process, then essentially what happens is from year to year we evaluate our forecasting error.

And in each year there is an error, we are off on the actual forecast -- and again one of my recommendations as well that I didn't mention, was that the model needs to forecast unweather corrected. It needs to forecast actual data.

In other words we have the ability to forecast electric space heating. We need to be forecasting actual

electric space heating and its variation as a function of weather, of weather data. That provides us with additional information, instead of weather-adjusting the data and then forecasting.

So -- and I'm sorry. I have lost my train of thought. What was your original question?

Q.22 - Where I was going to go with this, the question -- and I think the answer that you gave was yes. I was asking do you have to update the inputs for the end use modeling regularly?

And where I wanted to go with that -- and perhaps you could address this briefly -- is how regularly or how often should the input data be updated to stay current?

A. Well, it depends to some extent in terms of forecasting accuracy. If we have estimated the model, we have looked at the historical forecasting capability and we have looked at the validation statistics, we have conducted the conditional demand analysis.

So we have good understanding of the kind of -- of how much electricity is being used by each appliance, the saturations, how those have changed over time. Then we know where the uncertainties are, where the greatest uncertainties are in those model parameters. Therefore it's not necessary to update the conditional demand

analysis every year for sure.

What we want to do is we are going to keep track of how we are doing in terms of forecasting error when it appears that we may need to update data with respect to electricity use for instance for water heaters. At that point in time we will want to consider going out with another energy survey to update those data.

So the conditional -- the energy surveys that are done for customers can be done periodically, and presumably no more than every five years, perhaps a year or so prior to that, maybe three years.

But primarily what we are doing is matching on a monthly, on an annual basis, using information from our load research data in terms of how different components are changing over time. And we basically keep track of it.

Q.23 - So in terms of efficiency of different appliances, that is kind of an ongoing process.

But in terms of who is using what type of appliances, that comes about through customer surveys which you would suggest be done on a -- at least on every three to five-year basis?

A. Yes. That's right. And on the same cycle that DISCO --

Q.24 - Sure.

A. -- is conducting those.

Q.25 - Right. And DISCO refers to their customer survey's they send out 25,000. In a good year they will get 5,000 back. In your opinion would that tend to provide reasonable information with regard to the nature of and saturation of appliances in the residential sector?

A. Right. It does as long as the survey is stratified correctly and as long as there is post-stratification. What that means is that what we want to do is make sure that we understand how residential customers are distributed based on our billing data in terms of variation across the seasons with respect to electricity use and terms of size, in terms of other characteristics that may be important, like geography.

Once we have identified those strata then the survey is sent out and I'm assuming that DISCO does that right now. What happens then, we will get the surveys back and we will look at those individual strata and then the weights that go along with the individual strata reflect the responses that we have received in the strata.

So in fact we could do a survey of 25,000 customers and have 3,000 come back and still develop an accurate estimate of the population. 5,000 out of 25,000 is a

little bit low in my experience in terms of utility response rates.

I would have expected have something closer to 40 percent. But you could, you know, still -- you know, you can take -- political surveys are based upon 3' or 400 people and they use the same kind of sampling and margin of error and all those other things that --

Q.26 - Okay. That's the questions on that area. I would like to move on a little bit to explore the relationship between load research and load forecasting. And Mr. Larlee indicated yesterday the load researching isn't normally part of the load forecast of NB Power.

So I would like to ask if in your opinion is load research an important component to the development of load forecast?

A. Yes, it is, especially in New Brunswick where space heating is such an important component. The load research provides -- because the load research data has variation in terms of kilowatt hour usage from one hour to the next, for all 8,760 hours of the year, because we can develop temperature data, and in terms of information on those individual households can determine whether or not someone is home all day, a whole variety of different -- of different sources of information could be used to provide

a great deal of information that then goes -- that can then feed into the UEC or the kilowatt hours per appliance estimates that are an important part of the end use model.

Q.27 - Thank you. Now I will just get some of your thoughts on what would constitute a proper load search program for residential customers, and again I would -- there are three or four components to this. First of all, in terms of what would constitute an appropriate sample size?

A. For sort of a vanilla load research kind of application for residential customers that DISCO's sample of 190, you know, is sort of within industry standards. A lot of utilities have a somewhat higher sample. Some have somewhat lower. But it reflects accepted practice.

Q.28 - Okay.

A. Because -- what I was going to say -- was because the issues are somewhat different here in New Brunswick, that is the impact of electric space heating and water heating, does in my opinion suggest that the sample size should be larger.

Q.29 - The second part is again dealing with what would constitute a proper load research program for residential customers. Can you give us any thoughts you might have on the proper stratification of the sample amongst -- within the class?

A. The basic stratification depends upon the objectives to which the data are put. And so if the data are only to be applied to estimate January peak demand for instance, then that's the design variable. If on the other hand there are other objectives and those include developing -- assisting in the development of model parameters for the load forecasting model, then that's -- then one might want to stratify on some different variables. For instance, one would want to make sure that there are enough sample customers without electric space heating to differentiate between electric space heating and non-electric space heating.

Now if we take -- I mean, if you take a sample -- and actually that's one of the primary stratification variables in the survey -- but let's say we take a look at water heating. That wasn't a primary stratification variable. We want to make sure we have enough customers to sample -- to distinguish between water heating load rates, water heating electricity use. We need to make sure then that we have got enough customers who do not have water heating. And since about 92 percent of customers do, out of our sample of 200 we are probably talking 16 customers only have non-electric fuel source for water heating.

So that would be a stratification variable we would want to incorporate in terms of the survey process to make sure that that is increased maybe to 50 or something on that order.

Q.30 - So in summary there, the stratification depends on what you want to test as a variable?

A. That is correct.

Q.31 - Okay. And in terms of the frequency of the sampling for load research -- I mean, even the Applicant concedes here that perhaps there has been some problems with that over the years, but is this something that -- like a 1, a 3, a 5, or is it a continuous process? What would be your thoughts in terms of frequency of sampling of --

A. Well there is no question, the process should be continuing. There should be sort of a periodic evaluation of the sample to make sure that it reflects the population in an appropriate way, but that's a relatively minor sort of aspect of the process.

One just needs to check the billing file data and compare it to the sample that we have. But it should be conducted on a continual basis.

Q.32 - Okay. Is in your opinion -- and I think you did comment that the way they do the residential load research has some positives and is consistent with standards. But

in a very direct way does DISCO or has DISCO designed its residential research program appropriately, and if there are deficiencies what, if any, would you identify based on your knowledge of what they are doing in that area?

A. To provide the information which they designed the sample for, which was like I say peaked -- a contribution for residential in January, the sample was designed correctly. However, because a minor extension of that sample can substantially increase the value of that data set for other applications, like I say, my recommendation would be to extend that sample by say 150 or so additional sample points. So it goes from 200 to 350.

That's -- yes, that's my recommendation is that -- I mean, there are -- again we sort of go back to the issues of alternative rates to the extent if there is going to be a flat rate, then what we need to know is something more than we know right now with model parameters and the data that is at hand in terms of likely reaction of residential customers to those changes in rates, with respect to space heating utilization. It's very easy.

Especially New Brunswick has a high fraction of -- high saturation of baseboard heating, very easy to close off one room and turn the thermostat down. Get a much

higher price response from lots of customers that have baseboard heating compared to central furnaces. So it's important to provide that information because that's one of the uncertainties we have in the future in terms of addressing a forecast. An important part of the forecast process is to develop the best forecast we can based upon our expected values of the driver variables, but then also to look at scenarios where we look at a high and a low that incorporate potential impacts and rate changes in DSM programs alternative technologies are certainly issues that have to -- that should be incorporated in terms of the scenario analysis.

Q.33 - The information, once it's collected, I take it has to be properly analyzed and applied in terms of creating the load forecast. And I guess my question with regard to that is has -- in your opinion has DISCO fully utilized the data that it does have in terms of creating and preparing this load forecast?

And if your answer is no, could you briefly set out any reasons you feel that way?

A. No. The data are not being utilized in a way that would be most beneficial in terms of supporting the long-term forecast. Energy surveys can be -- should be analyzed in more detail and as I indicated, those can be

used to estimate contributions of individual appliances.

The load research data should be analyzed and used for the same purposes. Essentially all -- the objective in terms of all this forecasting -- in terms of forecasting is utilize all the information that is available. It's sort of a basic premise that the more information we use the more efficient the forecast is.

Billing file information, analysis of variations in monthly energy use provide better information about electric space heating and how we are doing in terms of modelling electric space heating, and that's why I suggested that the model should forecast actual electricity use rather than weather adjusted electricity use.

So yes, all the data that -- in my estimation all the data that is available to DISCO could be utilized more intensively to support load forecasting.

Q.34 - I would like to move on to maybe one of the main reasons you are here, and that's the possibility of utilizing conditional demand analysis.

And I think earlier in your testimony you briefly touched on what conditional demand analysis is, and if I'm repetitive I apologize.

But very briefly, and make this is as simple as you

can to someone that has a problem understanding the difference between a light switch and a megawatt hour. So if you could lay out exactly what conditional demand analysis is and how does it differ from the end use modelling that NB Power presently uses?

A. What can -- conditional demand analysis can be used to estimate the basic parameters that go into the DISCO residential end use model. And those basic parameters are kilowatt hours per appliance. It's my understanding that the parameters came from another source, were incorporated in the model, and then a process is used whereby a comparison from the previous year with the current year is done, an adjustment is made to electric space heating if that appears to be warranted, adjustments are made to water heating to reflect changes in a number of -- in average household size, and then the rest of the information is allocated in some way to the other end uses.

We start -- and in my evaluation of the UECs that go back I think to 1989, basically they start out and then they change very slowly to reflect impacts of increased efficiency in different kinds of appliances. But what you get -- what you see when you look at that is a series like I said that was started 15 or 16 years ago.

This has been allowed to run and so it's just run through the years, and in 2000' -- I think it was 2002/2003 there was an adjustment to space heating and an adjustment to miscellaneous category that was discussed this morning. But other than that, the parameters sort of have a life of their own. They kind of go and continue out in the future.

What is incredibly important is that these parameters reflect the way electricity is actually used by New Brunswick DISCO customers. And one way of determining what New Brunswick customers actually use is this conditional demand analysis.

It's a statistical procedure that -- you can think -- like my analogy before, if the only difference between us is that you had two colour TVs and I had one colour TV and we watch TV the same amount of time, the difference in our electricity use would be that colour TV. The fact that -- if we put three people into our group and another person has one colour TV and two refrigerators, then we can difference those two and we can come up with estimates of colour TV and a refrigerator, because the only difference between me and you is a colour TV, the only difference between us and the third person -- or between one of us a

third person is the refrigerator.

What the statistical process does is -- essentially it does that process in a statistical way, which means that we don't have to put people into groups. It actually separates the impacts statistically. So if we were to take everybody -- everyone in the room and we were to write down the appliances that we have and take our electricity use, it would look at differences between each of us and try to allocate that difference to the difference -- to the different number of appliances that each of us has.

And so it would take everybody in the room and it would try to figure out values for those appliances in such a way that the error in terms of explaining our electricity use is minimized. Actually the sum of those errors, if you square them, those are minimized.

So what you have got is a mathematical problem where it's going to start off with a set of parameters for TVs and dishwashers and dryers, and plug those parameters it's going to tweak one and it's going to see if the errors are less and it can tweak another and see if those errors are less, and keep on tweaking until it gets to the minimum error. That's actually one way of going about that process.

So it comes up with a set of parameters for these appliances that all of us have, and it figures out by tweaking these what appliance value explains most of the variation amongst us in terms of electricity use. It's a wonderful technique.

It has been used -- you can use it to come up with estimates of colour TV electricity use which happens to be about 450 kilowatt hours per year. Your microwave which on average is around 90 to 100 kilowatt hours per year. People use it for hairdryers, for spas, for anything that we can identify as being different and contributing to different electricity use, can be separated in this statistical technique in a way that provides us with estimates of those parameters.

The reason that that's important -- or the reason that it's important to make sure we have it specified for a specific area, is that a lot of the electricity usage patterns that all of us exhibit depend upon whether or not -- if there are two adults in the household, whether or not both adults work, how many children there are.

One important variable actually that we discovered earlier on was that it also makes a difference if you have a female teenage person in the house in terms of electric water heating.

So all these -- you know, all these behaviourial and income related demographic related characteristics are really important. And those things vary from one province to another, one city to another, and so forth.

So by focusing on the data that we have at hand we can develop estimates that we know are characteristic of New Brunswick. Just by virtue of having that we know we will improve the accuracy of the forecasting model because we have got parameters that actually reflect everyone in New Brunswick rather than taking things from the outside and trying to adjust them, you know, to look like what we think Central Maine power looks -- or modify Central Maine Power to make it look like New Brunswick.

Q.35 - How is that an improvement over what NB Power is using now in its end use modelling and saturation point analysis to determine the residential loads?

A. The UECs that are in the end use model right now have never been verified with respect to actual energy use. In other words the water heating use I think averages 3770 or something like that in a recent year. There is no indication -- we have no -- we have only the faintest evidence that 3770 is an accurate number.

Part of the reason is that water heating has a high saturation. It's about 92 percent. And so what one has

to do in this conditional demand analysis is to reflect variables that determine water heating use. In other words, we have to have variation in the sample of all of us to figure out what parameters work best.

Well, one way to characterize that variation is to find out who has water heating, but then also ask him how many baths and showers are done per day to identify whether or not individuals work in the home and all these other factors, and also to ask him whether they have a small, a medium size or a large water tank. That is enough in terms of differentiating amongst all of us to figure out what should go into water heating.

So the point is that the parameters that are in the mall right now come from someplace else. They came from someplace else a long time ago. They have been allowed to change based on efficiency assumptions in terms of new appliances. And we have something now. But we don't know how accurate that is. And the accuracy is a big factor.

And one of the issues that I have pointed out in my direct testimony was that in lacking that information in terms of what's actually happening here in New Brunswick introduces a lot of uncertainty in the forecast.

For instance in the 2002/2003 year, the electric space heating, kilowatt-hours per year was reduced by -- I

think it was 900, about 900 kilowatt-hours. And so something else had to be increased. Well, what was increased was the miscellaneous end use. And that was increased by 724 kilowatt-hours.

Well, what that did -- because electric space heating was contributing less over the future than miscellaneous, which was assumed to grow at 4 percent per year, just by switching around that 724 hours from one end use to another end use, ended up making a difference, a net difference of something like 300 kilowatt-hours at the end of the forecast, which is almost half of the expected increase over the next 10 years.

So the problem is that we just -- we don't have enough information to say well, was it reasonable? Maybe it should be 3000. Maybe the miscellaneous should be 3000 kilowatt-hours. We have no information to base that on.

If on the other hand we had been keeping up the load research data or had been doing conditional demand analysis on the three previous energy surveys, we could say something about what that miscellaneous component was in each of those three periods or how it seems to have changed over the last 10 years in our load research sample.

So all that information gives us something to work

with in terms of addressing, updating issues that arise.

Because models are simplifications of reality. And we constantly have to update those to reflect the best information we have.

Q.36 - Yesterday I asked Mr. Larlee questions about why there was a pattern of overestimation and in the residential sector he attributed it to the problems of some warmer weather that we have been fortunate enough to have over the past few years.

And he and I got into a bit of debate whether that has been tested or whether that is just a result of the application of judgment by the utility.

Would the use of CDA be able to better determine whether or not the errors that occur in estimates in the forecasting -- would it be possible using CDA to more accurately determine what has caused those forecasting errors?

A. Yes. The -- I'm sorry. Your first point, I was going to mention something. Would you mind repeating your question?

Q.37 - Well, the first part of my question was that we were discussing the overestimation in the forecasts of NB Power. And then Mr. Larlee explained to us that that was due to some warmer weather we had.

And my question is would CDA assist us in determining whether in fact that theory was correct? And what assistance would CDA have in terms of identifying the causes of forecast error?

A. Right. Now the appropriate thing to do here in my estimation is to forecast energy, actual energy. That is don't weather-adjust but forecast actual energy. That way we know whether or not we are high or we are low. And the weather is already incorporated in that process.

By incorporating weather effects we also get information in terms of how well we are representing space heating. So it provides us with some additional information. We don't want to throw that away. We want to incorporate that in our forecasting process.

So yes, that would -- you know, incorporating CDA means we have a more accurate estimate of electric space heating. It also means we have a more accurate estimate of the different components, which means -- and the fact that we are doing with actual data rather than weather-adjusted data means we can more clearly identify what the source of error is.

The other comment that I was going to make, which got me off base here, was that the most appropriate way to evaluate forecast -- model forecast error is not to

compare actual -- compare the forecast that was made 10 years ago with what actually occurred.

The appropriate way to test the model forecasting veracity is to go back to the model that existed 10 years ago and put in the actual forecast variables for the drivers, the number of customers and so forth.

What that tells us then is if 10 years ago we made accurate estimates of all the driver variables, then we know what the model error is. And then what we can do is then look at the forecast with the forecast driver variables that we made back then.

And that's a different component of the error. And that's a component that comes, that arises because we have uncertainty over what variables drive the model. So those are two different issues.

And the forecast errors are presented are not terribly -- they are not terribly insightful in part because we are comparing a forecast which is weather-adjusted with the actual weather data.

The weather data -- I mean, the actual data should be weather-adjusted, which would make -- which would provide more information, clearly. But in addition to that, since it's the load -- since it's the model that we are concerned about, we need to be testing the model structure

itself.

Otherwise, if we get to -- if we make an accurate forecast from 10 years ago because we misforecast the number of households, the number of people in our household, then in order to maintain that accurate forecast, we have got to misestimate it again in the future, which is not obviously good modeling practice.

Q.38 - I just want to digress a little into some areas about -- we were going to look at implementing a CDA.

I guess my first question, in terms of computer software and resources, not necessarily computer hardware, what type of resources are needed to be able to accommodate the additional information that would be used in a CDA program to utilize it?

Is it something that -- you know, in general terms tell me what NB Power might have to do in order to equip itself to manage a CDA program?

A. These are -- the model structure is a simple structure. It's easy to write. A programmer could sit down -- the programmer I use could sit down and provide something in two weeks, something like that. The mathematical structure of the process is very straightforward.

Q.39 - Along a similar line, what type of human resources

would be required and what type of additional -- and you may or may not know of all the qualities of the people at NB Power.

But what type of resources might they need in terms of additional people or expertise to implement such a program?

A. The primary -- a primary resource requirement would be to estimate, to take the energy surveys and to estimate those parameters. Like I said, the software component is relatively minor, is very minor actually.

So with respect to the estimation -- my estimate was that it would take between four and six months for an analyst to sit down with the data, to clean it up, to identify outliers and issues, to go through the estimation process, to compare it to previous applications, to make sure that it's consistent and then to incorporate it in the model and to test it against historical series. That's the CDA part.

Q.40 - Is there software available now that does this type of a function? Or is it to be developed inside?

A. There is no packaged software. And like I say, it's very easy to program. So there is really not an issue with respect to the software.

Q.41 - Sure. If NB Power wasn't to incorporate a full CDA

program do you see any steps that they might take that might permit an improvement in their forecasting?

A. Sure. Let's say we go with the UEC parameters that exist right now. What I would do first is to modify the software in such a way that represents the price components internally and obviously the software that does that.

I would incorporate the information from the space heating fuel choice decision process since that already exists into the model structure. The historical validation process could be conducted with that process. Now I would say realistically that would say, you know, a month or two probably.

Q.42 - What -- you may have touched on this but very briefly, what benefit would NB Power realize from the use of CDA and then if you could express it in terms of degree of improvement both in the short-term and the long-term forecasting that presently exists at NB Power -- the errors in their sampling. And as indicated yesterday, it seems in the one to three year range they are generally within the 5 percent margin of error with problems long-term.

Can you give us some idea how much of an improvement we might get from proper utilization of CDA in terms of

the accuracy of the forecasting?

A. Yes. That is a -- that is a -- like I say, it is tough to come up with a number. What I can tell you is it will improve it. And the reason I know it will improve it is because we will be using data that reflects actual New Brunswick customers. We will have a better idea of how much energy is going into water heating and space heating and all these other factors. So we are starting out from a better place.

It is -- what it really does is if you make all these changes, what you have is a modelling system. With a modelling system, you do more than just go back every year and look at what was done in the past and make an update for the next year's forecast.

With the modelling system, what you have got is internally consistent over the past 15 years. It is internally consistent over the future 15 years. It allows one to incorporate new information with respect to natural gas prices or with respect to a change in industrial growth or to growth of the tourist sector, whatever.

Basically what it does is it forces modellers and people who make policy to specify the important issues to come together and to put those issues in some kind of framework that everyone agrees with with respect to

consistency. And then what it does is it provides a vehicle for exploring how much uncertainty there is over the forecast.

I mean, we can be in a very uncertain time where there is a great deal of uncertainty. That may reflect the fact that we don't know what is going to happen to gas prices more than it reflects the fact that we have got a problem with the model itself. But allows us to figure out where that uncertainty is coming from.

And the problem that we have got in terms of the electric utility industry is quantifying the uncertainty and trying to manage our risk. And this is a risk management process. We need to figure out what the cost and the benefits are of different actions and choosing those actions that have the greatest social value in terms of electric utilities.

Q.43 - I have been somewhat -- sceptical may be too strong. But I guess because it is new, I am having a hard time grasping the concept. I am a little uncertain on CDA but I have been pretty bullish on the need for consistent and proper load research to be done.

If we were to prioritize which of these should come first, would you agree with me that we should be looking at making sure we have good load research as a first step

on approving a load forecasting?

A. I would have to disagree with you on that.

Q.44 - Okay. And I won't --

A. But let me say something else too and this actually goes back to apparently there are about 650 GS and small industrial customers.

Q.45 - Yes.

A. Who are interval metered right now. That provides a huge resource in terms of getting a load research program for GS 1, 2 and small industrial off the ground. It may almost provide enough right there to explain most of the load in those two sectors.

And there is not an issue -- I mean, the fact that these customers -- or that DISCO approached these customers from a marketing perspective doesn't disqualify them from being selected as a potential customer to be used in load research sample.

I mean, it doesn't make any difference -- it doesn't make any difference why they are in the stratum they are in as long as they represent that stratum in a way that is characteristic of that stratum.

In other words, you don't have to go out and sort of blindly sample GS customers and hope you get some of the 650 in there. You wouldn't want to do that. That would

be a waste of resources. You go to the 650, you put them in the strata, figure out where they are, and then what you want to do is verify that there is nothing about those individual customers that make them different than people in that strata -- in that stratum.

If there is something different, then you just go ahead and add more samples -- add more sample points in that stratum. So 650 is a freebie in terms of that load research. And 650, if you take $500 per meter, you know we are talking $330,000 that is already saved by using those interval meters.

Q.46 - In your experience, Dr. Jackson, is there a certain size jurisdiction -- utility jurisdiction that CDA becomes a useful tool? And I guess there is a suggestion made that you know, being a 3,500 megawatt capacity utility, we are really splitting hairs really fine because we are so small that at some point in time we don't gain.

And I was wondering what size jurisdiction do you use CDA and if size is an issue, can you comment why or why not you would feel New Brunswick is an appropriate place for consideration.

A. Sure. I did some work recently for Rochester Public Utilities in Rochester, Minnesota. They have a population of 75,000 people. Clearly it is too small to use CDA

there. But I have actually applied conditional demand analysis at Washington Water Power which is a small -- in Spokane, Washington which is a -- and I don't recall the gigawatt hour usage or their peak demand. But I would actually expect that it is probably about the same, perhaps slightly smaller.

Or (inaudible) Utility which is in Downstate New York, a very small utility. Rochester Public Utilities -- sorry, Rochester Electric which is in Rochester, New York, which is also a small utility, have used that. I know I used it for the city of Boston which is probably a couple of million people. And so no, there is no -- New Brunswick is not too small to use this. New Brunswick is not too small plus it already has the data to use.

I mean, if you are going to design the perfect survey or a survey you would like to have, it might not be the survey that exists right now but that survey will provide a lot of information in terms of end-use UECs. There is no question about that. So the data already exists. There is no reason not to use it. But now New Brunswick, certainly not too small.

But in addition to that, just because of the issue with respect to the importance of electric space heating, the potential that is going to have in terms of impacting

capacity additions, the growing use of innovative pricing strategies to manage -- to use demand side management as a supply resource and other factors certainly would suggest that New Brunswick should be applying that methodology.

Q.47 - They were open-ended questions but I was searching for information. I thank you, Dr. Jackson. Thank you very much.

CHAIRMAN: Thank you, Mr. Hyslop. Mr. Morrison, do you have any questions?

MR. MORRISON: If I could have ten minutes I might be able to shorten up some of my cross to make sure I don't duplicate some of the things that Mr. Hyslop has dealt with.

CHAIRMAN: Gladly. So we will take a ten minute break.

(Recess - 3:50 p.m. - 4:00 p.m.)

CHAIRMAN: All right. Are you ready to go, Mr. Morrison?

MR. MORRISON: Yes, I am, Mr. Chairman. Thank you.

CHAIRMAN: I hope the ten minutes was beneficial.

MR. MORRISON: I hope so too.

CROSS-EXAMINATION BY MR. MORRISON:

Q.48 - Good afternoon, Dr. Jackson.

A. Good afternoon.

Q.49 - I am going to preface my remarks -- and we have been discussing this and I think the flavour is coming through

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in some of the things that Mr. Larlee said. From DISCO's point of view it has been a real learning experience and of course it is helping to improving its forecast.

And DISCO as a result of your report has done some of its own research into conditional demand analysis and so on. However, we do have some questions to get a more full notion of what it is that you are recommending. And I guess we are coming at it from the perspective of the practical -- the practicalities of implementing this and the costs and the benefits and so on. So that's where we are coming from.

And you don't have to turn this up but in one of your IR responses you said that the costs of modelling and data development extensions are obvious. I think that was one of your responses. And I don't mean to be flippant about it and I'm sure that someone with your experience it is obvious, but from where we sit certainly we have some questions.

You talked with Mr. Hyslop about the end use model and that's essentially the model that DISCO uses today, correct?

A. Right.

Q.50 - And I'm going to ask you to turn to page 4 of your

report. And I'm going to start actually with your first recommendation which deals with the conditional demand analysis.

At page 4 of your report the last sentence in the first paragraph it says, correction of these deficiencies -- and you are talking about deficiencies in the model -- should be accomplished while maintaining the current end use model framework. So are you suggesting -- and I am not sure --

A. Sorry. Let me ask you for the reference here? I was looking --

Q.51 - Sorry. It's page 4 of your report which would be Appendix B of your evidence?

A. July 3?

Q.52 - Yes. Sorry.

A. I have got a different form here I guess.

Q.53 - It's the July 3rd 2006, final report.

A. Right. That would be probably be page 3 -- I don't know. I'm looking at page 4, I don't see what you are referring to. Tell me again?

Q.54 - Just above the paragraph that starts with, updating process.

A. Okay.

Q.55 - And you will see the last sentence there, correction of

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these deficiencies --

A. Right.

Q.56 - -- should be accomplished?

A. Mmmm.

Q.57 - I guess what I'm asking you is -- so are you suggesting that the model itself change or only the UEC inputs?

A. No. I'm suggesting that the -- well let me step back. First of all let me say by saying costs are obvious, I didn't mean to be flippant. What I meant was that the cost elements are obvious. You have got manpower, you have got resources, you have got, you know, software, all those other things. But getting back to this issue. No, what I meant was you adopt an end use model which focuses on electricity use of the various end uses and the saturations. That focus is appropriate and should be maintained. What I am suggesting is that the structure of that model can be modified in such a way to incorporate a variety of these suggestions.

You are still maintaining the end use model focus but you are modifying the software and incorporating some relationships that are not currently in that model. What the CDA process goes to is how parameters are developed for that modelling process.

Q.58 - And I will get to that in a moment, but I guess what

I'm trying to focus -- that in addition to the UEC parameters there will necessarily have to be model changes --

A. Correct.

Q.59 - -- changes to the model. Can you just outline as briefly as you can what those model changes would look like?

A. Sure. And I don't know what the model software looks like right now or how it's developed. I mean, I have seen some models that are done in Excel and they can certainly be done that way. But that doesn't lend itself to the kind of historical forecasting and sensitivity analysis.

What we are talking about is a fairly -- in terms of the model software is a fairly simple program. We have got the number of appliances times -- or got the number of households times the saturation which is a fraction of households who have the appliance times the UEC or the kilowatt hours per appliance times in this case a utilization factor which represents the price impact. Instead of doing price outside the model we are going to move it into -- inside the model. And then you sum of those accross the different appliances and you add those up.

Now what I would suggest that of course you may want

to take a look at is the extent to which all your residential customers are homogeneous. I mean, it's standard practice to include -- to have three dwelling unit types, single family, multi-family and mobile home. And I'm not familiar with the breakdown in terms of those structure types.

But to some -- so you may want to add some additional -- you may want to add some additional detail in that model process.

But the model structure itself is a very straightforward. It's a real easy thing to program.

Q.60 - Okay. With respect to the UECs themselves -- and we have space heating, water heaters, appliances -- are you talking about changes to some or all or them, or actually expanding the UECs into -- I think you talked about hairdryers and water pump -- you didn't mention water pumps --

A. Right.

Q.61 - -- but would you be expanding UECs to include parameters for -- UEC parameters for hairdryers and water pumps and --

A. I wouldn't include them to -- I would not expand them to include miscellaneous appliances like hairdryers. There are a couple of end uses that end up being important

though especially in areas that are more rural, for instance well pumps can use a lot of electricity and help explain the variation that occurs amongst individual customers. So there would be a couple of additional items that you might want to evaluate and consider. But basically the end uses that are incorporated in the model are typically considered sufficient for that kind of analysis.

Q.62 - Okay. So you are not looking at a major refinement of the UECs themselves?

A. No.

Q.63 - As I understand it, Dr. Jackson, from your evidence and what you have said here this afternoon, the purpose of conditional demand analysis is to essentially re-establish those UECs, correct?

A. That's correct.

Q.64 - So after you go through the exercise of the conditional demand analysis process what you will end up with is a new set of UECs, correct?

A. Correct.

Q.65 - Okay. But conditional demand analysis would not be used to forecast changes in the UECs themselves. In other words CDA does not have a forecasting function itself, does it, other than establishing the base UEC?

A. That's correct.

Q.66 - Mr. Hyslop asked you this question, he talked about maintenance of the UECs after they are established. And I think you went on and explained that they did have to be maintained and updated and so on and kept current.

And the only reason I am asking this question -- and you don't have to turn this IR response up -- I'm just a little confused and perhaps I have missed something. In DISCO IR-3 -- and it's at the top of page 4 -- you indicated I believe there was no ongoing maintenance, and I just want to make sure that I understand that there is not a contradiction there or that we are referring to the same thing?

A. Right. No. What I am saying is let's say you do the energy survey, you conduct the statistical analysis, you end up with new UECs, put them in the model and that's it. That's it for that UEC process.

So you don't -- you have already gleaned all the information you can get presumably from that energy survey.

You have updated the saturations, you have addressed whatever other issues you want to address. You obviously save the data in case something comes up later that you need to go back and revisit for some kind of program or

something like that. Well that's it.

So until there is a need to redo the conditional demand estimates you don't -- there is no more maintenance. In other words -- I mean, you know, you might go five years before you decide that it's appropriate to update the UECs again.

So my point was you don't need to do anything year to year. What you need to do with respect to the model is just keep track of the model and make sure that the structure hasn't changed, that something new is not happening that you don't need additional information to provide analysis for some incentive you may decide to offer.

Q.67 - And that's fair enough. That clears up that misunderstanding. And just to be clear, as I understand your recommendation is that conditional demand analysis will be used only for the residential load forecast, correct?

A. That's my recommendation, yes.

Q.68 - In your materials you refer to the California example, I will call it, and I have to say, Dr. Jackson, we reviewed that with great interest. I have the summary consultant report here and it's fairly lengthy.

But I do want to probe that a little bit because Mr.

Hyslop asked you a little bit about the size of New Brunswick and the applicability of the CDA to a market or utility the size of DISCO.

When I looked at the California example it's a compilation that was done for the whole jurisdiction as I understand it, correct?

A. Yes. For I think five utilities participated.

Q.69 - Five utilities. Yes. And we just went through it, for Pacific Gas and Electric it's 5 million customers, San Diego Gas and Electric was 1.3 million customers, Southern California Gas was 5.6 million, Los Angeles Department of Water and Power is 1.4 million.

And I guess we looked at that and we thought perhaps conditional demand analysis makes sense when you are dealing with that magnitude of customers, but when you are looking at a utility with 325,000 customers and the effort that is involved in acquiring the data for example and all of the other things that you mentioned, we had to question the practicality of it.

Now you mentioned earlier that you were involved in a couple of other utilities. But can you give us an order of magnitude of how many utilities that you are aware of that would be approximately size of DISCO, 325,000, that would embark on a conditional demand analysis program?

A. I can't give you a number off the top of my head because I am only familiar with those for whom I have worked or that happen to appear, you know, in the open literature like the California study did.

Most utilities don't publish their work. I mean, it's published as part of the hearing process but not something that is readily available.

It -- I mean -- like I say, it's not an unusual application for a utility the size of New Brunswick. Certainly larger utilities use it. One reason that I pointed -- in my earlier evidence, in the July 3rd report, I had referenced -- I had referenced the Department of Energy reference on conditional demand analysis to -- primarily just to provide an explanation of the process and how it works.

And that reference is -- it's a short and sweet reference. The conditional demand analysis that is done by the Department of Energy is not my favourite, it could be improved on.

But the reason that I have referenced the California study was that it spoke to a couple of issues that I know DISCO had a concern about. And one of those is the difficulty that one has in estimating UECs when saturations are high.

That is, one of the problems that exists, we are talking about the estimation process before was that the estimation process needs to look at the difference in energy use amongst all of us in this room, and figure out how much of that difference is coming from each the different appliances.

The problem of course that you have when almost everybody has water heating is we don't have much to compare in terms of the number of people with and without water heaters, almost everybody has one.

One of the ways of resolving that issue is to ask questions about water heating use that go to how much the water heater is used, and that would relate to the small water tanks, the medium size, et cetera, knowing for sure who has a dishwasher because that uses water, and the washing machine, how many of loads of laundry are done per week, that sort of thing.

But the other reason that I thought that was an instructive study was because what it has also done is it has very effectively incorporated engineering information in the process. For instance, one approach to a conditional demand analysis is to say that 60 percent of us in this room have electric space heating, and in our analysis -- in a traditional conditional demand -- not

traditional -- in a very simple conditional demand analysis we might represent that as a variable, has a value of 1 in our regression equation.

So you have a space heater -- you know, 60 percent of us have space heaters. It would give us an estimate -- one estimate for space heating that would represent the 60 percent of customers in this room who have space heating. Well -- and that's one way to go about it but it's not the best way.

A more telling characterization in terms of electric space heating use is to know something about the size of the house, because if we know something about the size of the house we know how much heat is being lost through the walls and through the ceiling.

In addition to that if we ask something about thermostats we know the difference between the inside temperature and the outside temperature. If we ask something about whether or not the ceiling is insulated, then we have got the information.

So we can actually develop these engineering based relationships which provide us with information in terms of heat loss with respect to space heating. The advantage of that then is that it doesn't matter so much what the -- if everybody has electric space heating because we pick up

- variation depending upon the size of our house. And that tells us what the average space heating is or tells you what the space heating is for large house, medium house and a small house.

So what -- I wasn't -- you know, I wasn't suggesting that you go with the same kind of -- I don't know -- with the same kind of approach necessarily that was followed in the California example.

What I was suggesting was that that represents an example of the kinds of variables that can be used and why they can be used and their application.

And when I had given my estimate before it was of about 75' to 125,000 in terms of implementing that process.

What I am assuming is that what you would want to do initially is take the energy surveys you have -- what I'm thinking you might want to do in terms of your next survey is to incorporate some information on review of this study that you think might be useful in terms of explaining variation in electricity use across the different appliances, and obviously to make it your own survey.

I mean, undoubtedly that study by the California Energy Commission and the five utilities was substantially more than what -- the cost was more than the 75' to

125,000. You are going to do a mail survey, you will do some follow-up work, you will do some post-stratification after you get the results to make sure you have got something that is consistent with the utility service area or population as a whole and those sorts of things.

So I think that the better issue -- the better question here is you sort of can't afford not to do it. You can't afford not -- you can't afford to be forecasting electricity use with parameters, they are taken from some place else.

I mean, you know, why not just take the model or somebody elses' econometric equation or -- you know -- I mean, you need to be forecasting electricity use based on parameters that reflect New Brunswick customers to the extent possible.

In my view, incorporating this is a relatively minor investment relative to what one could do for instance.

Q.70 - Okay. And we will get into that a little bit later.

You just mentioned something about California and why you chose it, because of the saturation problems. I'm not going to get into linear regression with you, Dr. Jackson, I can assure you of that.

But I understand that California had some saturation issues, right, where you couldn't find the differentiation

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between appliance use for example, and I think you have alluded to the fact that New Brunswick has similar saturation?

A. Right. Well what I was saying is I think the issue is a serious issue. The issue of saturation is a reason that you can't -- it's probably the reason that the 1990 effort failed in terms of providing useful results. It's probably because electric space heating was put in as an all or nothing variable. And it's probably the same thing in terms of water heating.

My point is that you can construct variables in such a way that reflect not only the presence but the use of that end use, and that's why I brought that -- I mean, I -- the California provides examples of incorporating engineering and utilization information in the regression equation. Rather than attempt to pull out a more simplified example of that I just referenced that.

Q.71 - Right. And the way you deal with that problem is you expand the survey, for example, to get the types of variables you need to make whatever --

A. Well, you could do that. And I don't know what questions are incorporated in the energy survey. If the size of the dwelling unit is incorporated then I would suggest

considering looking at exposed area and heat loss

based upon -- if you -- typically what you would do is assume the house is rectangular in some way or square.

You can figure out what the likely surface area is of the walls, typical number of windows in the house for a different house size. And you can simply develop some engineering relationships that allow you then to go ahead and differentiate between different kinds of dwelling units with respect to space heating demands.

Q.72 - Right.

A. Which is also important in terms of forecasting. Because one of the issues that we get into is that new dwelling units tend to be larger than existing dwelling units.

And so what we really want to be able to do is to forecast the impact of electric space heating was chosen for a new dwelling unit. So given the fact that new dwelling units use more electricity, it may be that you are underforecasting the energy use in terms of new a dwelling unit.

The issue here is, you know, in terms that UECs are incorporated in the model, they have been based on some year initially and then allowed to decline basically as efficiency improves.

But there is no -- there is no adjustment in there to

reflect the fact that utilization may be increasing or that the size of the dwelling unit is increasing. Or in water heating you have got a number of people in the household. But there is nothing there to represent the fact that old water heaters are being replaced with new water heaters that are more efficient.

So my point is that it takes all these factors together and the conditional demand parameters is sort of the only place to start. If you are not going to do that then I wouldn't do anything.

Q.73 - Okay. And I will explore that a little bit more in a moment. I'm going to ask you sort of a point-blank question. Because there seems to be some inconsistencies when I read your evidence and your report and some IR responses.

And I'm still confused about -- I guess I will call it the current state of DISCO's data. So I will ask you this question and see whether I can get it straightened out.

And that is is it your position that DISCO currently has enough data to do a meaningful conditional demand analysis? Or is more data required?

A. Well, I'm assuming -- like I say, I haven't seen the survey you used for your -- for the energy survey. I'm assuming it's similar to the one that was used in the load

research -- in the load research sample.

But I'm assuming that you asked the traditional questions, which are number of people in the household and size of the house and --

Q.74 - I can assure you that that information is not elicited in the survey. But I'm going to get into that in a moment.

Is it fair to say that in conducting a conditional demand analysis that it relies entirely or at least extensively on the survey information?

A. I'm sorry. Would you repeat that?

Q.75 - If you are going to do a conditional demand analysis, is it fair to say that there is either an exclusive or at least an extensive reliance on the customer survey?

A. Yes.

Q.76 - And I know you haven't seen the DISCO energy planning survey. And you asked -- or you suggested that it would have some of the demographic information that you talked about. But it does not. Because it was designed for a different purpose.

It certainly doesn't have the level of detail, Dr. Jackson, that we saw in the California example. When we looked at the California example, the customer survey there is 20 pages long. DISCO's is two and a half pages.

So that will give you sort of the order of magnitude.

So you were talking earlier about finding out water heat, how many teenage girls or for that matter teenage boys you have in the house is an important piece of information, exterior insulation, whether people turn their thermostats down at night or off at night or what they do.

That is all important information that you would need in order to conduct a conditional demand analysis. Is that fair to say?

A. That is correct.

Q.77 - So given that you would expect that the DISCO survey would have to be expanded I would say significantly in order to capture that data?

A. I have done surveys that are three pages, surveys that are three pages that are put together, go out and come back and they are processed within a month's time after they come back. It doesn't have to be. It doesn't have to be.

If you looked at the California results, what you saw was that they were actually producing estimates in terms of hairdryers. And hairdryers is an extreme I guess. But a lot of appliances --

Q.78 - No. Do you know what the extreme is? And I will

just --

A. Yes.

Q.79 - -- throw this out. It is whether the doghouse has a window or is airconditioned. It is there. That is the extreme, Dr. Jackson.

A. Well, maybe that's because we are dealing with California here. No, I wouldn't suggest that you would want to do that. What I am -- I mean, there are some basic variables, for instance the size of the dwelling unit, clearly the kind of fuel that's used for space heating and water heating, something about the use of that -- of those appliances, someone home during the day, a thermostat, a set point.

And then just some -- and then some minor. I mean, it's very easy I ask -- I have asked people to identify how many refrigerators they have and how many T.V.'s they have, if they have a microwave and approximately how many meals are cooked at home.

I mean, a list is actually a fairly short list. It's very easy to administer. And actually -- I mean, given the fact that you can use a mail survey to do this, it's a very low cost as well.

So if the current energy survey does not include that, I mean, I would certainly expect that you would want to

incorporate -- you know, to go in and incorporate that and get one out as soon as possible.

Q.80 - There would be no doubt that the survey would have to be expanded in order to capture that data. And would you agree with me that as the survey expands that one would expect the response rate to drop?

A. Well, it depends a lot on what your initial survey looks like. I mean, there is a real art in terms of designing surveys.

And the fact that you get 5,000 back out of 25', it means something is wrong with the surveys. I mean, that's such a low response rate. A more typical response rate is about -- at least 35 percent if not 40, if not 50 percent. So I don't -- it's like I say, I haven't seen your survey. And I don't know --

Q.81 - Again we looked at the California example because it was one that you mentioned to us. And they had concerns. And quite frankly their response rate dropped. And one of the concerns that they had was because the number of questions increased?

A. Oh, certainly. If you --

Q.82 - And they were eventually able to get I believe a 40 percent response rate. But they had to -- I think Mr. Larlee talked about that the other day. They had people

on the phone. They provided financial incentives. They did a lot of follow-up. It was very labour-intensive. So they themselves had a concern that as they expanded their survey, their response rate was dropping.

And so I just point that out that, you know, there has to be a balance there, doesn't there, Doctor?

A. Well, sure. No, -- I mean, again I -- I referenced the California survey because I was asked a question about what variables are included and how they are included and that sort of thing.

And I think that that's a nice blueprint of some of the procedures, methodological procedures that one uses in this kind of application.

I mean, there is no question that the larger the survey is the poorer the response rate it. There is no question about that. There is also no question that a well-designed survey can improve the response rate.

There is also no question that promotional activities can also help improve the response rate. And that, you know, essentially customers' feelings about a utility have a lot to do with what the response rate is. So there is a real art to maximizing responses.

However, let's say you send out 25,000 surveys and you get 4,000 responses or 3,000 responses. That's still

enough. It's still enough. Because what you know is who you sent it out to. You know what kind of people responded. And you know how to weight those responses.

So it really doesn't -- you know, we all like to have really high response rates. But it doesn't necessarily impact the efficiency of the estimates in any way that's significant, if we can get a reasonable threshold in terms of responses.

Q.83 - Okay. And just so that I'm clear, I think I know that we have to expand the survey in order to capture some of this additional data?

A. Correct.

Q.84 - Are you also saying that we will have to expand the scope of the sample? Will it have to go to more customers?

A. Well, I'm not sure about that. I mean, I think what you would want to do is -- I mean, I assume you test -- you know, you test your sample -- your survey instrument to begin with. To figure out what kind of response rate you get the different sample designs, instrument designs. So you send out -- you send out different kinds of surveys to individuals to find out what you can do to go about maximizing your response.

But I mean, you know, the thing is I don't know -- I

don't know what your survey looks like. So I can't give you suggestions in terms of how to improve the response rate.

All I'm saying is, you know, if you had 3,000 responses I would expect, based upon the kinds of people that responded, that that would still be sufficient to provide you with enough information to conduct the conditional demand analysis.

Now if you decide to increase it, you know -- I mean, if you increase the response rate by a better designed survey instrument, then you don't have to send out as many. But if you sent out -- I think Mr. Larlee's estimate was I believe 20' -- $30,000, was that it, for --

Q.85 - That is my recollection.

A. -- a survey? Well, presumably you are going to go ahead and collect it for whatever purposes you had to begin with, which may be something other than the conditional demand -- than the end use model.

But if you are going to go out with a survey anyway, you know, you can add -- I mean, you can increase -- so increase the sample by, you know, 10 -- 20 percent.

And all I'm saying is that I think the marginal effort in terms of what's required to get more information to support the analysis is an important consideration.

Like I say, you know -- I mean, we have got -- the customers are out there. We need to know something about how they are using energy. I mean, for instance the 3770 or whatever it is in terms of electricity use for water heating is a substantial -- substantially greater than electric water heating KWH in most jurisdictions.

Now the question is is that because of water -- is it really water heating that's causing that? Or is it in some other end use? If it's in miscellaneous end use it makes a big difference, as we saw when miscellaneous was increased from 724 and grew -- actually over the forecast, the largest component in terms of growth or residential is in fact that miscellaneous end use that's growing at 4 percent. But we don't know really what that miscellaneous end us ought to be, because none of these parameters came from our service area. So that parameter is growing. We plugged 724 into it. And it has increased from 724 to 1200. Whereas if we put water heating the forecast would have actually declined. So, you know, we are trying to respond to this different information in terms of calibrating this model.

And stuff is going here, there and everyplace. The 3700 is really high. A more typical kilowatt-hours for a water heater is something on the order of -- I mean, 2500,

3000. The question is is that, you know, is it really 3700? We don't know. We don't know because nobody has done any estimation with it.

Q.86 - And I guess --

A. But in addition to that we also don't know about space heating. There is no reason -- there is no reason not to go ahead and estimate the impact of space heating on dwelling unit electricity use. I mean, that's an easy thing. It's like falling off a log in terms of this estimation process. It's a critical issue in terms of impacts of natural gas penetration for instance.

But we really don't know, based upon the information that's available, if that electric space heating is accurate either. Because the way that has developed, according to my understanding, is we take electricity use in electric space heaters and electricity use in nonelectric space heaters and we take the difference. And that's electric space heating. But the problem is electric space heaters have a higher penetration of water heating. They may have higher demographics, may have larger houses. So that difference may be too large or too small. The problem is we don't know. That's not an appropriate way to do that.

Statistically we could estimate it with a conditional

demand process. So my point is, you know, we can bounce these parameters around a little bit. It makes a big impact in terms of the forecast.

Q.87 - Well, thank you, Dr. Jackson. And I know that you have highlighted the problems you perceive with the UECs. And I guess the purpose of my question was just trying to elicit some information from you as to what the survey changes would be and the sample size.

But I'm going to go on to something a little bit more specific. If I could get you to turn to page 5 of your report which is the appendix B?

And you might want to turn up -- it's PI IR-3 which is -- I believe that's marked as PUB-2.

A. I don't actually have a PI --

Q.88 - That would be your responses to both us and to the Public Intervenor.

A. I have the responses to you. I have misplaced my PI response some place between the hotel and here.

Q.89 - At page 5 of your report under the heading Estimation of Peak Kilowatt Hour and Load Profiles, you indicate that a conditional demand analysis application should provide some useful information on the contribution of each appliance to coincident and non-coincident peak. Do you see that?

A. Yes.

Q.90 - And if you refer to PI IR-3 -- and I'm just trying to get some clarification actually, Dr. Jackson. In PI IR-3 Mr. Hyslop asked you to design a model research program, do you recall that question?

A. I do.

Q.91 - And at item 4 of your response you indicate that approximately 150 additional -- we take that to mean residential meters would be required, do you see that?

A. That's correct.

Q.92 - And I guess what I'm asking you is that for the model program, or is that your recommendation? Are you recommending -- in your recommendations are you recommending an additional 150 meters -- residential meters?

A. Right. I'm recommending an additional 150 meters on the residential sector because -- I mean, in part because it provides additional information for the UEC estimation, that's correct, and the contribution of special electric space heating water heating on peak demand.

But what I'm also suggesting is that another 150 meters on residential customers would provide additional information with respect to variation in terms of residential customers with respect to geography, with

respect to for instance water heating saturation, things like that, that maybe important with respect to innovative rate programs, the load control programs, and the water heating load control programs are a popular -- a popular DSM option that for some utility turn out to be a lease cost kind of option.

So what -- all I am suggesting is that -- I mean, part of the problem with the load research programs or the surveys for that matter is that one should try and anticipate the needs of the data. If we anticipate the needs of the data then the information is collected and then those data can be applied to address those questions.

So I am just suggesting that in terms of having a robust sample for load forecasting as well as for load research questions that that should be -- that DISCO should consider expanding -- extending that sample.

Q.93 - And again, Dr. Jackson, the only reason for my question is we are just trying to get a handle on costs, whether the 150 meters was included or not included, and --

A. Right.

Q.94 - So in your conversations earlier with Mr. Hyslop you were talking about the importance of having New Brunswick data and how weather differentiation within New Brunswick is an important parameter, correct?

A. I don't -- I guess it was passed in the conversation. I don't recall specifically talking about that.

Q.95 - Oh, I thought you did have a discussion about -- or maybe it was with Ms. Desmond why it was important to have -- know whether it was colder up north or down south in the province.

A. No. What I said was that -- what I said was that it may be useful to distinguish in terms of energy use and hourly load profiles with respect to geographic areas, that's correct.

Q.96 - Are you aware, Dr. Jackson, that Environment Canada has closed a lot of its weather stations in recent years in New Brunswick, so that differentiated weather data isn't available?

A. No, I saw a reference to that. And I guess my assumption was that at least for major geographic -- I mean, geographic areas, we are not talking about dividing New Brunswick into 100 different geographic areas, we are talking maybe three -- three regions. I was assuming that weather information would be available for three regions or that if it weren't the utility itself would be collecting that data. So I guess that was my assumption.

Q.97 - My question was if it wasn't available through Environment Canada then your recommendation is that DISCO

would accumulate that data itself, correct?

A. Exactly. But again my suggestion was for major climate areas. There is no -- you know, there is no --

Q.98 - That's fair enough. You don't have to turn this up, but at page 7 of your report -- you discussed this again earlier -- you recommend inclusion of price elasticity directly in the model?

A. Correct.

Q.99 - And I know you had some discussion about it this afternoon, but we would like to know as precisely as you can how this works and what changes to the model are required in order to incorporate price elasticity into the model?

A. If the only thing you wanted to do is to incorporate price elasticity -- and I will need to address that after we talk about this. But if the only thing you want to do is incorporate price elasticity what you would do is -- I mean, let's sort of conceptualize here what we have got. We have got these individual products, so we have got households out here and then we have got saturations times household gives us the number of customers that have electric water heating, let's say. We multiply that times electric water heating UEC and that gives us the total -- that gives us the total electricity use for water heating,

right. So we have got the product of those three factors to give us water heating energy use.

What we do is we add one parameter onto that product. That parameter is called the utilization parameter. Is called the utilization parameter. The price increases -- the impact -- the immediate impact we see is customers turn their thermostats up or down or they change the utilization for most equipment. You can't for refrigerators very easily, but for space heating certainly, water heating, you can do some things.

So what do then is we add one parameter to each of the products that comes from each of the end uses. That parameter starts out -- let's say the model starts, so we are going to have to expand the model now to be able to go back to 1990 which you had indicated -- DISCO had indicated was considering. So we expand the software to go back to 1990 and start forecasting in 1990.

The value of that utilization parameter in the index, it can be 1 in 1990, and then when prices increase -- let's say prices increase by ten percent, if -- and let's just abstract from it for a minute, say we know the elasticity is .18, as it's estimated in the econometric model.

If price increases by ten percent then what that short

run elasticity tells us is that the utilization of that equipment is reduced by 1.8 percent. So that index changes from 1.0 to .982, right. And we continue doing that then for every year on the process. That gives you something that is completely equivalent to applying the price of elasticity after the fact. Okay.

So it's simply a matter of adding one term to each of the end use products and then updating that price elasticity over time. Now -- and you could do that, and if you did that that would be comparable to take -- to getting rid of that add on stuff with the price elasticity -- with the forecast.

But what would really make the model more robust and methodologically correct is also to allow the utilizational elasticity to change in response to changes in equipment efficiency, because if the prices goes up for electricity we may use less -- we may take fewer -- or double up on our washing and use a little bit less water heating for washing, let's say.

But at the same time if we buy a more efficient water heater, the cost of the water heating now has gone down. So consumers actually have this -- what is called a snap-back effect or efficiency impact. So if you buy a more efficient piece of equipment it costs less, therefore you

tend to use it more.

So what we want to do then as well is allow the utilization factor to be impacted by efficiency. So in other words, let's say in the perfect storm scenario, the price goes up by ten percent but we buy -- but we buy all new appliances that increase the efficiency by ten percent. Then what happens is the cost is not higher, so the efficiency and the price have to offset each other. So that's what I would do for that component. It requires a somewhat different representation of the way the efficiency comes into the model, but it's an appropriate methodological way to incorporate the short run/long run price impacts that are implicitly incorporated in the econometric forecast.

Q.100 - So would this involve more than one utilization parameter?

A. Well no, it's one utilization parameter, but the utilization parameter is impacted by price changes and efficiency changes.

Q.101 - Okay.

A. But in answer to your question, it is a fairly straightforward process of incorporating a parameter, expanding the model's software to allow you to go from 1990 let's say up to 2006, and then obviously you can

progress into the future.

Q.102 - Now if you can turn to page 8 of your report, it's the very -- it's under forecast error evaluation, do you see that?

A. Yes.

Q.103 - And in that you say, detailed documentation of model structure and development, presentation of model sensitivity analysis and more detailed error analysis is recommended. I guess I would like to have an explanation for that.

Are you recommended that a detailed manual be prepared, or just exactly what does that entail?

A. Sure. Just -- a user's guide. I mean, what I would recommend is that DISCO restructure its model and make it available to the interested parties.

And what that would include is just a description of the equations, the parameters, how they work, where they have come from, and how to run the model. And in my experience it promotes -- it actually reduces -- like I say in my experience it actually reduces the conflict in terms of opposing views, because what happens is that any improvements or suggestions in terms of structure people can generally agree upon.

It's the parameter values, let's say the increase

in -- or decrease in number of people per household or the increase in terms of GDP or something. So yes -- I mean, that's the way I think it's most efficient to do it. But yes, there needs to be -- in other words, when I -- in reading the forecast document here, it's very difficult. It's very difficult to evaluate the forecast because all we have are the end results. Well actually it's impossible to evaluate the forecast based upon this document alone.

I mean, I can see -- you can see the historical trends and you can see forecast trends, and they seem to be consistent. But the problem is you don't -- you know, you don't know. And, you know, unfortunately in terms of the electric utility industry we all know we have had our periods where the future didn't look at all like the past, and we want to make sure, having been burned on many occasions -- that is a variety of utilities having been burned -- we want to make sure that we are not surprised. So my point is -- for instance I would include in this document information on saturations and UECs and how they change over time, and all the other relevant variables that impact the determination of electricity use for both residential and GS and industrial.

Q.104 - So your recommendation there is to present -- prepare

a user manual that will have this transparency then, correct?

A. That is correct.

Q.105 - Okay. Now as you embark on this conditional demand analysis process and we have collected all the data and the data is there, I assume that -- I have heard people refer to it as data cleansing, and I don't pretend to know what that means. But I assume that once you collect the data you have to evaluate it to determine whether it is sufficient or suitable for your analysis, correct?

A. That's correct.

Q.106 - So what happens if after you collect this data and you do your analysis or cleansing or whatever it is called, and you determine the data isn't suitable for the purpose for which it was collected, there is some deficiency in it. Is it then just a wasted effort or would you then go and embark upon collecting more data or refining the data? I would just like to know.

A. Sure. What happens -- let's say you go out with the 25,000 -- let's say you go out with 30,000, you get 5,000 back. So you have got 5,000 responses and you have asked people to identify the appliances they have and whether or not they have electric space heating or electric water heating. And the first thing you do is just add up a

series of software checks because we know that people have electric space heating should have higher electricity use in the -- clearly in the winter months than the summer months. And it should be higher by some significant amount.

So what we can do then is to identify a screening technique. That's important in part because the issue of supplemental electric space heating can be an important -- important as well and actually can have a substantial price -- there can be a substantial price impact in terms of the secondary space heaters, but another issue I guess. So what we do then is we do this consistency check and identify observations that appear to have been incorrectly answered. That screening analysis then basically allows us to go back and identify and confirm or reject those responses.

If out of 5,000 we lost 500, you know, it's not a problem. The reason it's not a problem is because we are sampling from this large population. What our concern is is that within each individual straight out we just have a sufficient number within those -- within those individual --

Q.107 - I don't want to interrupt you, Dr. Jackson, but I am trying to get to the point here. And I guess the point is

just assume for a minute that the data isn't suitable, for whatever reason.

A. Okay.

Q.108 - It's just not suitable. Do you throw it out and say -- - throw up your hands and say, okay, that's it, we are not going to do CDA, or do you go on and have to do further testing or collect further data, make certain other assumptions, and I guess what I am trying to get at is what is involved and what is the cost of it?

A. Sure. If you sent out a sample -- if you sent out a survey and the data you get back is unusual, you fix the survey, because there is absolutely no reason in the world how you could send out a survey and not have anything usable with respect to conditional demand analysis. I mean it's inconceivable that that would be the case. If it is the case then the survey has not been correctly administered.

Q.109 - And I assume that would be an additional cost, if you have to fix this data or cleanse it or whatever?

A. If you don't do it the first time I guess there would be an additional cost, yes.

Q.110 - And I guess I would like to get to the nub of it, Dr. Jackson. What we are really concerned about here is the amount of work involved, the amount of resources involved

and cost. You weren't here when Mr. Larlee testified yesterday but I'm sure Ms. Desmond informed you that -- your -- you have given in an IR response for this recommendation one that we have been talking about, the expansion of the sample and for conditional demand analysis you have put in an estimate of 75 to $125,000. And I will be frank about it. Mr. Larlee thinks that's not enough money. And I guess we are very interested -- keenly interested in knowing is -- a lot to be clear about this -- DISCO is not coming at this from the point that we don't want to do conditional demand analysis. I guess we had a discussion the other day that quite frankly if we could do a CDA for $75,000 it's probably not a bad idea, assuming there is some benefit to it. But I will get into the benefits in a minute. What I want to get at is is that $125,000 -- is the deliverable that DISCO would get for that investment everything that we talked about here today, or are there other costs in addition, in-house costs, other costs that we are not seeing but we believe are there? Can you offer any guidance on that at all?

A. Sure. I mean I didn't include the cost of administering the survey clearly. I didn't include the cost of having it converted to digital form when it comes back. I assume that's in the $30,000 estimate in any

case. I was identifying that as an analyst cost. It's my expectation that you can you could put out an RFP to have -- to conduct an conditional demand analysis with a sample of data that you have procured through survey means, and have a complete estimate of conditional demand parameters that require the model without any additional effort to incorporate those.

Q.111 - So just so we are clear, and I'm trying to put a box around this if you will --

A. Yes.

Q.112 - So the 75 to $125,000, in addition to that there would be whatever the survey costs are which --

A. Correct.

Q.113 - -- which currently are $30,000, whether they have to be more than that I'm not is a position to say. DISCO has never done a conditional demand analysis. Would there be consultant costs on top of that?

A. No. Well what I was saying was that -- I mean this depends who you go to too obviously. I mean there are some companies that charge a whole lot of money.

Q.114 - Are these your fee quotes?

A. No. A conditional demand analysis is a fairly straightforward kind of process that has a certain, you know, academic component to it. You want to have somebody

that, you know, can appreciate basically the work that was done in California, not to replicate it or not to have it even that extensive, but someone who is already familiar with that kind of application. And send the data to them, have them do the consistency checking, provide the estimations and send you back a set of conditional demand parameters that are -- that would go -- that would point right into your model. Obviously you would want to use someone who knows something about the process because you don't want -- there is a whole literature in terms of these estimates and likely ranges and what other people have done, that sort of thing. You obviously would want to get someone who knows that literature, so you are not paying for that. But basically, you know, I mean between 75 and 125 would certainly be consistent with a good quality estimation.

Q.115 - Just to stop you here. The 75 to 125 is the consulting fee?

A. Yes. If you went to RFP and said we are going to give you the data, we want the CDA primers back, that wold be the cost of your contract to the --

Q.116 - I understand. So in addition to that there wold be the survey cost and whatever in-house costs DISCO might have in terms of manpower which I think you estimated at

46 person months.

A. No. That was my estimate of what it would take if DISCO did it with a competent analyst.

Q.117 - So there would be no in-house cost then?

A. Well not in terms of CDA work. I mean there would be some in-house cost in terms of -- we talked about revising the model to put in price impact for instance. I mean I'm not including any of that. If you modify the model then there are some costs associated with that. But with respect to the CDA parameters there would be no cost required from utility staff.

Q.118 - Okay. Thank you. I'm going to move along now to your recommendation number 2, and for that you can turn up DISCO PI IR-11, which is PUB-3.

Q.119 - I believe you have that in front of you?

A. Yes.

Q.120 - And essentially we are talking about the GS 2 issue, correct, load research?

A. I'm sorry. That was PI-11?

Q.121 - No. It is PUB DISCO IR-11?

A. PUB DISCO, got you.

Q.122 - And you were asked to list all the possible drivers for each of the five categories, that is Question B. And your answer -- and you refer to four drivers.

I'm interested in the fourth which says "Other variables related to demand for services provided by the five business sectors for which there are reliable forecast sources or for which reliable forecasts can be developed." My question, Dr. Jackson, if there are no reliable forecast sources available for a particular segment, then DISCO would have to develop the forecast itself, is that correct?

A. Well, that is correct. Except -- I mean, there is a qualifier here in that the fact that these are all muddled together in the same aggregate model --

Q.123 - No, I'm going to get to that in a minute.

A. -- assumes that there is at least one. And that's the one that was used. So yes, I mean, I guess I'm not -- in other words if we are forecasting GS with a single economic driver, the whole class in aggregate, then we can presumably at least do that.

Yes. If there is a series that makes sense in terms of economics and can be developed by DISCO, and it appears that that would improve the forecast accuracy, certainly.

Q.124 - So it would have -- if there is no forecast source available for a particular driver, I guess we have referred to it as, then DISCO would have to develop that

forecast itself, correct?

A. That's correct.

Q.125 - And how would this be done?

A. Well, it would be done -- you know, it depends on what variable you are talking about obviously. And I don't know. I don't have detailed knowledge in terms of specific variables.

They are available for New Brunswick. I have done a lot of this work in other areas, of what I can tell you, for instance school age population is a very easy variable to come by.

Q.126 - Well, you would get some debate on that. But that would be a good one. Assume there was no forecast source for school age --

A. Right.

Q.127 - -- school population?

A. Right.

Q.128 - What would end use model have to do to develop that forecast?

A. Well, you could take the persons per household variable that you already have, which tells you how many people are in each household. Then you can use demographics data for whatever area is available and use the same distribution then, use the same information. And

you can apply demographics.

I mean, there is a distribution of ages of adults and children and so forth. And presumably that wouldn't be difficult to apply from other areas in Canada that you consider consistent or that the data show are consistent. With New Brunswick in terms of -- in terms of basic characteristics, the population.

Q.129 - So it would be a derivation from --

A. Right.

Q.130 - -- another data source? And would you agree with me, Dr. Jackson, there would be some judgment involved in that?

A. Sure.

Q.131 - Can I refer you to page 9 of your report? And it is the first paragraph. And it starts with "Coding or billing file data permits and analysis of business groupings."

Do you see that paragraph?

A. I'm sorry. This is on IR --

Q.132 - Page 9 of your report?

A. Our report. Okay. Yes.

Q.133 - And when I read that paragraph -- I'm paraphrasing here. But essentially you are saying that traditionally the commercial sector is segmented into 11 categories, I

think you have listed there?

A. That's correct.

Q.134 - And in your evidence on page 10 you are suggesting that -- or actually you are recommending that the analysis be done using as few as five subcategories, is that correct?

A. Yes.

Q.135 - And why as few as five, Dr. Jackson?

A. Because I was told that that was all the detail that DISCO had. If you want to go back more than five years, which in an econometric model is important. So I would prefer to have the 10.

And if the billing file data could be unarchived and accessed then these 10 or 11 categories, here is what has traditionally been used for at least 30 years in terms of segmenting the commercial sector.

Q.136 - Right.

A. But I was told that the five were all that existed.

Q.137 - So would using five as opposed to 11 have an impact on accuracy of the parameters?

A. Well, you have done some -- there is some grouping here that obviously is -- for instance we have education. There is no university in this category. But presumably one could pull the university sector out if one wanted to.

You know, 10 is better than five. But five at least provides the major distinctions between -- for instance hospital and education are substantially different in terms of energy use and drivers.

And office -- I'm trying to recall the other sectors that we had and -- that you have identified as being available.

Q.138 - Who they are isn't significant. I was just trying to get to the point --

A. Sure. More is better than less. It would be great to have the 10. But like I say, I was told that DISCO did not have the data available.

Q.139 - So are you comfortable, Dr. Jackson, that using five won't impact the accuracy?

A. I'm comfortable that using five is better than using one, yes.

Q.140 - I want to bring this up a level. Do I understand from your recommendation that involves breaking in the General Service class which is GS 1 and GS 2 into separate forecasts first --

A. Yes.

Q.141 - -- correct? And if I also understand your evidence you want to take each of those classes and then apply subcategories, five subcategories each --

A. Correct.

Q.142 - -- is that correct?

A. That's correct.

Q.143 - So am I correct then that in order to produce the General Service forecast there is really 10 forecasts involved?

A. That's correct.

Q.144 - Okay. And you have estimated a cost of this of between 30' to $50,000, is that correct?

A. That's correct.

Q.145 - And again that is the consultant cost?

A. Yes.

Q.146 - And just to be sure, if there is any in-houses costs that would be in addition to that, correct?

A. Well, if you were to do this on a consulting basis -- I mean, you certainly could do it in-house. But if you were to do it on a consulting basis, what you would need to provide would be the data series for the estimation to proceed with. And in return you would get the models back.

Q.147 - Okay. Do you have any idea -- I'm just trying to ball park it -- what the expenditure and DISCO's resources would be to -- I'm going to say feed the consultant the information it needs to do the work?

A. Once you get it back you just apply it. Basically there is no cost. You are applying a different equation than what you had.

But since it's -- if it's an equation that has been estimated and vetted by someone else and it's reliable then it's no more difficult to apply that equation than it would be to apply 10 essentially. I mean, no more difficult to apply 10 than it is to apply one.

Q.148 - Okay. I'm going to move along to recommendation 3. And I'm hoping this will be a brief series of questions. This -- and I guess if you look at PI IR-4, which you also have in front of you?

A. Yes.

Q.149 - And if you turn to -- I guess it is recommendation 3. And it is "Development or rigorous framework for evaluating and presenting forecasts errors"?

A. Yes.

Q.150 - And is that -- the response that you gave here, is that the same recommendation that is found in your report, the historical forecast capability? I just want to make sure --

A. Yes. Right.

Q.151 - Okay. And is that what we have been talking about, the backcasting function of the --

A. Yes.

Q.152 - -- model? Okay. And again there may not be much turns on it. But I'm a little confused about some of the statements. And you don't have to turn this up. At DISCO response to IR-9 you state that there is no significant costs of -- I'm sorry.

In your report you say there is no significant costs of implementing this recommendation. And then in response to DISCO IR-9 you state that it requires a complete restructuring of the DISCO model.

A. Yes. What I --

Q.153 - And I don't know if there is an inconsistency there or not, Dr. Jackson?

A. What I was referring to -- what I have been referring to previous -- I mean, these two issues are related. All I'm saying in recommendation 3 is you need to make the whole process transparent.

If you go ahead and incorporate price responses, if you go ahead and do historical forecasting, for your own benefit, to improve the accuracy of the forecasting model, if you go ahead and estimate the UECs to improve the model accuracy and do all these other things for your own benefit, there is no cost essentially to showing this information to other people.

Q.154 - Maybe I'm confusing this. I thought what you were getting at here -- it is not the manual we discussed earlier -- it is the ability of the model to do the -- I think Dr. Sollows talked about it this morning.

It is the ability of the model to take into account the backcasting as a check on the accuracy of the model?

A. No. That's actually recommendation number 1 which says, using research data existing consumer surveys along with an extension of the model structure to include price response and the historical forecasting capabilities.

So I think there is just an issue of semantics here. What I was referring to in items 1, 2 and 4 are actually thoseactive kinds of tasks that require doing something.

What I was attempting to refer to here in item 3, just because I think it's an important part of the process, is to make this information available to others in a transparent way, that's all

Q.155 - Okay. No. I'm was confusing the two. And I just want to get it straight.

So in order to do the backcasting function --

A. Right.

Q.156 - -- then there would have to be a complete overhaul of the model, correct, if I understand your response correctly?

A. Well, you don't have to do a complete overhaul to do the backcasting. You could actually do that in a fairly short order.

If you want to do the backcasting -- I mean, if you want to do the backcasting and incorporate the price impacts and the fuel choice and all these other things that we talked about, then it requires a reasonable restructuring.

So I'm not -- in other words the backcasting doesn't stand alone by itself. You could do that by itself. But it won't have much value if that's all you do.

Q.157 - Okay. The reason I ask again, Dr. Jackson, is Mr. Larlee indicated either yesterday or this morning, I can't recall which, that that is something that DISCO is very interested in looking at implementing as soon as practical.

And one of the considerations obviously for them is the cost of doing it. And I would like to have some idea from you if, in order to improve the forecast accuracy, this backcasting capability of what is involved and what the cost is?

A. If all you are talking -- let's talk in isolation now. We will talk about just changing the software or coming up with a software package that can provide the historical

forecast.

And we are not going to include the price impacts. We are not going to include any of those other things. We are just going to have something that actually can start in 1990 and go on out through the future. That's something a programmer can do in a day.

Q.158 - Okay. That is fine. No. You have answered the question. Thank you. Recommendation 4, which is the load research program, I would like you to turn up at -- I guess it's page 12 of your report?

A. Yes.

Q.159 - And as I understand it, there is three components to the load research program you are recommending, implement the load research data, data collection for GS 1 GS 2 small industry rate classes, is that correct?

A. That's correct.

Q.160 - Then you say you go on to utilize the load research data analysis resulting from -- in the load forecast, correct?

A. Correct.

Q.161 - In other words, you use that data in the load forecast. And then finally it's to extend the Residential GS 1 and GS 2 and Small Industry sample designs to support analysis of DSM and rate design issues?

A. That's correct.

Q.162 - Now just dealing with the first one, implementing a load research data to collect GS 1 and GS 2 and Small Industrial, I know there was some talk -- some discussion of this with Mr. Hyslop, wouldn't some new meters be required?

A. Yes.

Q.163 - And I don't know if you spoke to -- mentioned the number of new meters that you were recommending with Mr. Hyslop --

A. I -- in some of my evidence -- some of -- the response to it, yes, an interrogatory I believe that I said that, you know, ordinarily for each class that's surveyed, if you look at what people used in terms of samples, you are talking 2' to 300. Some utilities do more than that, but 2' to 300 typically is appropriate. And we are talking three classes here. Then you got between 600 and 900 sample points. Customers you want to -- that you want to meet or what -- part of my point in that response was that I expect that a significant number, if not a majority of the 650 can actually fulfil between 600 and 900 additional required sample points.

Q.164 - I believe Mr. Larlee indicated -- again I don't know whether it was yesterday afternoon or this morning that

some of these meters are installed and are -- essentially nobody wants to move them, so they can't be moved around, some of the larger customers, so that there would be a requirement for additional meters in order to get the sample size that's required. Does that sound reasonable?

A. I am sorry. So there would not be, is that what you said? There would be.

Q.165 - There would be?

A. Sure.

Q.166 - The requirement for additional meters?

A. Yes. Correct.

Q.167 - And then the next part of your recommendations is to use the data that's collected for load forecasting purposes. And I think you have covered that already and I don't want to go down that road, but I will check with my consultant here. And again if you look at the third recommendation, which is extending the samples, that would require new meters as well, correct?

A. That's correct.

Q.168 - And if I am correct, when we talked about the residential piece, that was 150 new meters and an additional 300 and 600 meters for General Service, correct?

A. Correct.

Q.169 - And small industrial. And I think you quoted a cost for this recommendation of 50' to $75,000, is that correct?

A. Yes. I am talking about the analysis.

Q.170 - So that's the consultant cost, right?

A. That's correct.

Q.171 - And in addition to that would be the metering costs, right?

A. That's correct.

Q.172 - And any in-house costs that DISCO might have?

A. I am sorry?

Q.173 - Any in-house costs that DISCO might have, do you envisage any of those?

A. Any in-house costs in terms of -- in terms of the analyst?

Q.174 - In terms of this recommendation?

A. Well, I mean whatever in-house costs are required in terms of administering the program.

Q.175 - The meters?

A. Sure.

Q.176 - Dr. Jackson, could you turn up PI IR-4, which is PUB 2?

A. Yes.

Q.177 - And it's on the first page. It's response number 3

actually. And I know Mr. Hyslop tried to fish in this pool earlier today and I am going to try to fish in the pool, too.

Mr. Hyslop asked you in this IR if you could provide an estimate of the improvement and in forecast accuracy that is expected to result from implementation of Recommendation 1, which is conditional demand analysis recommendation. And your answer was providing a numeric estimate of expected forecast accuracy improvement requires a more detailed analysis than can be provided with the data and model information made available by DISCO. I take it from that response, Dr. Jackson, that if you were given -- you were provided with the appropriate data that you could estimate the expected forecast accuracy, is that a fair interpretation of your response?

A. Sure. Yes, if there is enough data and information available and enough time to do the analysis, it's possible to provide a range of -- a range of --

Q.178 - And what additional data and model information do you think you would require to conduct this analysis?

A. Well, basically it would take -- it would take more data and more information and more time and more money to calculate the expected improvement in terms of inaccuracy as compared to doing the analysis to begin with.

What -- I mean what you are talking about -- I mean it depends on -- it depends on what kind of accuracy you are talking about. If we could condense the accuracy of the forecast down to a single number, it would be a little easy issue to deal with. We are talking about load research. And we are also talking about applications in a modelling situation. We are talking about attempting to anticipate issues, flattening of rates, for instance, that may be important in the future. So, you know, coming up with a number like that is kind of -- I mean you know, you are asking for something that theoretically doesn't even exist. So I mean I could give you some numbers -- someone could give you some number -- but it's just -- I mean the problem you are asking is, you know, it's a complicated problem. It doesn't have a single point answer.

What I can tell you is that if you actually conduct a load research program with the GS 1 and GS 2 that the information you will have will be more accurate, because there is no information there at all that is being utilized if you used a 650 customers to develop what you could do. You don't have to -- I mean do that as the first step. If you use the 650 customers to develop estimates of characteristics of the 650 customers that's information that can be used.

So, you know, I mean it's like saying how much would -- how much will forecast accuracy improve if I have half the information as opposed to three-quarters of the information? Well, you know --

Q.179 - So if I understand what you are telling me, Dr. Jackson, is -- and I understand -- I appreciate what you are saying is that you can't quantify an increase in forecast accuracy until you have completed what it is you are recommending, is that correct?

A. That is exactly correct. And that is why -- that's why whenever I am asked this question, I always go back and say it's really -- we deal with the margin. If the benefit -- if the expected benefit in terms of forecasting is greater than the expected cost, then it's a task that should be considered in terms of going forward with.

So it's -- and those kinds of issues are relatively easy to address based upon experience in other jurisdictions or the modeller's experience and DISCO's experience and so forth. So it's easy to answer that question with respect to the issue you are looking at. But then your numbering is not easy.

Q.180 - Given your response, there is a number of questions I was going to take you through the same process for the other recommendations. And you gave Mr. Hyslop the same

response. And I am assuming you are going to give me the same response?

A. Correct.

Q.181 - So I won't go there.

MR. MORRISON: Mr. Chairman, I probably have about seven questions, which will take probably about 10 or 15 minutes. And I would just like to break for -- you don't have to leave the room if you don't want to, but I would just like to confer with Mr. Larlee for a moment.

CHAIRMAN: 10 minute break.

MR. MORRISON: Okay. Thank you.

Q.182 - I think we have all been given hits, Dr. Jackson. So I am going to make this as short and hopefully sweet as possible.

Could you turn to page 8 of the Load Forecast?

A. Yes.

Q.183 - Now, we just had a little exchange about nobody not being able to quantify the accuracy of your recommendations and I understand the reasons for that.

And you would agree with me. Dr. Jackson that no load forecast is ever going to be 100 percent accurate is it?

A. No.

Q.184 - No. So what we are dealing here with really are measures which will hopefully reduce the inaccuracy of a

forecast. correct?

A. Yes.

Q.185 - And if we look at page 8 of the Load Forecast document itself, you will see that 36.5 percent of the total load is industrial transmission?

A. Right.

Q.186 - And if I understand your evidence today, you would have no quarrel with the way that DISCO forecasts its industrial -- large industrial load, correct?

A. I think the procedure is appropriate, but I am not privy to the information that was used in that, so I can't comment on that.

Q.187 - That's fair enough. So what we are really dealing here with that is if there is any improvement in the accuracy of the forecast, it's going to impact approximately 36 -- approximately 64 percent of a load?

A. Yes.

MR. MORRISON: Thank you. Those are all my questions. Thank you very much, Dr. Jackson.

CHAIRMAN: Thank you, Mr. Morrison. You have one question.

COMMISSIONER SOLLOWS: I am sorry. But I do have to. In view of the long discussions we had about surveys and information, I am wondering if you can give me an opinion here. In this jurisdiction the new Energy Conservation

Agency is doing detailed energy audits for various clients. And they do detailed surveys of the buildings and they measure air flows and all that sort of thing.

In your experience would that kind of information, if it were made available to the DISCO be useful in terms of the conditional demand analysis?

A. Absolutely. That's wonderful information. That's wonderful information to have. And it's absolutely -- I mean it's wonderful information. As a modeller, that's the kind of data that you want. The only issue is how you integrate that with the other information you have. But that's also a fairly easy process because you can compare what those customers look like with respect to their billing characteristics and relate that to the rest of the service area. So, yes, that data is quite valuable. And to the extent that that is available, would be just a superior source to assist in the process.

COMMISSIONER SOLLOWS: Thank you.

CHAIRMAN: Redirect, Ms. Desmond?

MS. DESMOND: No questions. Thank you, Mr. Chair.

CHAIRMAN: Well, I would like to thank everybody. We have moved through it the two days.

So I remind everybody about the written final submissions for noon, December 15th. And the rebuttal

from the applicant, December 20th. And can the Applicant have any of the other undertakings that were done before the --

MR. MORRISON: We anticipate that those will be finalized in the next couple of days. There is some that will be ready tomorrow. There aren't that many anyway, Mr. Chairman. But we hope to have them wrapped up in a few days.

CHAIRMAN: So again I would like to thank everybody and wait upon your final submissions. Thank you very much.

(Adjourned)

Certified to be a true transcript of this hearing, as recorded by me, to the best of my ability.

Reporter