ONTARIO ENERGY BOARD

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BEFORE:	**Paul Sommerville**	**Presiding Member**
	Paul Vlahos	**Member**

EB-2007-0673

THE ONTARIO ENERGY BOARD

3rd Generation Incentive Regulation for Electricity Distributors

Proceeding held at 2300 Yonge Street,
25th Floor, Toronto, Ontario,
on Tuesday, August 5, 2008,
commencing at 1:04 p.m.

Stakeholder Consultation

BEFORE:

PAUL SOMMERVILLE	Presiding Member
PAUL VLAHOS	Member

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JULIA FRAYER	London Economics Group
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DR. LAWRENCE KAUFMANN	Pacific Economics Group (PEG)
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E X H I B I T S

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Tuesday, August 5, 2008

--- Upon commencing at 1:04 p.m.

MR. SOMMERVILLE: Please be seated. Thank you.

PRELIMINARY MATTERS:

Good afternoon, everyone. My name is Paul Sommerville. I am a member of the Ontario Energy Board and sitting with me is Paul Vlahos. Today we are here to listen carefully to the various presentations respecting, today, the productivity factor, but over the next couple of days, the three issues that are still outstanding for the 3rd generation IRM program.

Our goal is to foster a full, frank, comprehensive discussion, following which we will report to our colleagues at the Board, who will make the final determination with respect to these particular -- these three particular items that we're dealing with during the course of this consultation.

We will try to stay out of the way as much as possible. We will try to foster the discussion in directions that will be of help to us in making our report to the Board, but we in no way want to inhibit the exchange of ideas that we look forward to and hope for today and tomorrow and Thursday.

Just some logistics. We will typically start at 9:30. We will start at 9:30 tomorrow and Thursday. We will break at 4:30 fairly rigidly. We will take a morning break and an afternoon break, typically 15 or 20 minutes each time. We will try to fit those into the schedule so that they

represent the least inconvenience to the presenters.

We will generally follow a path where presenters -- all of the presenters will complete their presentations and the discussion will ensue thereafter. The only exception to that may be questions from Mr. Vlahos or myself for clarification in the course of a presentation.

But it is thought that having the presenters complete their presentations before the -- before questions from others is a more appropriate and more - frankly, more respectful approach to take as we go forward.

If we do happen to make particular progress on the stretch factor tomorrow, we may start to deal with the capital module threshold earlier so that you may want to plan accordingly. If we do have some extra time tomorrow, we will use it to advance the capital module discussion.

Without further ado, I think, unless there are some questions or observations from anyone -- and please don't be shy. This is not a hearing. This is a -- we are here to facilitate the discussion, not to inhibit it. So feel free to ask questions and to raise issues, and so long as they are focussed on the three items that we are dealing with in this process, we will do our best to accommodate them.

Are there any preliminary matters that anyone would like to raise?

If, when you ask questions, you could identify yourself for the court reporter, that would be helpful. I think that is the protocol that you followed before this,

in this process.

So without -- unless there are some preliminaries, Ms. Frayer, are you ready to proceed?

MS. FRAYER: Thank you, yes.

MR. SOMMERVILLE: Thank you.

Ms. Frayer, I'm sorry I neglected this. There are microphones -- two microphones on each segment of the desk and if you push the button and the green light goes on, you are alive. That's the only way really that the court reporter can hear you.

PRODUCTIVITY FACTOR

COALITION OF LARGE DISTRIBUTORS & HYDRO ONE NETWORKS

PRESENTATION BY MS. FRAYER:

MS. FRAYER: Apologies. I hope it is on now.

Before -- I was going to start -- I wanted to take a moment to thank the Board for inviting me here to present today on behalf of the Coalition of Large Distributors and Hydro One Networks.

I would also like to compliment the Board Staff on the wonderful and comprehensive job they have done on the consultation process so far. I have really enjoyed being able to participate and be involved in this process in planning for 3rd generation incentive ratemaking.

I have organized my presentation along the three subject matters, and I am going to hopefully in the next 20 minutes encapsulate my recommendations for the productivity factor, which is the agenda item for today.

My recommendation has a number of dimensions. My

primary concern is that we set a productivity factor for 3rd generation IRM here in Ontario based on measures of long-term productivity for the Ontario electricity distribution sector.

I do believe that analysis of productivity growth from other jurisdictions and other similar industries is useful and can be used as checks and benchmarks, but it cannot, in my opinion, substitute for Ontario-specific business circumstances.

I recommend that we use a 20-year average total factor productivity growth measure that we can estimate by combining productivity analysis results from first generation IRM, which cover the time span of 1988 through 2002, and our independent analysis of productivity growth among the Ontario LDCs for the period 2002 through 2007.

We will have to make some conjectures and some guesses at productivity growth that ensued in that gap or missing years' period of 2002 -- sorry, of 19 -- of 1997 through 2002, but, nevertheless, we do have a robust, I believe, historical estimate of total factor productivity growth for Ontario spanning many, many years.

Based on my analysis over the most recent six years, on average, total factor productivity growth has been negative as the increases in the quantities of input have generally outpaced the increases in the quantities of outputs we have measured.

This negative trend needs to be acknowledged and included in an analysis that is the basis for a

productivity factor going forward, but I would like to underscore I am not recommending that we only take that negative trend and use that as the sole basis going forward for the productivity target.

I am simply noting that we need to incorporate it and acknowledge it into a long-term estimate.

That being said, I don't believe that there will be a reversal of recent negative TFP trends in the near future. And, in fact, I don't know if there will be a complete reversal of trends to long-term averages during the term of 3rd generation IRM.

However, I still believe that a 20-year average total factor productivity growth rate of 0.58 percent is a reasonable target for LDCs for the longer term. It will create measurable savings for ratepayers in the near term, and balance that against a useful target for local distribution companies to attempt to achieve in terms of their productivity in the longer term.

Before I go into the analysis in a little bit more detail about how I derived my recommended level of TFP growth, I wanted to go back and talk a little bit about three guiding objectives that I had put behind the work I have done to date in this consultation.

The three guiding objectives is the Board's own criteria that they set forward for 3rd generation IRM, and I won't speak to that, because I think we're all very familiar with the criteria.

The other guiding objective is to be able to complete

empirical analysis, robust empirical analysis that I am confident in presenting, and the third aspect of this is real-world sensibilities. I wanted to be able to have an analysis that is practical and realistic.

Let me tell you a little bit about what I mean. Well, on the issue of the objective and robust empirical analysis, I wanted to have a recommendation and be able to present a recommendation to the Board on long-term productivity that is the best possible estimate of historical productivity and potential future productivity going forward.

Therefore, it needs to be reflective of local conditions and reflective of this particular industry, the electric distribution industry. It needs to be robust to different measures and variables, it needs to be transparent and replicable, and we need to be able to consider all available data, because that makes us more confident in the estimate that we derive from that analysis.

On the real world sensibilities, if you will, or practicalities, I understand that the Board wants an achievable productivity target and a reasonable and sustainable IR mechanism. For some of us here, this was a very interesting theoretical exercise, followed by a lot of work with empirical analysis and data. For myself, this particular analysis was also, I won't say complicated, but was also interlaced with the fact that my clients, the largest distribution companies in Ontario, reminded me

every day that this is not about theory or historical empirics for them, this is about their business going forward.

They really wanted me to show them the theory, show them the empirics, but also work with them through the number and check whether the number is appropriate, whether it is practical and reasonable and whether it is justified on a going-forward basis.

So my work never really finished with the presentation of the theory and the historical analysis and empirics, that is just where it began. We worked quite a bit on validating and understanding the numbers, is it this reasonable? Is it possible? Under what circumstances will it be achievable and successful, and in what circumstances do we need to reconsider the options going forward?

So there was a lot of pragmatism in the work that my clients demanded, and I had I that pragmatism is a theme I will come back to quite a bit this afternoon.

Before I start, maybe I -- I don't want to spend too much time on this, but I wanted to at least give two minutes to the underlying sort of analysis that we did, the theory, if you will, or the concepts, because I do understand and completely agree with the Board reports prospective that in a comprehensive price cap, the productivity target needs to be based on long-term measures of total factor productivity. And total factor productivity growth analysis is simply a matter of calculating the quantity of outputs produced per unit of

input.

In this very simple example, I have decomposed, if you will, the analysis into three steps and it's really a question of identifying the relevant inputs and outputs followed by a calculation of the quantities of those, because at the heart of production theory, you are really looking at the quantities of input you are using and the quantities of outputs rather than what you spend on those.

This is a very illustrative example purely to kind of highlight the simple aspects of the analysis, so we're using a single input and single output. Of course the electricity distribution industry is a little bit more complicated than that, but if you bear with me I will take you through the analysis.

In effect, in step 2, once we have identified the input and outputs, what we simply need to do is look at an index of how those inputs and output quantities change with time. So the start year will start at 100 and we will grow with changes in quantities from year to year.

The TFP level is then the relationship, the ratio of output quantities to input quantities. And the TFP growth, which is what is actually the foundation for our productivity target, is then the rate of change in TFP levels from year to year.

The TFP growth number -- in this very simple illustrative example, is the yellow bars in the third chart all the way to the right, which is basically the change in the TFP levels from year to year.

Of course, in the real world complications arise, because we have complex production processes. We have an industry that uses multiple inputs: Capital, labour, contracted services, and produces a product or service that is sometimes difficult to find appropriate measures for and define.

Before I go into that a little bit and to the realities of how I took this methodology and applied it to Ontario data, one element that I wanted to speak to is: Why my focus on Ontario data?

Well, my focus has come from my own experiences in rate-setting regulatory regimes and performance based ratemaking concepts and application in projects that I have done in the US, in South America, in Europe, and parts of Australia, New Zealand with my associates at Mayrick & Associates which is a firm that specializes in this, in the pan-Asian area.

From my own experience, I have come to realize that there is no substitute for local data. And the reason is that in effect, the process may be the same. Electricity distribution in Ontario is the same as electricity distribution in Massachusetts, where I live, or in, you know, Bogota, Columbia, but it is the trend in input and outputs that may be different over time.

The trends for inputs and outputs in Ontario may not be in synch with trends in the US and this is my biggest concern that I think that the Ontario business landscape is distinct from that in the US, and that's why I would like

to stress Ontario metrics for 3rd generation IRM.

Ontario LDCs tend to be quite small, in comparison to their US peers. They have a different type of customer base, and with few exceptions their focus in Ontario is on distribution of electricity. They don't do distribution of gas or have vertically integrated operations with generation and transmission.

Many US LDCs -- and I am referring specifically to a very useful comparison that Dr. Kaufmann's group put together in follow-up to the May workshops -- they had a sample of US utilities that they presented against and they gave us some statistics about those utilities.

Many of the US LDCs that were used in the Pacific Economics Group analysis were in fact vertically integrated or had gas operations and that has very big implications, not only for productivity levels but historical and going-forward productivity growth. And that's very important to keep in mind, that -- to the extent that historical estimates may not align because there was more or less opportunities for economies of scale, more or less opportunities for the use of different technologies and other types of cost pressures. Those would impact the historical productivity growth estimate, which is what we want to base our going-forward productivity target on. More --

MR. VLAHOS: Sorry, if I could interrupt you. “Many vertically integrated utilities,” you say, in the US, many, being more than half? Less than half? Can you give me a

number or percentage or portion?

MS. FRAYER: I don't have the list in front of me, but I will gamble to say it is more than half. In fact, I think it is the majority of that grouping, because there are very few stand-alone distribution utilities in the US.

MR. VLAHOS: Thank you.

MS. FRAYER: Now, in terms of integration with gas distribution, I think it is probably less than half of those. But most US LDCs, investor-owned utilities, are vertically integrated or at the minimum also have transmission with the distribution.

Ontario LDCs also face what I believe to be unique challenges in how they operate, and how they build their systems because of weather and customer base conditions, the distribution of customers. In effect, you know, once we measure historical productivity, it is also a function of the legacy of how the system was built out and configured and that is distinct in Ontario in comparison to other parts of the US or if we were looking even further abroad, to other countries. Each country will have its own legacy, its own history of how it electrified and how it decided to build its systems and it's also a matter of engineering preference, to some degree.

This has implications, again, not only for the historical input/output relationship and historical measures of productivity growth, but in my opinion these types of drivers also have implications for productivity growth going forward.

One other thing to keep in mind is that the Ontario LDCs have been under I would say a unique, to some degree, regulatory environment where they have been under de facto price caps since the mid 1990s, while also trying to corporatize and meet the mandates of market restructuring.

In contrast, I would suggest that the US environment has been that more akin of a stable cost-of-service regime, for the most part. And most of the US LDCs I know that we have looked at for the Pacific Economics Group analysis have been investor-owned utilities for many, many years, so they have had a stable corporate structure -- a fairly stable corporate structure as well, distinct from the municipal- to investor-owned transition we are having right now here in Ontario.

So that with that in mind, once I was commissioned to represent the CLD and HONI, one of my first sort of commitments and deliverables was to look at the available data, and I think Ontario is very uniquely positioned, in that it has a lot of data available, a "lot" meaning more than -- maybe the time frame isn't long enough, but there was a volume of data publicly available and that data is very useful at looking at productivity, and that is what we did.

We took the cost comparisons modelling data that Board publishes on its website and we created a total factor productivity analysis for the period 2002 through 2006. And in July, thanks to the updates that the Board had published, we were able to go back and actually update the

analysis that I had previously presented in March 2008 with 2007 data.

Generally speaking, the addition of 2007 to the data mix did provide us with one additional data point, but it did not change the overall trends we had previously observed.

OM&A and inputs, in general, continue to grow much faster than the quantity of outputs produced by the sector on average.

The table on the top of this slide, the yellow table, shows the quantity indexes for the three outputs we considered, as well as the two inputs, OM&A and capital.

It shows the year-on-year change in the quantities of those input and outputs that we measured, which is the underlying -- this is the underlying indices that then go into the TFP growth measure.

As you can see, OM&A has grown by over 14 percent over the last six years, in contrast to more moderate 4 to 8 percent growth in other -- in throughput and customer numbers, respectively.

You may ask, Why has OM&A grown so robustly over the period? And I think there is -- again, this is kind of bringing me back to that pragmatic real-world aspect to it. We spent quite a bit of time thinking about this with the distributors and understanding these results.

I think there are two drivers to it. OM&A is a combination of labour and materials. Materials is not the steel and copper that goes -- or the wood for the

distribution poles. Materials in this respect is contractor services, the type of inputs that we don't capture by looking at labour quantities or looking at capital quantities.

Let me start back now with labour. Generally, what we have seen over the recent time frame is an increase in the quantity of labour, and, as the Board has probably already heard through evidence from some of the distribution companies in their rebasing, that increase in the quantity of labour is not likely to come down very quickly to long-term sort of average levels in the near term, but will eventually over the medium term.

As an example of this statement, in the supplemental materials I have in this presentation in slide 33, which I could actually quickly -- or I could ask people to quickly look to on their own, I have represented some information that Hydro Ottawa had already submitted in its rebasing application to the Board to show how its staffing requirements have generally gone up historically and are expected to slowly come down to longer-term averages, but probably not for quite some time, probably not until the end of 3rd generation IRM.

The reason this is happening is that there is a demographic shift in the labour pool. There is a need for apprenticeships to educate the new additions to the labour pool prior to losing the -- I would kind of call the older generation of the labour pool to retirements.

On the material side, there has also been expanding

pressure and expanding scope historically. Contracted services such as consulting services, like from consultants like myself, as well as IT services, accounting services, legal support, all of those types of services have been expanding in scope in response to growing compliance and regulatory and legislative requirements.

We don't expect those to actually stabilize, even at 2006 and 2007 levels. We are expecting those to continue to increase for some time, just as those legislated mandates continue to increase.

It should be also noted that in the yellow figure on the top, I am reporting throughput or sales of electricity, as well as peak demand metered on actual numbers basis. I am not weather normalizing those figures.

You may ask why I am not doing that, and the reason is that, in effect, I want to present the actual results, subject to actual operating conditions. The distribution companies operate to those actual conditions. They don't operate to weather-normalized figures.

So what I want to do is measure total factor productivity on the basis of actual figures, since I understand that that productivity -- that will then form the productivity target which will impact actual revenues in the future.

So to the extent that rates were collected on a weather-normalized billing unit basis, I might weather normalize my historical analysis, but, in effect, revenues and operations and, therefore, productivity of distribution

cap depends on actual conditions. And, therefore, I think it is important for the historical analysis to be able to represent actual conditions.

Then we can make -- we can have a discussion about what that means. For example, we can see that peak demand has gone up and down depending on weather conditions during the summer period. That measure is very sensitive to weather conditions at the summer peak, but it is important to understand that, in effect, the utilities need to operate to those conditions, whatever they may be, and they cannot predict or control the weather.

So what is the result of this analysis?

Well, depending on the various weights you give to the output measures of throughput, customer numbers and peak demand, we have different levels of estimated total factor productivity growth over this six-year period. It varies from negative 0.5 percent under scenario 5, which is basically giving no weight to peak demand and the most weight to throughput, to a low of negative 1.67 percent, which is giving the most weight to peak demand.

In my analysis and my recommendation for the productivity target, I have conservatively taken into consideration scenario 5, which gives no weight to peak demand, and scenario 2, which, again, minimizes the weight to peak demand and gives it only a weight of 25 percent.

So those are the two numbers, the negative 1 percent and the negative 0.5 percent, that underlie my recommendation of 0.58 percent that I will turn to.

I am going to skip slide 7 for a second and come back to it in a minute. I wanted to turn very quickly now to slide 8, since we were talking about historical -- my recent historical analysis.

I had mentioned in the beginning of my presentation that I am recommending a very long-term productivity target of 0.58 percent.

So how did I get 0.58 percent? Well, I combined the productivity analysis that Cronin and King performed for first generation IRM, which covers the periods of 1988 through 1997. I then incorporated the conjectures about productivity growth in Ontario that Pacific Economics Group presented in their February report for the missing period of '97 through 2002. And then I incorporated my conservative estimates of recent TFP growth in Ontario based on actual data.

On that basis, I was able to calculate average annual productivity growth estimates in Ontario over different time frames and that is what you see here in this grey chart, grey back chart.

We have four scenarios here of average annual TFP growth along different time frames. If we go back 20 years -- and we have effectively 20 years of data if we incorporate the conjectures about what happened during the missing years' period -- we see that average annual productivity growth over 20 years in Ontario, according to the different potential scenarios, lies somewhere between 0.42 percent -- which is represented by the pink line in

the pink metric to a high of 0.73 percent, which is represented by the yellow line.

In fact, for those interested, the numbers behind this graph are available in the supplemental materials under slide 35.

My recommendation of 0.58 percent is based on the 20-year productivity growth estimate. It is the midpoint or the median between the four different scenarios that I am confident span the potential range of productivity growth in Ontario over the long-term.

I have also been conservative, in that this -- these rolling average estimates of productivity growth equally weight each year. So I have not applied any additional weighting to recent period. What I have done is simply incorporate the recent negative TFP growth that we have seen on a one-to-one basis with very high TFP growth that Cronin and King measured for the 1992 to 1997 period, the generally lower TFP growth that they observed between 1988 and 1992, and the conjectures that Pacific Economics Group presented under their model 2 and model 3 for TFP growth in Ontario between 1997 and 2002. I believe a 20-year estimate should be sufficiently long term to capture the various cycles in TFP growth that we see. In fact, I believe it is the best estimate we have today about total factor productivity growth in Ontario.

You may ask, why 20 years? Why not 15 years, because in fact if you look at the 15-year estimate, all of the various scenarios and models we have looked at suggest a

little bit of a higher average annual TFP growth number.

My response is that 15 years would ignore the cycles that the Ontario electricity distribution industry has actually seen. It would effectively ignore the period of 1988 through 1992 for which we have actual data for which Cronin and King made an actual figure of TFP.

We also want to rely on the most -- on actual data as much as possible. The 15-year estimate would in fact put greater weight on the conjectures that we had to make about the missing years, and I would like to minimize those conjectures as much as possible, so I would like to rely on as much actual data as possible to smooth out some of the potential errors we may have made in those conjectures.

Most importantly, I think the 20-year data follows my basic principle of empirical analysis. It uses the most extensive compilation of available data possible. In my mind, it makes me feel more accurate about the estimate that I am providing you, and therefore the recommendation of 0.58 percent.

In effect, I believe it is the best estimate because I have the most confidence in the analysis that went into creating that estimate.

In short, I do think a 0.58 percent productivity factor would be an effective and balanced productivity factor for 3rd generation IRM. In my mind, it really meets the Board's criteria. It will produce immediate benefit to ratepayers, they will see prices declining in real terms, but it will also motivate efficiency improvements from the

LDCs.

Recent history suggests that even a 0.58 percent productivity factor may not be achievable in the near future. But nevertheless, I believe that it is important to have a positive productivity factor that the Ontario LDCs could use and aim for for the longer term.

This productivity factor is also very practical, on multiple dimensions. It is transparent and its relevancy is unquestionable because it is based on Ontario data that we have available, and it employs easily replicable index methods to estimating total factor productivity growth historically.

It is also using all the data available. It is effectively representing a 20-year long-term average. So I am very confident that it's the best estimate or, the most accurate estimate of long-term productivity growth that we can produce today.

That being said, I also think that it is important that this value of 0.58 percent explicitly recognizes and incorporates the recent negative trends in TFP growth that I have estimated and observed in the industry so that we take those into account, we take it -- the recent experiences into account.

One last comment I had which was again important, and it is going back to the ultimate sort of objectives that I talked to you in the beginning of my presentation, and that pragmatic reality check aspect of it.

There may be some who wonder, London Economics, Ms.

Julia Frayer is presenting a recommendation for 0.58 percent productivity growth. Pacific Economics Group has proposed a recommendation of 0.88 percent. That's 30 basis points? Is that a difference that is worth discussing and developing opinions on?

My response is that it is. It is quite important. I think it very important for the stakeholders and I would hope the Board, to recognize that although 30 basis points in a finance class may not sound like a lot, mathematically it is quite important to the bottom line of these distribution companies. As an illustration here on this last slide, I have presented what 30 basis points could mean, in terms of accumulative difference in revenues vis-à-vis the actual net income that a distribution company earns in a typical year.

What I have done is, to make it as realistic as possible, without actually picking on a particular utility I have created a hypothetical utility using Ontario data. I took the 2007 CCM data and I have averaged all of the utilities, the really large utilities, Hydro One Networks and the CLDs with all of the smaller utilities and I created a hypothetical utility that has distribution revenues of about $30 million, OM&A expenses of about $14 and a half million and so forth, producing a net income of about 2 million a year, according to the 2007 data.

Now, if we look at the revenues based on a price cap regime for 3rd generation IRM -- based on a three-year term after the base year -- we see that a price cap with

inflation of one and a half percent and an X factor of 0.88 percent produces a cumulative revenue stream of about $92 million. A price cap with the same inflation factor, but an X factor of 0.55, .58 percent which is what I am recommending, produces a cumulative revenue stream of about $92.5 million. That difference of over half a million dollars is substantial. That's over a quarter of a typical year's annual net income.

Now, if you think about it, to the extent that the LDCs have already been under substantial cost pressure since the mid 1990s, they have -- I don't want to say this, but there is a new sort of phrase that I have learned over the months of working with them, they've had to, in effect, find all types of costs to cut and in some cases delay investment kind of harvest the system and use the system as best as they can under those extenuating conditions, that 25 percent of net income is quite substantial.

In that context, I think my recommendation for a 0.58 productivity factor is, in fact, more realistic and more practical than other recommendations that you will hear before you today.

MR. SOMMERVILLE: Thank you very much.

MR. VLAHOS: Ms. Frayer, just a couple of questions. Starting with your last point first, you indicated the difference is really -- in the proposals is not that significant. It doesn't appear significant, but it is once you translate it into dollar terms.

Based on your experience - and you have noted that you

have worked in many other jurisdictions - when you fight those battles with the other side, those numbers that the other tribunal will be faced with, are those typically larger differences than we are faced with today here?

MS. FRAYER: No. I think that many of the conversations are in terms of basis points, because, in effect, if you're talking about hundreds of basis points, you know, there have been differences between two, three, 400 basis points, but those have been on completely different paradigms.

I think one of the things you need to keep in mind is that we are using the same methodology. We are doing a total factor productivity analysis based on index methods, and I think the difference is really about: What data are we using? And that data, what are the trends underlying the data, the trends in input and outputs, and which ones do we apply going forward to Ontario?

So I think it is quite common to have differences of opinion, in expert opinion, in that range.

MR. VLAHOS: Right. So to make sure I understand, when you talk about 200 to 300 basis points, we're talking about 2 or 3 percent difference?

MS. FRAYER: Hmm-hmm.

MR. VLAHOS: We're not talking about 20 or 30 basis points that is in question here; right?

MS. FRAYER: Yes. But it is also common to have differences in that range, in the range that we have here.

MR. VLAHOS: I understand that. Thank you.

Your suggestion of a 20-year model, is this -- is the 20 years something that is robust that you can use the next time around? I don't want to put you on the spot as to what you may recommend three or four years from today, but what drives the 20 years? Is it driven by the data or is it driven by 20 years is as good as one should get on the theory of what we're studying now?

MS. FRAYER: Well, my short answer is that I am not wedded to the 20. I am wedded to: What data do we have available in front of us and whether there has been any structural changes or shifts that would make data going back too far in time no longer effective or applicable going forward?

I think, for purposes of 3rd generation IRM, a 20-year profile, in my mind, is what we have. We do have 20 years of data with some missing gaps that we can fill in with some intellectual analysis, but we do have that. And I think that there hasn't transpired any structural changes in the industry to date to invalidate those periods going back in time.

MR. SOMMERVILLE: If I may, if I understood your presentation, you were saying that the 20 years happens to include the data from 1988 to 2002, as well as the projections or the estimates related to the missing years.

MS. FRAYER: Hmm-hmm.

MR. SOMMERVILLE: If you used 15 years, your fear is, first of all, you exclude that actual data that we have, and you over-emphasize the projections or the conjecture --

MS. FRAYER: Yes.

MR. SOMMERVILLE: -- about the missing data?

MS. FRAYER: Exactly.

MR. SOMMERVILLE: If I understand it, that's the magic in your mind of the 20-year slot as we come to it right now?

MS. FRAYER: Exactly.

MR. SOMMERVILLE: That doesn't necessarily mean that a 20-year slot is the best model forever and ever. It just happens to work in this instance. Did I get that right?

MS. FRAYER: Yes, that is correct.

MR. VLAHOS: I had in my notes here 20 years is a fit, not the driver. Is that a correct observation?

MS. FRAYER: Hmm-hmm.

MR. VLAHOS: If I can take you to slide 6 and if you look at the column that depicts the OM&A input, the 14 percent -- 14.1 percent.

MS. FRAYER: Hmm-hmm.

MR. VLAHOS: Now, do you have a view as to whether that number is under or over, compared to what may have been if there was no rate freeze in the province of Ontario?

MS. FRAYER: In my opinion, the 14 percent is not an outcome of the rate freeze in the de facto price caps, as much as it is an outcome of demographical shifts that happen in the industry on cycles because of the labour impacts, as well as other initiatives since the rate freeze, other legislative regulatory initiatives and

mandates that have effectively expanded contracted services, as well.

MR. VLAHOS: So there is no influence at all, in your view, of the rate regime in the province on the O&M that has been observed?

MS. FRAYER: I think -- again, I think it is a function of the quantity of labour going up.

Another way to think about it is it might have been even higher if we didn't have the rate freeze, because, in effect, the way -- the impact of the rate freeze and the de facto price caps is that the utilities have had to deal within their means, in effect, have had to operate their systems as best as they could without having to raise rates.

So perhaps if they had an opportunity to have raised rates earlier, for example, rebased prior to 2006, they may have been able to expand -- you know, expand at a greater level, because, in effect, the sentiment I am hearing is that they have really had to learn to operate their systems as leanly as possible over the many years since the de facto price cap, since the mid 1990s.

MR. VLAHOS: If that is the case, that reinforces your theory on what? If the 14 percent is understated, if it was a normal world, it would have been something higher, then? Does that support your recommendation?

MS. FRAYER: Well, in effect, if we kind of go through the logic, holding all else constant, if we assumed that the growth in output is as measured and that OM&A growth

was even higher, then we would get an even lower TFP estimate from this type of hypothetical exercise, which suggests, again, even greater cost pressures on productivity growth.

MR. VLAHOS: All right, thank you.

Just finally, perhaps, Ms. Brickenden, can we get some coloured graphs on this presentation? I don't know -- we have black and white. I don't know if anybody has colours, but it makes it a lot easier to follow when we read the transcript. So I don't know whether I impose on you to do that.

MS. BRICKENDEN: Sure.

MS. FRAYER: As duly, noted I will refer to the square symbols from now on and the triangles.

MR. VLAHOS: All right. Thank you.

MR. SOMMERVILLE: Just one question. You referred to quantity of labour as a primary driver in the negative, as a negative factor in productivity, the total factor productivity. Did I get that right?

MS. FRAYER: Well, in effect, it is the quantity of labour and materials is growing quicker than the quantity of outputs.

MR. SOMMERVILLE: I sensed that you were emphasizing the labour part of that aspect. Did I get that correct?

MS. FRAYER: It is, because based on our measures of the quantity of capital - as you see, it is the last column in the top table - that has been growing, according to our measures, fairly moderately at about -- less than 5 percent

over that six-year period, so 4.6 percent.

So if we left out labour all together and said the only input is capital as we have measured, the physical measure of capital, then, in effect, different combinations of the quantity of output would have grown faster and we would have seen a positive TFP growth.

MR. SOMMERVILLE: All right. Is related to unit cost of labour, or -- you used the terminology "quantity of labour". What do you mean by that?

MS. FRAYER: That's an important point, actually. Productivity theory requires that we look at the quantities as the measure, rather than the amount you spend on labour or the amount you spend on capital input.

So one of our most challenging tasks in doing a total factor productivity analysis is taking the data we have, for example, on annual expenditures on labour, OM&A, labour and materials, and calculating from that a measure of quantity of labour and materials. The way we do that is we look at the annual expenditures and then normalize it by the reported costs per unit of labour. In effect, we're using Statistics Canada data on average weekly earnings in the utility sector in Canada.

MR. SOMMERVILLE: Now, on the sector?

MS. FRAYER: On the sector.

MR. SOMMERVILLE: The sector is electricity distribution?

MS. FRAYER: I believe the sector is utility, so it is a little bit of a wider sector. It is the best -- from the

various analysis we did and we presented a little bit about this back in March, that is probably the most -- the Statistics Canada index that we have the most confidence in, that particular one.

MR. SOMMERVILLE: Thanks. Thank you, Ms. Frayer.

We have gone over a little bit, but that presumably will go over in some instances and come in a little under in others. That's not a direction disguised as an introduction, Dr. Yatchew.

Dr. Yatchew, can you proceed, please.

DR. YATCHEW: Yes, thank you.

MR. SOMMERVILLE: Thank you.

ELECTRICITY DISTRIBUTORS' ASSOCIATION

PRESENTATION BY DR. YATCHEW:

DR. YATCHEW: Let me confirm the microphone is on. It is, thank you.

First, I would like to thank the Board Members for this opportunity to address the Board. I appreciate the value of your time and I will try to be as succinct as possible.

Let me begin, therefore, with what I believe to be one of the most informative graphics relating to the productivity factor issue.

This graph contains data on US -- on US distributors and their annual growth rates in TFP over the period 1989 to 2006.

The volatile, the blue volatile line depicts the actual annual growth in productivity and I should mention

that these are data that were developed with quite a considerable amount of work by the Pacific Economics Group.

Let me make the following observations. First, there is significant year to year volatility in productivity ranging from minus 1.5 percent, that occurs in the early 1990s, to values as high as plus two and a half percent, which occurs in the about 2005.

The second point. The average annual productivity growth in the US data is 0.72 percent.

Third. There is no statistical evidence of systematic acceleration in productivity growth throughout the sample period, nor is there any statistical evidence of systematic deceleration in productivity growth over the sample period.

If one were to fit a straight line, a standard linear regression model to these data, one would get an essentially flat line. So we are neither decelerating nor are we accelerating.

MR. VLAHOS: Dr. Yatchew, when you say "US distributed data", are those pure distribution companies or are they also an amalgam of integrated companies, as well as pure distributors?

DR. YATCHEW: Many of these are vertically integrated, but there are forms that are filed that specifically require these vertically integrated utilities to segregate to the extent possible the costs of their distributor operations.

MR. VLAHOS: So can you give us more information as to how pure is this data?

DR. YATCHEW: How cure?

MR. VLAHOS: How pure.

MR. YATCHEW: How pure.

MR. SOMMERVILLE: Same question.

DR. YATCHEW: First of all, there are systematic over many years.

On the other hand, I prefer to work with pure stand-alone distribution companies of the kind that we observe in Ontario, in Norway, in New Zealand, perhaps to some extent in Germany. So inevitably there is going to be issues of how overheads are allocated, whether there are scope economies.

So they may not be very pure and these are concerns that have been raised by the EDA, by other stakeholders, by myself in terms of their direct transferability to the Ontario setting. But for present purposes, I think this is the best we have and we have to interpret our analyses and results within that context.

This isn't quite the right data set for us.

MR. VLAHOS: So it does reflect an attempt to isolate the distribution component of the enterprise? Am I right on this?

DR. YATCHEW: That's correct.

MR. VLAHOS: Okay, thank you.

DR. YATCHEW: And that's, that is available within the data in the form that they've provided, but it is still requires a considerable amount of work on the part of, in this case, the Pacific Economics Group, to tease out what

really belongs in the distribution segment and what does not.

As is, by the way, the case in, amongst our Ontario distributors, where you might have a distributor being involved in distribution or having some small generation that you would need to factor out of their books.

Now, although there is no evidence of a systematic long-term trend either acceleration or deceleration, there is evidence of trends in productivity over shorter periods of time.

These trends are captured by the smoother yellow curve. Estimation of this kind of a non-linear trend suggests variation of average productivity growth between 0.4 percent and just over 1 percent over this period, over the period 1988 to 2006. And the technique that I have used to estimate these shorter-term productivity trends is based on moving averages. It is moderately more sophisticated than simply taking moving averages, but that's its fundamental cornerstone.

And this idea of taking them from the averages has been around for a century or more. The specific technique that I've used here, I described in one of the submissions to the Board and is widely accepted and has been around for at least a quarter of a century that I am familiar with.

Based on the moving averages, on these moving averages, the most recent years of data suggests that we are in a period of decelerating productivity growth, and the recessionary effects in the US are likely to have a

continued adverse impact on productivity trends.

Let me return to the issue of the quality of the data, which you have raised. The Pacific Economics Group has advocated the use of these US distributor data and a number of stakeholders have commented and expressed their reservations with respect to these data.

Although my discussion will be focussed on their proper use, the proper use of these data using statistical techniques, that discussion should be understood in the broader context of these less-than-ideal circumstances. That is that the current dependence on US data and errors that this can entail.

Before me, Julia made some suggestions along those lines as well.

Productivity growth in the electricity distribution industry during recent years has not only slowed in the US as was evident from that graph, it has also showed in Ontario. Pacific Economics Group estimates of productivity growth for the period 2002 to 2006 are as follows: For the US distributors, it's about 0.41 percent per year, well below the long-term 0.72 average; and for Ontario electricity distributors, it is 0.01 percent per year for that same period.

There are additional estimates that suggest that negative productivity growth may, in fact, have been observed in these recent years.

Possible reasons for recent low productivity growth rates in Ontario, there has been a changing and expanding

service mandate for distributors, such as conservation and demand management. There is the aging infrastructure. There are expanding regulatory requirements.

In addition, in the US, there have been recessionary effects, and, in Ontario, we have observed job losses. All of these are likely to have adverse effects on productivity growth.

One must ask one self whether these factors are likely to abate or reverse themselves during the upcoming regulatory period.

MR. SOMMERVILLE: Dr. Yatchew, Ms. Frayer talked about the pragmatic influence of her clients in developing what she described as a pragmatic approach to the development of this figure.

In terms of, for example, conservation and demand management, how did your clients describe that as a drag on productivity? How was that -- how did that materialize?

DR. YATCHEW: It complicates their operations, to the extent that they can recover from other accounts costs directly associated with this program that would wash out -- at least in theory would wash out of these calculations.

However, it is a different learning curve. It is a process where the objective is to decelerate the quantities of output being sold, and, if those quantities are what we're measuring in the numerator of a factor productivity calculation, that performance measure is not going to look as good. So there are certainly conflicting objectives here.

MR. SOMMERVILLE: One would have thought that after the so-called commercialization of the sector, that as time goes by there would be some innate productivity gains through, you know, just simple things like systems, being able to manage the business in a much more effective way just through experience.

Did that play a role in any of your assessments?

DR. YATCHEW: In my discussions with utilities, their sense has been that they have been bringing in these efficiency improvements, including what you have described as systems management, IT, more advanced IT, insourcing versus outsourcing.

These are all efficiency improvement channels that were being explored as early as in the mid 1990s, and I would suggest that if you look at the industry as a whole, which has been in a kind of yardstick competition for many more years, there was a fair amount of efficiency gain through devices like outsourcing, having some central company doing certain aspects of operations or the sharing of capital amongst utilities.

So I think that that -- that the presence of multiple utilities -- many utilities in this province contributed to a kind of pseudo competitive effect or pressure that found efficiencies for quite some time.

There was also quite a bit of comparison being done. What I have not seen is an empirical analysis that would try to estimate how much efficiencies were gained as a result of the yardstick competition that even preceded the

first incentive regulation mechanisms that were put in place.

MR. SOMMERVILLE: Thank you. That is helpful.

MR. VLAHOS: Dr. Yatchew, sorry, I want to take you back to a few minutes ago when you went through your very first graph showing the productivity factor annual growth in TFP. You don't have to turn it up.

In any event, I think you mentioned if you were to put a straight line, you said that it would show no slope?

DR. YATCHEW: Yes. Let me just turn up that graph.

MR. VLAHOS: And I am just going by the naked eye here. If I put my pen down, it shows a slight increase, naked eye. Did you actually produce some results on the record on this?

DR. YATCHEW: Yes, I did.

MR. VLAHOS: You did?

DR. YATCHEW: I can give you an exact reference. It was in a submission I made to the Board.

MR. VLAHOS: Was that questioned by anyone or...

DR. YATCHEW: I'm sorry?

MR. VLAHOS: Was that questioned by anyone?

DR. YATCHEW: I don't think anybody disputed it. It was just a simple regression on a linear term to see whether there was a systematic long-term trend.

MR. VLAHOS: You say it was essentially flat. Essentially, unless it is a zero slope, was it a positive or negative?

DR. YATCHEW: If you give me a moment, I might be able

to turn it up and I will tell you exactly.

MR. VLAHOS: That will help me.

DR. YATCHEW: Okay. This is found at -- in the document filed on April 14th, 2008, 3rd Generation Incentive Regulation For Ontario's Electricity Distributors, submissions on behalf of the Electricity Distributors Association under my name, Adonis Yatchew. It is at page 16, and footnote 20, and the dependent variable is the percentage TFP growth, and on the right-hand side there is a constant and a trend term, the year.

The R squared for the model, that is the percentage of variation in those blue -- in the blue line, percentage of variation that would be explained by a simple linear model, is 0.8 percent, less than 1 percent, for all practical purposes an immaterial amount.

MR. VLAHOS: Sorry, that is the R squared?

DR. YATCHEW: Yes. And that's informative, because it tells you --

MR. VLAHOS: There is no slope one way or another?

DR. YATCHEW: What it tells you is whatever the slope is, it's not explaining very much of the variation.

So now let me return to the slope, which was what your specific question was. The slope was 0.02, with a standard error of 0.054, which implies a T statistic of 0.364, and that means statistically indistinguishable from zero slope.

MR. VLAHOS: So we cannot tell? It could be upwards sloping, downwards sloping, but whatever the slope is, it is not significant?

DR. YATCHEW: It's not significantly different from zero, and that is what I mean -- meant when I said it is essentially a flat line --

MR. VLAHOS: Thank you.

DR. YATCHEW: -- over those years. I had estimated this to begin with, because I thought that over time, as incentive regulation would sort of take hold in the US, you would expect an acceleration in TFP growth, and it is not observed, at least not in these data.

MR. VLAHOS: Okay.

DR. YATCHEW: May I go ahead?

MR. VLAHOS: Please.

DR. YATCHEW: So let me turn now immediately to what I believe to be a reasonable range for productivity growth in Ontario, and I believe that range to be between 0.5 percent and 0.6 percent, with a point forecast of 0.55 percent.

We can devise very sophisticated models trying to weigh all of the various factors and incorporate a number of variables. I am suggesting that this way of looking at the problem is relatively straightforward and transparent.

Essentially, what it does is it says there is a long-term target. That long-term target is 0.72 percent. That's the long-term average productivity growth rate.

But the graphic that has been displayed suggests that there are variations in -- systematic variations in productivity growth, related to perhaps many factors, but among them, the business cycle.

Perhaps they're related to certain political agendas

or changes and views in the industry. These are events that don't change randomly from year to year. They persist over a certain period of time, and therefore will have a persistent effect over relatively intermediate periods of time on productivity growth rates.

That would suggest that one would want to assign some additional weight to the recent weights of productivity growth.

The Ontario Energy Board in first generation IRM took a similar view relatively straightforward, transparent, sensible, we could quibble about the exact coefficients and the exact weights but as a general approach, it is sensible.

It took -- it assigned two-thirds weight to a long-term productivity growth rate and a one-third weight to recent patterns in productivity growth rate that could be expected to continue, persist for some period of time over the upcoming regulatory window. Applying the exact formula that was put forth by this Board and using the 0.72 percent figure for long-term productivity growth, the 0.01 percent figure for recent Ontario growth, weights of two-thirds and one-third yields a 0.49 percent productivity factor as one estimate.

If we now use the same formula, but replace recent Ontario productivity growth rates with recent US productivity growth rates -- which are 0.41 percent -- then one arrives at a higher figure of 0.62 percent.

MR. VLAHOS: Sir, by "recent" -- what's the definition

of recent?

DR. YATCHEW: It's the 2002 to 2006 period that is found at -- this is the PEG calibration document put colloquially or the calibrating rate indexing mechanisms for 3rd generation incentive regulation, February 2008 at page 54.

I appreciate those numbers may be updated with 2007 figures. I would be surprised if those results would materially increase the target range.

Let me turn now to the proposal being put forth by the Pacific Economics Group. That proposal is for a base productivity factor of 0.88 percent. Keeping in mind that the average over the entire period 1988 to 2006 is 0.72 percent, the 0.88 percent estimate proposed by PEG is obtained by restricting the period over which the average is calculated to about two-thirds of the original data set, restricted to the years 1995 to 2006 and that restriction, in turn, is derived from an analysis performed by PEG that was called the “Start Date Analysis.”

I would like to provide a few comments on the start date analysis.

Essentially, this statistical procedure selects a past year that is most similar from the point of view of weather and economic conditions to the most recent year for which data are available.

So you want to find a year somewhere in the past, but not too distant past nor too recent, that is similar to the present year both in terms of weather and economic

conditions, and at first blush there's some plausibility to that, because if the initial year in the data set has wildly different economic and wildly different weather conditions than the last year, you might expect some biases to get built in.

Nevertheless, I believe there is a fundamental deficiency in this approach, and I would like to illustrate it as follows: I am at slide 10. Suppose, for simplicity of understanding the key issues here, that productivity growth follows a cyclical curve as in figure 1 varying between zero at its lowest and one at its highest over the period 1989 to 2006.

Now let's apply this methodology that is being proposed, which essentially says: Find the year occurring before the year 2006 that is most similar to what we observe in 2006.

Well in 2006, we observe a productivity growth rate of 0.5 percent, and in 1997 we observe that same productivity growth rate.

So that's going to be the matching year. I guess this isn't going to work. So...

MR. SOMMERVILLE: We can find it.

MR. VLAHOS: We can follow.

DR. YATCHEW: I actually wanted to point the laser at certain points on the slide. There is a hand here somewhere? There it is. Somebody is working it. The magic. At any rate, what I want to point out is this: That if you take a look at 1997 and 2006, you get exactly

the same value. You have a match.

Now what you want to do is you want to average over that period 1997 to 2006. But by doing so, you have, in effect, omitted all of the data preceding, because there is no other observation here that has a value that is 0.5 that matches the current year.

Now, the long-term average productivity growth in these data is around 0.5. We can see that, because it is more or less a symmetric curve around 0.5. On the other hand, if we just consider the data after 1997, yes, thank you, then we're going to get a value that is more like 0.75. If that's our estimate of long-term productivity growth, we have overestimated long-term productivity growth by about 50 percent.

In simplest terms, the problem that I have with the start date analysis is that it searches for a single year that is most similar to the most recent year, rather than for entire period, a collection of data that is likely to be representative of the future. Here is one example of how this approach could fail.

And we have also seen how volatile TFP can be from year to year. So a matching could be more accidental than consistent with, with the hypothesis similarity.

Let me give a second argument that would argue for using the entire data set that we have.

There is a fundamental idea in statistics which states that the precision of an estimator increases as one includes more data. If you have 100 observations on

randomly selected Canadians and average their heights, you will get an estimate of the average height of a Canadian. But you will get a generally much better estimate if you had 200 observations or 300 observations. The larger the data set the more likely you are going to get a more accurate estimate.

Returning to the present context, as sample size increases year-to-year fluctuations, unusual observations, or outliers are averaged out. Thus, if the concern which was expressed by the Pacific Economics Group is that the initial year in the sample can inappropriately influence the estimate of long-term productivity growth, a more sensible way to alleviate this concern is to increase the sample size, because then each observation, including the first observation, is getting less -- progressively less and less weight. That's what averaging is all about.

By including the entire sample period 1988 to 2006, rather than limiting the data to the sub-period 1995 to 2006, one effectively increases the sample size by about 50 percent and thereby increases the accuracy and reliability of the estimator.

I would add that the Pacific Economics Group has asserted that weather can significantly affect estimates of productivity growth. Year-to-year weather effects, unlike business cycle effects, which really do have a cyclical impact -- year-to-year weather effects are generally uncorrelated, so that including more observations will help to average out this source of randomness more quickly.

I have abstracted from -- any systematic climate change effects in that argument.

Let me return to this -- to the real data now and to this graph, which I think is really quite informative.

Neither the raw data, the volatile blue line, nor the non-linear trend model or the moving average model, which has been estimated, would suggest that the data prior to 1995 does not belong and should, therefore, be excluded.

That's not the case in all circumstances. From time to time, we run into a regime change where all bets are off. There is a new system in place, whether it is a political change or technological change. Certainly in electricity demand, we saw a dramatic drop of electricity demand and electricity growth from 7 percent year over year down to about 3 percent year over year, and that occurred somewhere in the 1980s, early 1990s.

Those old data would not be terribly informative of what should be happening now.

But I am not seeing that kind of precipitous change here that would cause me to want to exclude the earlier data.

On the contrary, the early 1990s were a period of relatively higher unemployment, which arguably should not be excluded precisely because the subsequent years enjoyed higher employment levels and are, therefore, not likely to be representative of the longer term.

If I may summarize - and I have probably exceeded my 20 minutes - I would recommend a productivity factor of

0.55 percent. This combines the entire 1988 to 2006 period with an average productivity factor of 0.72 percent, a figure that was calculated by the Pacific Economics Group, and assigns additional weight to the most recent years, 2002 to 2006, when we have observed slower productivity growth.

Whatever number the Board ultimately settles upon, I would urge the Board to take these two key factors into account: The long-term average productivity growth rate and the more recent patterns of slower productivity growth rate.

One can have reasonable differences on how to weight those two in the bigger picture, but, in my view, both elements need to be embedded in the estimates.

The Pacific Economics Group productivity factor of 0.88 percent, in my view, inappropriately restricts the data to the period 1995 to 2006 and does not assign any additional weight to the more recent data.

Thank you.

MR. SOMMERVILLE: Thank you.

I have no questions, nor does Mr. Vlahos at this time.

Dr. Kaufmann, can you proceed, please?

ONTARIO ENERGY BOARD STAFF

PRESENTATION BY DR. KAUFMANN:

DR. KAUFMANN: Okay, thank you. I should say that I have a written statement which follows my presentation, although somewhat loosely, but I will read to you directly from my statement.

Good afternoon, everyone. To those of you who don't know me, my name is Larry Kaufmann and I am a partner of Pacific Economics Group.

For the last ten months or so, I have had the pleasure of advising the Board Staff on the development of 3rd generation incentive regulation mechanism for the electricity distributors in Ontario.

Our work began with a series of meetings with the working group of stakeholders representing the companies, customers, employees of the electricity distribution industry. The process has culminated in a July 14th report of the Board on 3rd generation incentive regulation.

This Board report establishes a comprehensive framework for incentive regulation of the Ontario distributors and reaches decisions on most of the specific elements of a 3rd generation incentive regulation plan, including the broad methodologies the Board will use to set the productivity factor and stretch factor components of the X factor.

As an incentive regulations specialist who has worked on these issues throughout the world for over the last 15 years, I can honestly say the Board report represents one of the most thoughtful, cogent and well-reasoned incentive regulation determinations by any energy sector -- any energy sector regulator.

Indeed, I believe this report may one day view be viewed as a landmark decision that helped to structure and rejuvenate the application of incentive regulation

throughout North America.

Everyone involved in the process can take pride in the good work that has been done to date, and I would especially like to express my gratitude to the conscientious Board Staff members I have worked with and the stakeholders who participated in the working group discussions.

Largely because of their contributions, I believe we have gone a long way towards satisfying the Board's objectives of developing a framework that will lead to sustainable, predictable, effective and practical incentive regulation for Ontario's electricity consumers.

However, as we all know, our work isn't done yet. The July 14th report has indicated the Board would be assisted by further consultation on specific values to be established for three key incentive regulation parameters, the productivity factor, the stretch factors and the materiality threshold for the capital investment module.

For many interested parties, these numbers are really where the rubber meets the road. The specific values determined for these parameters will have significant, concrete implications for the rates that customers pay and the revenues the companies earn.

But while we all recognize the importance of getting these parameters right, or at least as right as regulatory economics and accounting is capable of doing, we must also recognize we are not engaged in a results-oriented exercise. Ultimately, the reasonableness of any proposed

value for an incentive regulation parameter depends on the methodology and data used to derive and support that value and not the numerical result, per se.

Any method that is used to set incentive regulation parameters for 3rd generation IRM must therefore be consistent with objective, rigorous economic research, not simply something that can be feasibly implemented using available data.

It would also frustrate Board's goals of creating a sustainable, predictable, effective and practical incentive regulation framework if, in the interests of expediency, our well-intentioned desire to place more weight on Ontario data, we adopt methods for estimating productivity factors that are logically inconsistent with how distribution rates have been set in the past and will be updated in the future.

Clearly, any productivity factor estimate that is contrary to ratemaking practice in Ontario cannot be sustainable in the long run. So there would be no value in using it now for setting 3rd generation incentive regulation IRM parameters.

With that backdrop in mind, let me briefly explain the methodology that I used for recommending a value for the productivity factor for 3rd generation incentive regulation.

I will then turn to the other proposals that have been put forward for developing values for the productivity factor.

When I began my work for Staff, I of course knew that total factor productivity, or TFP trends, were estimated for Ontario distributors for the 1998 through '97 period as part of first generation incentive regulation.

My initial objective was to update these TFP estimates to include more recent data for the Ontario industry. However, I soon learned that this was not possible, since there is a gap in the available Ontario data.

Data were not readily available for the years 1998 through 2002, although a consistent data series was available since 2002. My discussions with OEB Staff indicated that it would not be possible to close this data gap for the Ontario industry without undertaking a significant data collection and data reconstruction project.

This would be long-term endeavour and it was not feasible, in the limited time we had available, to prepare a draft report which contained our productivity and stretch factor recommendations.

Using available data, however, PEG did estimate TFP trends for Ontario distributors for the 2002 through 2006 period. We found that TFP growth was essentially negligible over this period, with average growth of 0.1 percent per annum. This compared with appear average TFP trend of 0.86 percent that was calculated in first generation IRM.

Now, at this point there were some options for relying entire on Ontario data to set the productivity factor.

These options were essentially to use the TFP trend estimated for 1988 through '97 the more recent TFP trend estimated for 2002 through 2006, or some combination of the two.

Regarding the more recent trends, I quickly concluded that using only the 2002 through 2006 TFP trends was not reasonable. It's my strong opinion that a productivity factor should never be estimated using only four years' of TFP changes, because TFP can be very volatile from year to year, as Dr. Yatchew has pointed out, and four years of growth is not a long enough period to balance out these fluctuations and obtain a good estimate of the underlying long-run TFP trend.

This opinion is supported by the TFP research done in first generation IRM. While TFP growth averaged 0.86 percent over the 1988 through '97 period productivity growth were very different between the first and second halves of this sample. TFP actually declined by 0.01 percent per annum in the first half of this sample from 1988 to '93.

TFP increased by a brisk 2.05 percent in the second half of this sample from 1993 to 1997.

This means --

MR. SOMMERVILLE: Dr. Kaufmann, again, sir, bringing us back to sort of a pragmatic aspect, how would we account for those differences? What do we see in the real world that would result in a productivity factor of two and change in the latter part of that sample as opposed to the

previous -- what is it attributable to?

DR. KAUFMANN: It could be attributable to things either within the utility itself or things in the broader business environment. In the broader business environment, the broader environment they operate in, the sort of factors can be the sort of factors that we in fact controlled for in our start date analysis things like the state of the economy. That can impact growth. It can impact kilowatt-hour sales, peak demand.

Obviously that's going to be dependent on the economy. It can be impacted by weather. Weather is variable from year to year. That's going to have an impact on the total sales of companies, of distributors and therefore on output growth. So those are the sort of broader economic things. Within the companies, it can be variable for a number of reasons, asset replacement patterns, the timing of inspection cycles, maintenance cycles all of those things can vary from year to year. They can all come together in unpredictable ways so that in any given year, the TFP changes can be either up or down.

MR. SOMMERVILLE: Do you have any idea as to what the growth in TFP during that second half of the segment, what were the driving causes? Was it simply a matter of more throughput? Just more demand?

DR. KAUFMANN: It wasn't that. Because I wasn't responsible for that TFP estimate. But in that TFP estimate, demand did not play a role.

Output was measured entirely by customer numbers in

that TFP study. So at least in that case it wasn't due to demand. Again, it wasn't my study, so I am not sure -- there wasn't a lot of supporting detail on where those numbers came from, so I don't think it is possible to determine exactly what led to the more rapid growth in the seconds half of the sample.

MR. VLAHOS: I want to make sure I understand, there is no difference in the interpretation of the word "demand." Demand... did you mean...

MR. SOMMERVILLE: Basically throughput.

MR. VLAHOS: Throughput, is that what you meant?

DR. KAUFMANN: Energy or demand. Kilowatt-hours or kilowatts, neither one of them were in the model.

MR. VLAHOS: When you answered the question, you had in mind both of them? Or just demand?

DR. KAUFMANN: Neither. Neither kilowatt-hours nor kilowatts were in the output specification, in that model, in IRM 1.

MR. VLAHOS: All right.

DR. KAUFMANN: I can say something, though, about the more recent US TFP deceleration, that's something that has been discussed.

It has been suggested that the decline in 2002 through 2006 in the US may have been due to slower growth, and in fact that wouldn't be a reasonable thing to think that's causing that decline, because the US wasn't in recession over those years.

The US did have a very mild recession in 2000-2001.

The economy began to recover in 2002, and by 2003 through 2006, there is actually fairly healthy growth in the economy. But one thing was very different in that period compared to the late '90s, and that was pension contributions.

In the late '90s, a lot of companies conserved on the contributions they made to their pension plans, because of the fast growth in equity markets during those years. They didn't have to make ongoing monetary contributions to still meet their obligations. That obviously changed in 2000, and that's -- I think that is an important demonstration of the volatility of the sort of decisions that companies can make internally, for good rationale reasons that can tend to raise their TFP growth over a multi -- over a short period of time, but over time, they have to catch up.

I think that is one of the things that we do see, TFP tends to increase relatively rapidly in the late ‘90s in the US, that was one of the reasons for US distributors.

One of the main factors leading to a deceleration in TFP in 2002 through 2006 was the catch-up in pension contributions.

MR. SOMMERVILLE: Thank you.

DR. KAUFMANN: So on the issue of first generation estimated TFP growth and what its implications were, this means that if staff had relied only on the first four sample years as the basis for its productivity factor, it would have selected a negative productivity factor of negative 0.01 percent.

This would have dramatically understated the TFP growth that the industry actually experienced in the following four years. I believe this is a compelling illustration of the dangers of relying on only four years of TFP change for setting the productivity factor.

It is therefore not surprising that no energy sector regulator has ever approved an x-factor on the basis of such a short TFP study.

It also dramatically underscores the fact that if TFP is flat or declining as has apparently been the case recently for the Ontario industry, this does not necessarily imply that TFP growth will be flat or negative in the future.

In fact, the actual past experience from Ontario distributors indicates that the opposite has been the case.

A second option for using only the Ontario data was to rely on the trends estimated in first generation IRM. However, this was not appealing because the sample period that was used to estimate TFP would have ended more than ten years before third generation IRM took effect.

Relying on TFP trends that are more than a decade old is not consistent with a long-run sustainable incentive regulation framework. Regulators should have access to and rely on much more current information as the basis for establishing incentive regulation plans.

A third option was to combine the two estimates in some way. However, this was also not appealing because the two estimates were separated by the gap years of 1998

through 2002. Simply ignoring this gap was untenable but there was no way to rectify it because of the data constraints in Ontario. I also believe that undertaking some type of weighted average of TFP trends for disjointed non-consecutive periods would have been arbitrary and established a poor precedent going forward.

Clearly, TFP trends will be far more credible and likely to be accurate if they are developed over a continuous time period rather than over two distinct and non-overlapping periods.

I therefore found that given available information, it was not possible to use only Ontario data to estimate the productivity factor.

This was contrary to my objectives at the outset of the project. However, circumstances and data constraints made my original work plan impossible since relying only on the available Ontario TFP estimates, but if either led to unreliable measures of long-term TFP trends or required the use of arbitrary ad hoc methods that were not consistent with the Board's objectives to develop sustainable incentive regulation framework. I had to develop an alternative approach. And I decided to examine the suitability of TFP trends for US distributors as a proxy measure.

My firm, PEG develops and updates these TFP measures consistently as part of our incentive regulation consulting practice. TFP information for a US distributors is therefore available continuously for long sample periods.

PEG has also presented our TFP studies in many North American incentive regulation proceedings. After intense scrutiny and review, regulators have proved our TFP estimates as the basis for the approved productivity factors for numerous gas and electric utilities incentive regulation plans.

PEG's TFP therefore provides a feasible, rigorous and prudent source of productivity information that could be applied in new incentive regulation applications.

For 3rd generation IRM, the issue was whether our TFP estimates for US distributors were a good proxy for Ontario TFP trends, which, again, could not be continuously estimated using consistent, rigorous methodology over a period that is long enough to yield a reliable estimate of the underlying TFP trend.

I examined this issue by undertaking a side-by-side comparison of our TFP estimates for US distributors with the available TFP information from Ontario.

I discovered that the TFP growth for US distributors was a reasonable, although not perfect, proxy for measured contemporaneous trends in Ontario.

For example, in both Ontario and the US, TFP growth was essentially flat over the 1988 through '93 period. More precisely, it was negative 0.01 percent in Ontario and a positive 0.1 percent for the US.

TFP growth turned sharply positive in the US and Ontario in 1993 through '97, although the upswing, which I have already mentioned was 2.05 percent, was relatively

greater in Ontario.

It is impossible to compare 1998 through 2001 because of the lack of Ontario data, but in 2002 through 2006, TFP decelerated in both the US and Ontario.

Over the 13 years for which TFP growth could be calculated, the average TFP growth rates in the US and Ontario differed by only 0.01 percent. That is, for practical purposes, they were essentially the same.

Given this experience, I concluded the TFP trends for US distributors were a reasonable proxy for Ontario and a reasonable productivity factor could be calculated using the continuous TFP indexes that were developed for the US industry.

My analysis showed that the current estimate of a long-term TFP trend for the US distributors was 0.88 percent per annum, and this was the value I recommended for 3rd generation IRM.

Clearly, my recommendation for the productivity factor is based on a proxy, but given the current data in Ontario, this is unavoidable. Some type of a proxy must be developed, because TFP cannot be continuously estimated for Ontario distributors.

But it should be noted that our fundamental methodology for estimating TFP and developing the productivity factor can be easily extended to Ontario data as more information becomes available.

In fact, by the time 3rd generation IRM is completed, PEG's methodology can be applied entirely to Ontario data

and it will yield a reliable estimate of the industry's long-term TFP trend.

My recommendation, therefore, embodies not just a value for the productivity factor for 3rd generation IRM, but a clear transition path for developing feasible, rigorous productivity factors using entirely Ontario data.

This is important, because it means that PEG's recommendation is consistent with developing a sustainable, long-run incentive regulation framework. Our methodology is also clearly practical and will be effective, since it utilizes proven techniques for estimating productivity.

The methodology itself is also predictable, since it will be sustained from application to application, although it will be transferred from US to Ontario data as the latter become more available.

I therefore believe that our methodology best satisfies the objectives laid out by the Board at the outset of IRM 3, which was the reason I recommended it.

Turning briefly to the other proposed values. On behalf of the Coalition Of Large Distributors, London Economics has presented what it claims are several estimates of 20-year TFP trends for the Ontario industry.

I have numerous problems with their TFP estimates. Let me focus on one element, which, to be blunt, makes their work a non-starter for any serious discussion of these issues, and that element is the measurement of capital.

TFP growth for an industry is defined as the growth in

that industry's total output quantity minus the growth in its total input quantity. So we all know electricity distribution is a very capital-intensive industry and capital is the biggest input for electricity distributors.

How capital is measured will therefore have a very significant impact on distributors' measured TFP trend. In the London Economic study, capital is measured using a single variable, which is the total kilometres of line. Now, we all know that kilometres of line does not accurately measure the capital stock of any distributor currently operating in Ontario.

In addition to having lines, distribution assets include substations, poles, meters, trucks, CIS systems, SCADA and OMS systems, personal computers and software and similar items.

When a utility sets its rates to recover depreciation and carrying costs of these capital goods, it does so with reference to the aggregated monetary values of these disparate assets net of their depreciation.

London's TFP study completely ignores this monetary valuation of assets, which is fundamental to ratemaking, in favour of what it calls a physical method for estimating capital stock.

But since physical asset measures are not used to set rates at the outset of a plan, it follows that London is proposing to use a productivity factor to adjust distribution rates that, over time, bears no relationship to how those rates were originally set.

This is one of many logical inconsistencies in London's proposal, and I will discuss some others shortly. Before I do, it is necessary to point out one other critical aspect of the London methodology, and that is their TFP model assumes that there is no physical decay of distribution assets over time.

London has not simply claiming that distribution assets are long lived and therefore decay slowly, but, rather, that there is zero physical decay in all years that an asset is in place until the day it is retired or entirely replaced.

In the economics literature, this is known as a one hoss shay pattern of depreciation, and I regret that I introduced that term, because it may come up quite a bit in the next couple of days. London says, in its presentation, that economic theory, empirical evidence, industry experience and recent regulatory precedence all support the recognition of one hoss shay depreciation.

I am more than happy to engage in a technical debate on one hoss shay depreciation, although I hope we can avoid it, but I am confident the more we talk about this issue, the more it will become clear to objective, open-minded individuals that London's position is not the truth.

But before we begin any arcane debates on the finer points of depreciation, I would like to consider two implications of London's assumption of one hoss shay depreciation and the resulting use of kilometres of distribution line to measure capital.

First, if London believes that physical capital quantities should be used to adjust rates in 3rd generation IRM, then it must also revise its recommendation for the materiality threshold.

This is because the rate adjustment mechanism in IRM 3 includes two potential adjustments to recover the costs of capital inputs.

The first is the productivity factor. As London has recently acknowledged, the productivity factor adjusts distribution revenues to recover some amount of capital expenditures. The second potential mechanism nor recovering the cost of capital inputs is the capital investment module.

But the productivity factor remains the primary vehicle for recovering cost -- capital costs in IRM 3, and its primacy is evident in the fact that the productivity factor is part of the core plan that is applied to all distributors, while the capital module is simply an option that some distributors may choose to invoke, provided they satisfy certain conditions.

To put this more colloquially, when recovering the costs of capital inputs in IRM 3, the productivity factor is the dog and the capital module is the tail. And the capital measure that is used to recover capital costs in the main body of the dog must also be used for the tail.

This is not true of the London proposal. London's productivity factor links capital cost recovery to changes in kilometres of line, but its capital module ties capital

cost recovery to changes in capital expenditures. They simply can't have it both ways, and what is good for the goose is good for the gander.

If London's position is that capital is adequately measured by kilometres of line, its capital module must be revised to reflect that. But if rate adjustments via the capital module depend on monetary capital values, then London's TFP study must also be revised so the capital is measured monetarily.

It is logically insupportable to use two contradictory capital measures to recover capital costs in the same adjustment mechanism.

Another implication of London's capital measure is that all distribution costs, excluding tree trimming, are imprudent and should be disallowed when rates are rebased.

I am sure this conclusion will come as a surprise to distributors, but if London truly believes that distributors' assets are characterized by one hoss shay depreciation, then there is never any physical decay of those assets, and every dollar that is spent to maintain those assets must be wasted.

It would not be prudent for ratepayers to pay these costs, so companies should either be willing to discontinue the maintenance programs or to accept the completed disallowance of maintenance costs when rates are set.

So, I know that is a controversial and provocative statement and I don't believe it myself, but I just want to make the point that before we launch into any abstract

theoretical debates on depreciation, I propose that we begin our consideration of the adequacy of London's productivity factor by addressing two questions where we're much more familiar, conventional ratemaking ground.

First, do distribution rates recover the monetary values or physical measures of a distributor's capital inputs? If the answer is monetary values, then why is it appropriate for a mechanism that adjust rates over time to ignore monetary capital expenditures?

Second, if distribution assets never experience any physical deterioration, why is it appropriate for distribution rates to recover maintenance costs that are designed to offset or prevent physical decay? I believe we need reasonable answers to these puzzles before we progress to more academic points.

Another productivity factor has been put forward by Professor Adonis Yatchew on behalf of the Electricity Distributors Association. Professor Yatchew raises three main concerns with my proposed productivity factor.

First, he said that PEG's method for determining a start date for estimating TFP is incorrect because it searches for a single year that is most similar to the recent year, rather than for a period that is likely to be representative of the future.

Furthermore, he says our method - and here I am quoting from his presentation:

> "...has a fundamental flaw which can be illustrated as follows: Suppose

productivity growth follows the cyclical curve in figure 1, varies between zero and one, and averaging about 0.5 percent over the period 1989 and 2006."

Professor Yatchew’s use of the word “suppose” is critical and revealing for it shows he is making an assumption that productivity growth follows a cyclical path. But he offers no evidence to support this view and his critique depends on that assumption, that is, if productivity growth does not display the cyclical behaviour he assumed, then his conclusion regarding PEG’s analysis does not follow.

While I appreciate Professor Yatchew's examination of US TFP behaviour, I do not believe his conclusion that our analysis has a fundamental flaw is a fair one, since it depends entirely on the assumption that distribution TFP obeys a regular observable cycle. Professor Yatchew has simply a assumed this and not presented any evidence that cyclical behaviour has either been systematic in the past or can be expected to persist in the future.

Let me now temporarily assume he is right. Suppose there is cyclical behaviour in TFP. The question is, has Professor Yatchew presented a practical method for helping us locate a period that -- that is, again, I am quoting, likely to be representative of the future.

I don't believe he has, because according to his method, you have to know exactly where you are in the cycle

to know where TFP is going in the future.

This is an extremely difficult thing to know. Understanding the twists, turns, frequency and amplitudes of economic variables that display cyclical patterns is a very tricky business. In the present context, I don't believe we have anywhere near enough information or knowledge to forecast the cyclical behaviour of TFP going forward.

I would like to present an example which I believe illustrates the difference between what Professor Yatchew is recommending to estimate TFP growth, and what I have done in my work, and that example is the stock market.

As we all know, probably from painful personal experience, stock markets don't always go up. Over longer periods, however, stock prices do tend to increase in real terms albeit with a lot of booms, busts, and corrections along the way.

Let's say we want to forecast how much stock prices will increase on average over the next ten years. Professor Yatchew would say that we need to know the entire cycle of stock market prices and where we are in it to make this prediction but this immediately raises the question, what is the cycle. For example, in the recent past, the Dow Jones increased by an average 17 percent per annum, between January 1996 and August 2000, fell by 11 percent annually between 2000 and 2003, increased about 11 percent annually between 2003 and 2007, and fell by an average of 6 percent per annum between January 2007 and June 2008.

Do we expect this recent observed cycle of stock prices to persist and if not, why not?

We will get very different answers for future growth rates in stock prices, depending on where we are, where we believe we are in the cycle. And because the predictions are very sensitive to the cyclical starting points, the potential to make large prediction errors is also likely to be large.

My approach is different. If applied to equity markets I would not try to identify the twists and turns of the market, but rather assume that there is an underlying long-term trend in stock market prices which is likely to be a good predictor of where the market will go over a multi-year future period.

However, I would go beyond simply calculating average growth rates over two arbitrary points because we know the measured growth rate can be distorted by transitory factors that can impact stock market or TFP index levels in any given year.

In TFP estimation these transitory factors are weather and overall economic activity and these are the factors I controlled for in my analysis.

Stock markets are driven by earnings in the long run. So these transitory factors may be captured by the price earnings ratio for stock market indexes. For example, if the price earnings ratio is especially high relative to long run history, as it was in March 2000, then it would not be reasonable to expect the measured trend up to that

point to be representative of stock market trends going forward.

If the IRM basic methodology for estimating TFP was applied to the stock market, it would first obtain a measure of the current PE ratio, locate a past date in which the PE ratio was similar and compute the average growth rate of stock prices between these two dates.

This method is very similar to what I did for estimating TFP growth, and it is clearly feasible, controls for transitory factors that can distort the measured index values in any given year, and is likely to reflect the ongoing long run trend in the underlying variable. Not only is our approach much simpler than Professor Yatchew's recommendation, which requires knowing the entire stock market cycle, but I also believe it is likely to yield more accurate predictions of the underlying long-term trend.

I should add, too, that just based on Professor Yatchew's presentation that preceded mine, there actually, his description of what we did is not an accurate statement of how we actually located the start date. I would be happy to expand on that at some point, but we do not search for a previous year in which the TFP growth rate was similar to the current year. Rather what we do is focus on previous year in which transitory factors, being weather and the unemployment rate, are similar to the current year.

If we have similar levels of those transitory factors in a given year, between the two years, then the impact of those transitory factors on measured TFP in that year is

likely to be similar. That's, again, analogous to the PE example that I mentioned before. So we are focussing on the business conditions, not the TFP growth itself.

Professor Yatchew's second concern is that PEG did not use the entire 1988 through 2006 period to estimate the TFP trend and he claims it is a fundamental idea in statistics that larger samples deliver more precise estimates.

While this is generally true, it is not clear in the present context that extending the sample period backwards in time necessarily leads to a more precise estimate of the current long-run TFP trends.

Suppose we could estimate TFP for US distributors since 1900. Is the 1900 through 2006 TFP trend necessarily more representative of the future than the 1995 through 2006 trend?

As I said in my February report, I believe that estimating the long-run TFP trend requires striking a balance between selecting a sample period that is short enough to reflect current conditions and long enough to average out random year-to-year fluctuations in TFP.

In nearly all regulatory proceedings a sample period of about 10 or 11 years has been selected as an appropriate balance of these goals which is consistent with what I have recommended in IRM 3.

I should also mention two other points that are relevant for the issue of the start date of my TFP analysis.

First, I began the TFP analysis in 1988 because I was

undertaking a side-by-side comparison with the Ontario TFP results. And the first TFP study for Ontario began in 1988.

If PEG had chosen to do so, we could have computed TFP for US distributors for a longer period. There is accordingly no economic or empirical significance related to the year 1988 itself.

It was chosen simply to allow comparisons with the existing Ontario data, but it does not represent the longest feasible TFP trend that could be estimated for US distributors.

Second, I have personally been involved in regulatory proceedings where regulators have requested that I estimate TFP trends over periods that exceed the standard 10 or 11 years but they have rejected these longer run trends in favour of the 10 or 11 year average growth rate. This was the case for Boston Gas where I originally presented a TFP trend for the north-east gas distributors for the 1990 through 2000 period. Another year's worth of data became available during the regulatory review, and in response to a data request, I was asked to update the TFP trend to include a new year's worth of data and also to extend the TFP estimates back in time to 1984.

The Massachusetts Commission therefore could have used the TFP trend that I estimated between the 1984-2001 periods about as long as Professor Yatchew is recommending, but, instead, it used my estimated TFP trend from 1990 through 2001 as the basis for the productivity factor that

it approved in that plan.

Finally, Professor Yatchew claims that my recommendation for the productivity factor does not put enough weight on recent TFP experience. He notes that the Board took recent and long-term TFP patterns into account when it set productivity factor in first generation incentive regulation.

Professor Yatchew then implies the Board selected two-thirds and one-third weight from IRM 1 to two different sets of TFP estimates developed by PEG. The first is the 18-year US TFP trend and the four-year Ontario TFP trend, which yields a value of 0.94 percent. The second is the 18-year US TFP trend and the four-year US TFP trend, which yields a value of 0.62 percent.

Professor Yatchew's recommended productivity factor of 0.55 percent is essentially the midpoint of these calculations.

I have four main concerns with Professor Yatchew's final recommended productivity factor. First, the Board has approved productivity factors for two incentive regulation decisions since the IRM 1 decision more than eight years ago, yet in both of these instances it did not repeat the methodology for estimating the productivity factor that was adopted in that decision.

Clearly, the Board does not believe that it is bound by the IRM 1 precedent.

Second, PEG's approach for setting the productivity factor does take recent TFP information into account and it

does so in a manner that, in my opinion, has a stronger analytical foundation for distinguishing between transitory and long-run factors that drive TFP growth than was adopted in IRM 1 or than has been proposed in any of the alternative proposals.

Third, because TFP can be volatile over relatively short periods, I believe repeated applications of the IRM 1 approach or any approach that weights recent TFP growth differently than longer-term trends can potentially exacerbate volatility in the productivity factor, and, therefore, volatility in rate adjustments over time.

This would run counter to the Board's objective of creating a predictable incentive regulation framework.

Finally, I believe Professor Yatchew's method of calculating the productivity factor is not consistent with the most appropriate sustainable incentive regulation framework. Professor Yatchew's recommended productivity factor mixes US and Ontario data in relatively arbitrary ways.

I have relied on US TFP trends as a proxy for Ontario trends only because there was not sufficient Ontario data to compute a reliable TFP trend for IRM 3.

However, in IRM 4 and all future incentive regulation applications, my method can be transferred easily in Ontario and entirely to Ontario data. This will allow a clean transition to the appropriate long-run basis for estimating productivity factors and is therefore more compatible with the Board's objective of sustainability.

In closing, let me say that I look forward to debating these issues with my colleagues, and I will keep an open mind regarding alternatives views and values as I tried to do in the entire process. As an advisor to Staff, my primary objective has always been to adopt the best usable data and the most rigorous, objective methods for estimating incentive regulation parameters.

As we turn to finalizing these values, I will remain impartial regarding particular numerical results, but, rather, let the data and analysis dictate the outcome.

Thank you.

MR. SOMMERVILLE: Thank you, Dr. Kaufmann. We will continue until 3:30, and then take a short break, and then continue on to 4:30.

Mr. Vlahos.

MR. VLAHOS: Yes, thank you. Dr. Kaufmann, just a question. Your method will allow the continuation for 4th generation IRM, you say.

What's wrong with adopting the methodology going forward, but not necessarily adopting it for IRM 3? What are we violating here, if we were to say that your methodology is sound and it will probably produce good results going forward because of availability of Ontario data, but in the interim that may not be the best model?

So what are we going to violate by saying that?

DR. KAUFMANN: I guess I would have to know why it is not the best model for IRM 3, if it is the best model and what we plan to transition to for IRM 4.

I would think that the only difference between IRM 4 and IRM 3 is the use of the data. IRM 4, I think the expectation -- more than the expectation. I think it is close to certain there will be enough data to estimate TFP for Ontario for a long enough period to calculate a TFP trend.

So the only reason that we're not doing that now is because of the data. So I guess I would have to wonder why there is -- there would be an interim sort of decision that would be necessarily better. I would have to know why it is better than what we plan to adopt in IRM 4 to really give you an answer to the question.

MR. VLAHOS: I notice that is a point of departure between yourself and London Economics is the use of the number of years of data.

DR. KAUFMANN: Yes.

MR. VLAHOS: Yours is less than ten. Eleven years is pretty common in other jurisdictions.

Twenty years has been out of scope?

DR. KAUFMANN: I am not aware of any plans that have used 20 years of data -- that have estimated a TFP based on 20 years' worth of data.

MR. VLAHOS: I will ask you to repeat that. What is the criticism of going to 20-year data as opposed to a shorter time frame like 10 years?

DR. KAUFMANN: The criticism -- my particular criticism with the 20-year TFP trend is not that it is 20 years, but that it is constructed -- basically, it's pieced

together TFP trends for -- that have been done in various applications, and the last piece that has been added is -- uses a capital formulation which really is not acceptable for TFP estimation. It is not something that should ever be done.

So, ultimately, my problem with the TFP study that has been put forward is not the 20-year value, per se, but it is the values that go into that 20 years.

MR. VLAHOS: Let me ask you this.

If you had a -- if data was not a restriction for you, if you had 20-year data and ten-year data, would it be a de facto preference for a ten-year data as opposed to 20, or you would be indifferent?

DR. KAUFMANN: I don't focus on the number of years per se. The start date analysis is really focussed on trying to pick some past period which is similar to the current period, the most recent period, in terms of the transitory factors, to make sure the trend isn't distorted by weather or the unemployment rate or things like that.

So I think that is the key issue for selecting a period is to try to make sure that those factors are similar. Whether it is 11 years versus 20 years, I don't feel as strongly about, although I do think that as you go farther back in time, I think is it hard to dispute that it is more likely that the past becomes less representative of the current conditions than more recent data.

MR. VLAHOS: I couldn't help but notice that when you made the statement that in Dr. Yatchew's model one would

have to know at which point of the cycle you are in, that Dr. Yatchew was shaking his head.

So like, you know, maybe you have not interpreted his model right or something to that effect. I am sure Dr. Yatchew can speak up when his turn comes, but did I read you correctly, Dr. Kaufmann? That is your interpretation of what he is suggesting?

DR. KAUFMANN: My understanding of what he is saying is you need to know -- you cannot focus on two points, you need to know the entire cycle. You need to know the entire pattern of behaviour to know what is a correct pattern, which -- you can't just look at a given year, year 1 and year 2, and say, Let's compute the TFP growth rates between those years.

You have to know the entire cycle. Perhaps not the entire cycle, but you need to know a period. You can't just look at a year. You need to know a period that precedes the current year, and you have to look to that period to see if it's going to be representative of the future.

I think the stork market is a good illustration of why that is. I just see the difficulties with that sort of approach. The way I think about it is there is a long-run, undergoing trend inherent in the data, and what you want to do is estimate that trend. It is a long-term trend, but you want to be sensitive to the fact that trend can be distorted by temporary factors.

MR. SOMMERVILLE: I took your presentation, and I

think Dr. Yatchew's presentation, to be on all fours with each other with respect to this idea of trend, that there really isn't a trend in TFP growth, that this is a highly volatile exercise at the best of times. Did I get that right?

DR. KAUFMANN: It's highly volatile, but there is still an underlying growth rate.

But there is no systematic acceleration. What he said is there is no systematic acceleration or deceleration.

MR. SOMMERVILLE: To the extent that there is -- that there is growth in the TFP factor over a given period of time, it may be attributable to many different factors which are genuinely external to the utility. Isn't that a fair statement?

DR. KAUFMANN: Yes.

MR. SOMMERVILLE: And that's why you look at externalities in order to develop your start date analysis. You look at externalities and say: Well, the state of the economy is roughly the same at this point as it is it is here. Therefore that's the sort of comparator we ought use. That's the underlying principle; is that right?

DR. KAUFMANN: That's right.

MR. SOMMERVILLE: In your withering assessment of London Economics, Ms. Frayer's model, you concentrated a good deal on the -- what you perceive as the inadequacy of using kilometres as a proxy. And I think that's the way to describe it -- Ms. Frayer, correct me if I am wrong -- as a proxy for capital.

QUESTIONS/DISCUSSION:

MR. SOMMERVILLE: Ms. Frayer, we're now in the general questions and discussion portion, so we can open up -- we can slip the bonds of whatever formality we had and perhaps you would like to respond directly to Dr. Kaufmann's suggestion that lines of capital is not a good proxy for capital.

MS. FRAYER: It's on. Great.

I surely would like to. I am hoping I can do it within the next five minutes before our 3:30 cut-off.

MR. SOMMERVILLE: You've got ten minutes, actually. We're using this clock over here.

MS. FRAYER: Ten minutes okay. The first point I wanted to make is that it has been done elsewhere.

I submitted papers back, after I believe the March workshop, which talked to the methodology I had utilized in measuring the quantity of capital input and it has been done elsewhere and has been used to set rates in incentive ratemaking. I can provide more information to the Board if they would like.

But before I go down that path, I think I want to also acknowledge that Larry was correct in saying that one of my decisive points in doing that approach to approximate the change in the quantity of capital input was because of depreciation.

He's correct in characterizing that, but he is probably quite incorrect on other points he raised on what that means to the characterization.

So one, I would like to first start with kind of a general reminder, what we're trying to do, a total factor productivity analysis is looking at the growth in quantities of input and output. Not the growth in rates. Not the growth in expenditures or revenue requirement over time. That's not what we're trying to do. We're doing a productivity analysis which intrinsically looks at quantities.

And therefore, an approach that looks at a physical inventory of quantities is a valid conceptual approach, a logical approach one could do, to the productivity analysis.

Now, to address that point about, well, if you're looking at quantities of input and inventory, of physical units, rather than how much you spend on those units, how much those units cost you to purchase, how is that then related back to the revenue requirement and how rates change?

Well, they're related intrinsically. If I buy an additional distribution pole, an extra kilometre of distribution line, that will add to my rate base and that will eventually appear in my revenue requirement, therefore the rates that I need to recover from customers for the service I provide.

So inherently they're related. It is just a question of timing and a translation from buying more capital or hiring more staff to complete your operations and provide a quality service and how that relates down the road to

actual rates.

So given those two points, I want to go back to the physical capital measure. Why did I choose to proxy distribution lines for the quantity of capital input in my analysis?

The reason is depreciation, because, in effect, I wanted to use the best proxy I could, given the data we had, to take into account that you put in a new distribution line, the next day that distribution line does not lose its physical carrying capacity. An accounting approach, which is what underpins the monetary value approach that PEG has completed, just -- does just that: It applies accounting depreciation parameters. So it assumes that one period from the day an asset is placed into service, it no longer has the same value. When I am thinking of inputs and quantity of inputs, I am thinking about physical value, physical carrying capacity. So what I wanted to represent was the fact that if you put a new distribution asset into service, that unit -- if well maintained -- should not lose its physical utilization or carrying capacity with time.

And so that statement made that somehow that physical depreciation, the capital method and the physical depreciation I assumed somehow implies that we should ignore maintenance is actually not true. It is quite the opposite.

My analysis is assuming that the assets are well maintained and the cost of that maintenance is represented

in the units of OM&A that are measured side by side with the units of the capital.

MR. SOMMERVILLE: You're in fact predicting the stability in that group of assets, not an erosion, if you like?

MS. FRAYER: Not an accounting-based erosion. There is an erosion over time. I'm not saying a one hoss shay which is actually on the spectrum of things what -- it is tied to a famous poem, but I won't go into the historical concepts of the terminology. But what it's saying is that distribution assets are like light bulbs, you screw it in, it works until it doesn't work anymore at all. It doesn't mean the light bulb will slowly get dimmer and dimmer and dimmer and lose its physical attributes with time. It just works until it stops working. Well, that is the assumption I'm making, that the distribution quantities -- the capital quantities I am estimating for distribution assets will be there until they're replaced or added to.

In fact, it is quite -- although it is extreme, and I can recognize the distribution assets will, in time, will lose some of their carrying capacity. A transformer station will age and slowly with time won't carry the same level of load it carried when it was new, but that loss is very slow in comparison to an accounting depreciation schedule that would be used.

MR. SOMMERVILLE: Or decisions about pension costs; right?

MS. FRAYER: So the other question that was raised is,

why did you look at lines only, distribution lines and length of lines?

Well, in fact that is a reality of the data. I would have preferred to have both line length and carrying capacity measure of assets which would have allowed me, then, to incorporate transformers, substations and distribution lines into my measure of capital input. But that data is not yet readily available.

I think it is easy to compile but it is just not quite publicly available right now. So we had to do with an approximation, which was the kilometres of distribution line, and frankly, if you actually go back to the real data, the Ontario database publicly available data, and you look up, going back to monetary values, the unadjusted asset value of poles and wires in comparison to all other capital assets listed, all other categories of capital assets, on average for the sector it is 60 percent. So it is a good approximation. It represents more than half of the total asset stock, capital inventory that utilities have.

I agree that there are other capital assets, but we're in a unique situation that the electricity distribution sector can be described by only a few types of capital assets.

So my decision to use length or kilometres of distribution line was a pragmatic decision based on what was available to me.

Now, going back, there are effectively two

methodologies to look at the physical inventory of capital and to look at the monetary value of capital and adjust it for inflation, deflate it and adjust it then for depreciation.

In my approach to using a physical capital inventory, I didn't completely rule out using monetary value. Don't take me as a proponent of physical capital inventory and nothing else. I am much more of a pragmatist in terms of empirics, it is just we don't have very good data to do a monetary value approach right now.

So I am not ruling it out as a potential for the future. But the data right now is quite miserable and unfortunately Dr. Cronin isn't here with us today, but he commented on this in the last workshop and it is on the transcript so I can probably misquote him a little bit on this and we can look up the exact reference, but he noted because of the lack of capital additions data for Ontario, the mini-inventory approach to measuring the monetary value of the capital input is very, very strongly biassing the TFP results, biassing the measure of capital in the TFP results.

So again, I was a little bit of a pragmatist but my first feeling is that a physical measure is a good approximation of the physical operational depreciation of these assets.

And to the extent you said, Well, Julia, would you ever use a monetary value approach, I would say, yes, I would, if we had very good data and capital additions going

back in time so there was less sensitivity to the start year.

Two, I would also couple it with what is referred to in these days as age efficiency profiling. This is what the statistics agencies themselves are doing. They're not doing an accounting depreciation like Pacific Economics Group performed. They're actually adjusting the depreciation profiles to mirror the physical depreciation of capital stock, because they have recognized, through lots of historical studies, that there is a bias that tends to build up if you're using accounting depreciation measures.

MR. VLAHOS: Dr. Yatchew, did you want to respond before we break in a couple of minutes, if you could do it in a couple of minutes?

DR. YATCHEW: I am afraid it is going to take me a little bit longer.

MR. VLAHOS: This is on my question about whether Dr. Kaufmann has properly interpreted your recommendation in his analogy to the stock market example of price earnings ratio.

DR. YATCHEW: My short answer is I think there is a fundamental misunderstanding over here of the technical idea.

MR. SOMMERVILLE: I wonder if it might not be worthwhile, when we come back in 15 minutes -- there are other participants. Mr. Shepherd, you will have some questions? Mr. Thomson? Ms. Girvan?

MS. GIRVAN: Yes.

MR. SOMMERVILLE: Mr. Harper? Ms. Kwik? Mr. Aiken?

MR. AIKEN: Perhaps.

MR. SOMMERVILLE: Mr. MacIntosh? Forgive me. I am not personally familiar with others down on this side.

Will you have questions?

It may be worthwhile if those who do have questions, just cram into the 15 minutes we have here, try to coordinate them a little bit, and, Dr. Yatchew, you may -- you may want to find a way to address Dr. Kaufmann's criticism in the course of answering these other questions.

I am sure the issues will arise. That may be the most economical way for us to proceed both today and tomorrow, if we can coordinate this action a little bit.

So we will break for 15 minutes and come back with questions from the floor. Thank you.

--- Recess taken at 3:30 p.m.

--- On resuming at 3:45 p.m.

MR. SOMMERVILLE: Have the questioners worked out an order of proceeding? Mr. Shepherd, I think you are going first.

MR. SHEPHERD: Yes. It wasn't a discussion. I was just simply told.

MR. SOMMERVILLE: Well, it was a short discussion.

MR. SHEPHERD: When Mr. Thompson decides what the order is, that's what the order is.

MR. SOMMERVILLE: Everyone needs a supervisor.

MR. SHEPHERD: That's right. I have a couple of

questions for Ms. Frayer, and these are sort of in the nature of trying to understand some things you said.

Part of your --

MS. GIRVAN: Jay, sorry, your fan, again, keeps coming on when...

MR. SHEPHERD: Is that better?

MS. GIRVAN: Yes.

MR. SHEPHERD: Part of your analysis was influenced by your expectation there is going to be a dramatic increase in capital requirements in the next few years; is that right?

MS. FRAYER: Part of my analysis of total factor productivity?

MR. SHEPHERD: Yes.

MS. FRAYER: The historical, the productivity factor recommendation consistent with how the Board report asked that it be carried out is looking at historical productivity growth.

So I will present more on the capital module tomorrow, but I wanted to leave the -- anything related to the capital module for that period.

I think total factor productivity and my recommendation for the productivity target for third generation IRM is based on the historical numbers.

MR. SHEPHERD: I understand that. But I think you said, if I understand this right, that one of the reasons why you have to use Ontario data instead of US data is because of this demand that you are expecting for dramatic

increase in CAPEX; is that right?

MS. FRAYER: Well, that is one of the distinguishing features between Ontario and the US in that I believe there is different time capital expenditure programs which affect the input and output relationship.

MR. SHEPHERD: So do you have some data on that, that you can share with us, on this CAPEX expectation over the next few years, what the pattern has been? I mean, this is you're saying it is a cycle, right, so if there was spending in the ‘60s and ‘70s, there will be a lot then, there will be a lot now. So do you have that data?

MS. FRAYER: I don't have the actual data breaking it down by time periods, but effectively, I think there was spending to electrify the province in response to building booms that occurred in the '60s and '70s and just typically on the basis of the number of years necessary to replace certain assets, we expect that there will effectively be spending over some cycle going forward to replace those.

So that particular capital expenditure is related to the aging asset question that we have been talking about through the consultation.

MR. SHEPHERD: This is just something that your clients have told you? You don't have any data on it?

MS. FRAYER: I don't have explicit numerical data that shows, this is the spending that occurred then and this is the spending I expect going forward.

I have reviewed the rebasing applications that have come over the recent period and I have noted on an

individual basis where there is a projection for higher capital expenditures at least over the next few years over the test year as compared to historically.

So you also have access to that, though, so...

MR. SHEPHERD: Thank you. The other thing you said is that one of the special things about Ontario is that there has been effectively a rate freeze over the last several years.

Have you done any analysis of what the actual rate increases have been over the last few years?

MS. FRAYER: I have not looked at the actual rate increases. I know there have been for things like corporatization and PILs but not for the underlying revenue requirement for operational expenses.

MR. SHEPHERD: Would it surprise you to find out that the revenue requirement for operations, distinct from those other things, would increase by more than inflation over the last five years? Would that surprise you?

MS. FRAYER: It would not -- that the expenditures? OM&A you're talking about?

MR. SHEPHERD: No. I'm talking about the revenue, the actual amount of revenue that each of these had adjusted for those special factors that you are talking about increased by more than inflation. Were you aware of that?

MS. FRAYER: There is growth and demand.

MR. SHEPHERD: No. Adjusted for growth.

MS. FRAYER: I am not sure -- what is the basis for that?

MR. SHEPHERD: I am asking you, if that turns out to be the case -- I mean the information is published so we can simply show Board the published data. Then would that change your conclusion as to whether Ontario data is more reliable than US data and why Ontario utilities are different?

MS. FRAYER: Well, I don't think it changes my overall conclusion that to set a rate-making regime for Ontario, it is best to use Ontario data. I think that is my ultimate recommendation, that would still stay the same.

MR. SHEPHERD: You use this unusual approach to the capital component for the last four years, which Dr. Kaufmann has criticized.

I have two questions about that. As I understand what you're saying, that accounting depreciation is not the same as physical depreciation. Is that right?

MS. FRAYER: That's one element of it, yes.

MR. SHEPHERD: Well, okay. Is there another element of it?

MS. FRAYER: Well, what type of depreciation do -- I guess the next step is, we know the difference between accounting and physical. Which one do we want to model then in a total factor productivity analysis?

MR. SHEPHERD: Well, no, but that's what I'm getting at because accounting depreciation, of course, is intended to track physical depreciation, in fact, you use Iowa curves to calculate the period of time; right?

MS. FRAYER: But we also know that they tend to

overstate the pace of physical depreciation.

MR. SHEPHERD: Well, yes, okay, so it is it interesting you say that because on an individual asset basis, I understand why that is the case, it's the light bulk example, right, the light bulb doesn't get dimmer and dimmer? But on a system-wide basis where you have assets added every year, isn't it true that the depreciation, in fact, is very similar to the assets that reach their -- the end of their useful life. In fact, it is based on that, isn't it?

MS. FRAYER: No. I think that in effect, I disagree that the accounting measure of depreciation, depreciation expense that is reported -- and the accounting measures of depreciation that have been used to estimate the value of the capital input -- reflect that.

So I think that in effect, they're biassing the TFP results because they may be biassing the measure of the capital input unless you account for the age of the assets.

MR. SHEPHERD: So I am trying to understand that, because I guess I would have assumed that if your depreciation is 4 percent of your rate base in a given year, that approximately 4 percent of your capital stock is going to be out of service that year, because in fact they're calculated using the same method.

Isn't that right?

MS. FRAYER: Well, we're talking about the -- repeat the question again because I think –-

MR. SHEPHERD: Let me put it to you a different way.

If your depreciation is 4 percent, then your retirements, at their original costs, should probably be about 4 percent of rate base. Isn't that right?

MS. FRAYER: In effect, if you're saying your average depreciation is 4 percent of rate base, you're saying that on an accounting basis, those 4 percent of your asset base has been fully recovered from rates.

MR. SHEPHERD: No. I'm saying actual retirements. Your actual retirements should be approximately 4 percent of your rate base at an original cost basis; right? Because they're calculated using the same method.

MS. FRAYER: Well, I'm not sure about physical retirements. Or replacements.

MR. SHEPHERD: Don't utilities have physical retirements?

MS. FRAYER: They definitely do but I haven't actually looked at the numbers. I am not sure that they match the actual depreciation rate.

MR. SHEPHERD: Of course, the method you have used assumes there are no physical retirements; right?

MS. FRAYER: Sorry?

MR. SHEPHERD: The method you have used assumes that there are no physical retirements.

MS. FRAYER: It makes no such assumption. It looks at the data and says: Is there?

MR. SHEPHERD: And the other thing I don't understand is, you used poles and wires as a proxy, which I understand --

MS. FRAYER: Well, actually, length of wires.

MR. SHEPHERD: Length, which is poles and wires, it should be, roughly? And that's about 60 percent.

Did you do some analysis -- it should be relatively easy to see whether it's a good proxy by testing it against overall capital needs. Isn't that right?

MS. FRAYER: Well, to do -- I would actually have preferred to look at, have a measure that allowed me to incorporate other classes of distribution assets like transformer substations.

But that's not something I could do without additional information about the voltage, and carrying capacity. So it is not that easy an analysis because if it was I would have done it and incorporated a more complete, I guess, proxy for the input quantity of capital. But it's not something that is readily available.

MR. SHEPHERD: I guess what I don't understand is when you choose a proxy, usually you test to see if the proxy has some reliable relationship to what it's proxying; right? And you didn't do that here?

MS. FRAYER: Well, I am supposed to be proxying the input quantity of capital. So a physical inventory of capital is, by definition, a measure of input quantity.

My concern was, distribution lines, does that encapsulate a significant portion of the capital employed? I did actually look at the actual data. I went back and said, okay, what portion of gross unadjusted book value over time have distribution lines and poles represented?

They have generally represented more than half. So I felt that it was a suitable proxy, given the data that I had at hand.

MR. SHEPHERD: So you're saying that you couldn't test whether it was a good proxy because -- for the same reason that you couldn't use the original data from the other classes? You just had to ignore computers and things like that, because you don't have enough data on it?

MS. FRAYER: Well, I am not explicitly ignoring it. What I am suggesting is other classes of capital employed grew at the same rate as distribution and poles. That's what the analysis is looking at. We're only looking not at levels, but at changes from year to year.

MR. SHEPHERD: Okay. My last question is you -- for you is, to get the labour quantity, you took the labour expense and adjusted for the Stats Can unit labour costs. Is that a standard way of doing it?

MS. FRAYER: It is. In fact, what we have is OM&A. So we have a composition of both labour and materials.

And so you adjust the annual expenditures, OM&A, total labour and materials expenditures, by the implicit price of those inputs, which would be the input price of labour and implicit price of materials. On the material side, there is no great Stats Can index that really goes to it, so I used the GDP deflator for that portion.

MR. SHEPHERD: All right. Can I ask, Dr. Kaufmann and Dr. Yatchew, whether that sounds like a reasonable approach to the labour component?

DR. KAUFMANN: To use a weighted average of something like an economy-wide inflation measure for the non-labour OM&A?

MR. SHEPHERD: Yes.

DR. KAUFMANN: To use a Stats Can measure? Stats Can for the electric utility industry or utility industry?

MS. FRAYER: Utility industry, yes.

DR. KAUFMANN: Okay. I mean, that could be reasonable. I would have to look at it. I would have to see exactly what's in their -- generally, using a weighted average of economy-wide measures for the non-labour component and some measure of the labour price that's specific to the industry is a reasonable approach.

MR. SOMMERVILLE: Dr. Yatchew, do you agree with that

DR. YATCHEW: With respect to the labour component, I think using the Stats Can data can lead to erroneous results.

One of the reasons is that the electricity industry, the distribution industry, has a very substantial unionized component. This tends to reduce inter-regional differentials in wages.

And that will look very different than if you just look at the geographical wage distributions or other sort of labour that would be available through Stats Can.

So that if anything, my expectation -- and I can give a specific example. If anything, using the Stats Can data for the labour component will tend to suggest that there are larger differences and potentially greater cost savings

across utilities in a labour component than there actually are.

MR. SHEPHERD: So you're suggesting that Ms. Frayer's calculation might overstate the total factor productivity?

DR. YATCHEW: I'm sorry, you would have to walk me through that again. I am not sure I caught all of that.

MR. SHEPHERD: You're suggesting that using that method of calculating the labour component might end up with her number, her 0.58 number, being slightly high?

DR. YATCHEW: Using, sorry, which number?

MR. SHEPHERD: Sorry. Okay, let me back up. I asked about the labour quantity inputs, and you said that the number might lead to -- the approach might lead to erroneous results.

DR. YATCHEW: Yes.

MR. SHEPHERD: And that, in fact, as I understand what you said, the erroneous results might actually overstate the differences. And do I understand that to mean, when you track that through the calculation of total factor productivity, the result would be that Ms. Frayer's number might be too high?

DR. YATCHEW: That's not obvious to me.

The point I am trying to make is that there will be smaller inter-utility labour differences.

MR. SHEPHERD: Oh, inter-utility?

DR. YATCHEW: Inter-utility labour differences than would be predicted by an inter-geographical comparison.

MR. SHEPHERD: Okay. I understand.

DR. KAUFMANN: Jay, I should point out we used the union wage rates for the reasons you pointed out.

When you asked me, I was making a more general statement, a more general point, about whether the index from Stats Canada could be reasonable, and there are pluses and minuses in both.

But we have been using the union wage rate. Our judgment so far is it is a better measure, but I think that's one of those finer points of productivity estimation that I think could be something that could be revised in further applications.

MR. SHEPHERD: Would there be a material difference in Ms. Frayer's number if she used the approach to the labour component that you have used and that Dr. Yatchew thinks is better?

MS. FRAYER: Well, if I can take a jab at answering that, I don't believe so, because we actually presented side by side the union wage estimates from one Canadian source against the Stats Can labour utility -- weekly earnings for utility labour index I believe in the March workshop, in the context of the IPI, the inflation index. If you all go back to those slides, I can actually pull the reference --

MR. SHEPHERD: No, that's fine.

MS. FRAYER: There isn't really a lot of difference for the time period we're studying.

One concern with -- you know, you have to weight pros and cons. The concern is that we use the Canadian-wide

utility index, so it incorporates utilities outside of Ontario, because we actually had great reservations about the sampling techniques Stats Can did for the Ontario version.

We looked at the unionized wage labour index, but the problem there was the unionized labour across many different sectors, so, again, reservations. Fortunately, there is nothing perfect in there, but they do tend to move closely in parallel. So I don't think it actually affects substantially a measure of the quantity of labour input.

MR. SHEPHERD: So your conclusion is that your results wouldn't be materially different if you used that approach?

MS. FRAYER: I don't believe so.

MR. SHEPHERD: Does that sound reasonable to you, Dr. Kaufmann?

DR. KAUFMANN: I would have to do a side-by-side comparison. I haven't done that.

MR. SHEPHERD: I have one question of Dr. Yatchew.

DR. YATCHEW: If I could just add in one final observation?

MR. SHEPHERD: Sorry.

DR. YATCHEW: If you were able to use data directly from utilities, like lineman data, benchmarking -- benchmark wages across utilities, I suspect you would get substantially more accurate results, and you would also get much closer tracking of inter-utility differences of labour costs.

MR. SHEPHERD: So if you were using --

DR. YATCHEW: That goes to the equity issue.

MR. SHEPHERD: If you were using it for benchmarking purposes, for example, then it would be more important that you get the individual utility data?

DR. YATCHEW: Yes. That's correct.

MR. SHEPHERD: I see, okay.

DR. KAUFMANN: There is a counter-argument to using that, which is that labour prices should be extra, and to the extent that you go directly at the company level and you measure what companies are paying for labour, you could be picking up a management decision as opposed to an external market condition.

DR. YATCHEW: I would not be averse to both sets of numbers. But in my experience, the estimates that I did back in the '90s, which actually used lineman data for 280 utilities, that labour variable came in very clearly as an explanatory variable of -- in the total cost function.

MR. SHEPHERD: To compare utility to utility?

DR. YATCHEW: Yes.

MR. SHEPHERD: Which sort of makes sense, from an intuitive point of view. The utilities that were tougher on -- had tighter control over their labour costs were more productive; right?

Dr. Yatchew, you said a couple of times in your presentation that if we're going into a recessionary period, you would expect productivity to be lower.

I guess from a business point of view, that doesn't sound intuitive to me. Most business people would say that

while your outputs go down, of course you are under a lot of pressure to cuts costs and you tend to be more productive in a period of recession than you do in a period of expansion, where you have a lot more ability to waste money.

So can you just help me understand why that is true?

DR. YATCHEW: Sure. There are a number of literatures addressing this issue, but the general rubric is that there is a procyclical effect relating to productivity growth in business cycles.

Now, there have been many theories examined at various microlevels of why that is the case. One of the simpler reasons is that companies are willing to keep their labour force in place at times when they're producing less output and therefore "less productive" because it is a good business decision, to hang on to your well-trained people, not get rid of them, because they're going to be more productive when that -- when acceleration occurs and demand and you don't have to bring in untrained talent into your labour pool.

So I don't find it surprising that there is a procyclical effect relating productivity growth and the business cycle.

MR. SHEPHERD: Okay. Dr. Kaufmann, I had a question for you on your start date analysis.

You said that Dr. Yatchew assumes that there is a cycle, or a predictable pattern, if you like. I take your point there is no evidence on the record that that's the

case, but what if that were true, if that were true, would it then mean that when you do your start date analysis, there will be more than one year in the past that is an appropriate start date and you have to choose between them?

DR. KAUFMANN: If you assume that to be true --

MR. SHEPHERD: Yes.

DR. KAUFMANN: Well, not in our start date analysis. Because our start date analysis, I suppose that would depend on what is driving the cycle.

If the cycle is driven by factors that are internal to the company, internal to the industry, then our start date analysis would not pick that up. Our start date analysis focuses on external factors that can have short term impacts on TFP.

So therefore, if there's some, something inherent in the industry that's leading to cyclical pattern then our analysis will not pick up multiple start dates in the past. If on the other hand it is driven by cyclical changes in weather, cyclical changes in the economy, then there is a good possibility it would pick it up.

MR. SHEPHERD: So then if that were the case, how would you decide between previous years? You have more than one previous year that is a suitable start date, how would you decide between them? Because you would get different answers; right?

DR. KAUFMANN: You might. It depends. I mean I think if you have a regular cycle, it would depend -- I mean, if you really do have the cyclical pattern and you're picking

that up from where you are right now until two different points in the past, if you really do have say one cycle to gets you from where you are now to the first point and then the second cycle that gets you to the second point, then you would get the exact same TFP results, because it is just two cycles one after the other.

So in that case you wouldn't get a different number. You would just -- because, you have the same cycle that, if in fact, you have a cycle that leads from point A to point B and it looks exactly like that and then you have that exact same cycle that gets you from point B to point C, you will have the same cycle.

If it’s the same number of years under which the cycle applies, then when you calculate that average, there is no reason. You have all the same numbers that go on the numerator of that average and then you have the same numbers of years in the denominator, you would get the same average growth.

MR. SHEPHERD: Let me just follow up on that. The point of the start date analysis is to make sure you have the slope of the line accurate; right?

Sorry, things that happen at the beginning or end of the period that you are choosing --

DR. KAUFMANN: Yes.

MR. SHEPHERD: -- haven't affected the slope of the line --

DR. KAUFMANN: That's correct.

MR. SHEPHERD: -- unreasonably; right?

DR. KAUFMANN: That is correct, yes.

MR. SHEPHERD: So how then would that change if you went back to a previous suitable start date? Are you saying the slope of the line would continue to be the same all other things being equal?

DR. KAUFMANN: A previous start date?

MR. SHEPHERD: Yes.

DR. KAUFMANN: Well, I mean the...

You can't -- I don't think you can make a general conclusion on that. You know, there can be factors, because frankly I don't believe there is a regular cyclical pattern within TFP. I just don't believe it. I mean, I think there is a lot of variability. We have 11, 18 years and you can smooth it out so it looks like there might be one but I don't believe that is actually what's going on.

I think that there is an upward trend in TFP and there is a lot of volatility. So given that that's my belief about the reality of this industry, if you take two different points and you estimate a trend over two different points that may happen to be the same, then there is no reason that the TFP estimates couldn't differ a little bit. You wouldn't necessarily have the same trend because there is volatility, and there can be random volatility.

And depending on how long the difference is between, say, point B and point C as opposed to point A and point B, the volatility can dominate the trend and you can get a different number on the average growth rate.

MR. SHEPHERD: I haven't forgotten, Dr. Yatchew, but I just want to finish off that point.

You just talked about a cycle of the TFP.

DR. KAUFMANN: Right.

MR. SHEPHERD: But as I under stood your start date analysis, you're not identifying a cycle of the TFP. You are identifying a cycle of the exogenous factors. If there is a cycle of the exogenous factors, then Dr. Yatchew's comment would be correct.

But if there is not a cycle of exogenous factors, the one you're using to calculate the start date, then it should be irrelevant. Isn't it?

DR. KAUFMANN: No. I mean even if there is a cycle in the exogenous factors, Dr. Yatchew's assumption wouldn't necessarily be correct.

There can be cyclical changes and variability in TFP for a variety of reasons that don't just have to do with the cyclical, the external cyclical factors it can be dominated by investment decisions, replacement decisions, you know, real productivity gains that become new in the industry compared to the past and there are a lot of things that can go into the data.

So I don't think you can say that as a general statement.

MR. SHEPHERD: Dr. Yatchew.

DR. YATCHEW: That makes the problem that much more complicated in trying to use just two variables to identify -- and two point in time to identify the period that is

supposed to be representative.

But if there are all of these other factors going on, they're missing from your analysis in selecting start dates.

DR. KAUFMANN: But they're inherent to the industry. And that is really the issue.

I mean what we want to do is we want to have something that reflects the industry's behaviour over a multi-year period. We want this to be representative of what's going on within the companies, independent of exogenous factors, external factors that might be driving TFP that doesn't have anything to do with the industry.

For example, pensions is a great illustration. In the late '90s companies conserved on pensions, their measured TFP went up. After 2001, companies had to make pension contributions. They're measured TFP went down. That is a business decision. It made sense in the '90s it also made sense now.

But if you cut that period in half and you just focus on one as opposed to the other, you won't be picking up those fluctuations and the same thing with asset replacement cycles. I mean, if you look at short periods or you look at any given period, it can be dominated by those factors. But what you have to do is look at a long enough period so those factors more or less balance out and you have a reasonable -- you can't control for everything. But you want to make sure that you have a reasonable period so that those random fluctuations that reflect company

decisions more or less balance out.

DR. YATCHEW: I think the insertion of all of these other considerations obfuscates the analysis of the start date approach.

Let me try to put the start date analysis in a simple perspective. Suppose there were two factors, the two factors that were introduced by Dr. Kaufmann in that analysis: Weather factors and unemployment rate.

Let's also agree, for the purposes of this discussion, that weather factors are essentially random year to year. I am abstracting from climate change. In that case you really do want to take the longest possible average because the longer your time period, the better chance you have of averaging out the unusually hot years with unusually cold years.

Now let me focus on the unemployment factor.

It has been stated that the, there's no proof that there is a cycle in TFP. That's not the claim that I am making.

The claim that I am making is that there is a cyclical component, within TFP, that is driven by and related to the extent that the business cycle -- and I didn't use that word accidentally -- that the business cycle has an impact on TFP.

If the business cycle has an impact on TFP, then TFP must have at least that cyclical component within it.

MR. SHEPHERD: So here's the problem I had with that, Dr. Yatchew, so maybe you could help me understand.

What's the practical result of that? You are not presenting data on the cycle, as I understand it.

So how is this Board supposed to assess how to choose the period, if you're saying, Well, Dr. Kaufmann's method is wrong, but I don't have any evidence on what the cycle is?

I don't understand what you expect the Board to do.

DR. YATCHEW: Well, I did put forth a specific recommendation, and I could put forth a much more sophisticated recommendation.

Actually, I put forth two recommendations. One is that the start date analysis is incorrect.

I found no evidence of this approach in the mathematical statistics literature or in econometrics literature that would justify this kind of approach in this kind of setting.

I am not trying to reinvent the wheel if it's already been invented.

The wheel that has been invented is a somewhat more sophisticated tool. It's a tool that says, Let's look at the data, let's look at the period we are trying to predict and let's test various kinds of predictive models.

We can go through that exercise and we could probably spend a week here of expert testimony on exactly how to calibrate that kind of exercise, how we're going to incorporate the various elements in the model, cyclical effects, time trend effects, seasonal effects, weather effects, and so on, and try to find the best predictive

model, because that is our objective.

Our objective is to try to obtain the best possible prediction of the base productivity factor for the next three years.

That exercise can be done. It is a sophisticated exercise. It will not be specially transparent to the Board.

Therefore, I recommended the third, which has literally countless numbers of papers supporting it, and that is unless there is evidence that certain observations do not belong in the data set because there has been a regime change, because they are unusual outliers, because you've got David Gates in this data set of income on people living in this room, present in this room, and we're calculating the average income, because there's some sort of unusual -- unless there is evidence that there are some unusual outliers in this data, the presumption is you use as much data as you can, simply because of the law of averages.

MR. SHEPHERD: Well, so, okay, here is what I don't understand, then, Dr. Yatchew.

What you appear to be saying to the Board is, If you don't reflect the cycles, then you're doing it wrong. And, by the way, my suggestion is don't reflect the cycles.

I mean, surely if your point is that there is a cycle, you should identify the cycle and the Board can then use it in its analysis. Otherwise, I don't see how your suggestion is practical. Sorry, just -- you are probably

right. I just don't understand.

And the other part to that is, if the answer is, Well, just take the longest period of time you have, then why wouldn't you use 50 years or 100 years, because at least in the US data you have a lot of data to use and you can correlate it?

So why wouldn't you do that? What is the magic in 20 or 18 or whatever?

DR. YATCHEW: I guess there are two responses to that. If you really do have long-term data -- and I have seen long-term data, but I haven't examined it to see whether it sort of meets certain standards -- long-term data for the US, one of the things you would have to ask is whether there has been a systematic change somewhere along the way that would make one period look different from another period.

The example I gave earlier where, in demand for electricity, was that 7 percent guaranteed for decades and decades and all of a sudden dropped to 3 percent. You wouldn't want to use those decades with the 7 percent and mix them with the decades where you observed 3 percent.

So you would have to look at the data to see whether there are reasonable break points.

Now, as far as the cyclicity question that you are asking, I am not saying ignore the cyclicity. As far as I can tell, that graph which I am -- I keep returning to, because for me it has been the most illuminating within this whole discussion. We can go through a lot of

technical analysis, but one nice graph is for me very informative. It actually does exhibit a long-term wave.

It doesn't explain a great deal of the variation in productivity changes year to year, but there is some sort of a systematic trend being picked up that sometimes increases and sometimes decreases.

And we don't have to claim that that cycle is going to be the same the next time around for the same reason that macro economists never claim they know the length of a business cycle. Business cycles vary from seven years to 15 years to four years, a huge variation.

That does not mean that recent experience is uninformative about the prospects in the immediate future. That's the essence of what I am trying to say, that you need to look at not only the long-term average, but you need to look at what's happened in the last few years and see whether that's informative or helpful in predicting the next three years.

MR. SHEPHERD: Dr. Kaufmann, do you want to comment on that?

DR. KAUFMANN: First, in terms of the long-term average and using as much data as possible, earlier you used the example of the height in Canada, and if you wanted to figure out what the average height of a man in Canada is, you could take a sample and if you expand the sample, you would get a better average. And I would agree with that. That's obviously a cross-sectional analysis.

But if you were to take the average height of a man in

Canada in 2006 and the average height of a man in Canada in 1990, you would get different answers.

And that -- what we are talking about here is not expanding for a cross-section. We are talking about moving this sample backwards in time. And the more you do that, the more you start going back further and further in time, the more there is a likelihood that conditions will be different in the distant past than they are now.

It's true that there has been no evidence presented that the data from 1995 to 1998 are suspect in any way, but there's also been no evidence presented that they're representative of the current trends in any way.

My point is just that we know we want -- we want to see trends that reflect current conditions, including any potential slowdown in TFP that's occurred in recent years. If that's occurred, we want that reflected in the trend. So we want it to reflect current conditions.

So it has to be current. But, at the same time, we don't want it to be distorted by transitory factors. So you have to balance those two.

You're always going to be striking a balance between having a period that is long enough to reflect current conditions, or short enough -- long enough to reflect current conditions, but not so short that it is overwhelmed by transitory factors.

So because of that, it doesn't follow that you always want to extend the sample backwards in time or that more data is better. I don't believe that is the case in a time

series analysis.

My approach is an attempt to balance those two considerations.

DR. YATCHEW: Okay. You raised the example of the average height of a Canadian male in the 1970s and the average height in the 1990s, and people, men and women, trend to grow taller over the centuries. That's exactly the example that doesn't apply here, because that is the case of non-stationary.

DR. KAUFMANN: Understood --

DR. YATCHEW: It's an example of non-stationarity where there is some sort of a trend going on here over time.

MS. FRAYER: A structural change.

DR. KAUFMANN: It doesn't have to be structural.

DR. YATCHEW: There is some sort of a non-stationary -- something is not standing in the same place. The average height of Canadians is not standing in the same place.

Now, my question then is: Statistically, when you look at these data (a) is there any visual evidence of non-stationarity; (b) have you done any statistical tests to convince yourself that there is non-stationarity in these data and that would justify dividing the sample? Even that would be a more defensible approach than just to look at two points of time.

MR. SHEPHERD: I guess what I don't understand, Dr. Yatchew, is, Dr. Kaufmann has chosen a start date for his

time series based on an empirical analysis and some logic.

DR. YATCHEW: And --

MR. SHEPHERD: Some logic, a reason why he chose a particular year.

I don't see that you have chosen a start date that's based on any similar rigorous analysis. You just chose the earliest date you had data for, and that seems a bit random to me and I don't understand why that would be as scientifically rigorous as Dr. Kaufmann's approach.

DR. YATCHEW: You know, there is lots of science conducted to discover phlogiston, P-H-L-O-G-I-S-T-O-N, and other -- and the ether in the universe that would somehow transmit light. There are lots of rigorous experiments sets up that never discovered these things.

So the fact that there is an algorithm in place for executing some computer steps doesn't provide -- doesn't justify it scientifically in any way whatsoever.

I keep going back to the simplest way that I can express this idea. If you really want to predict a block of time based on past experience, you want to take another block of time and hopefully show that it is as representative as possible of the future, not pick two years without any regard for what's really happening in between.

That was the point of this idealized cosine curve that I drew.

If you applied that technique blindly, you would pick two points in time that were identical and I could have

used – I didn’t have to use TFP in those curves, I could have used unemployment rate. If unemployment rate was the criterion, then I could have picked two years when unemployment rates were the same. But whether that would pick up both downturns and upturns in the economy is the question I thought you were getting at earlier. In other words, are you picking up the full cycle if this cycle crosses the sort of midpoint numerous times.

MR. SOMMERVILLE: You get the last word for today, Dr. Yatchew. We will break now. We will resume tomorrow morning at 9:30. Mr. Shepherd will we be resuming with you?

MR. SHEPHERD: No. I am done. Thank you.

MR. SOMMERVILLE: An interesting day. Let me re-emphasize the importance of the dialogue. I think this has been useful, but I would just remind everyone that this is a dialogue-type process. It's very important for us to get to the point, as -- without -- and I say this with respect -- without the arcane -- arcania of your respective disciplines. So if we can remind ourselves tomorrow to focus on the very concrete exercise that the Board has got to discharge, we've got to arrive at a number. And we will arrive at a number.

We need the tools to do that, and so I implore you to assist us in that, as you have done today.

So we will pick this up tomorrow morning, and thanks everyone and see you tomorrow.

--- Whereupon the proceeding adjourned at 4:32 p.m.