

# **Competition and Reliability in North American Electricity Markets Technical Workshop**

*Sponsored by Canada-U.S. Power Outage Task Force*

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This publication is the recorded verbatim transcript and, as such, is taped and transcribed in either of the official languages, depending on the languages spoken by the participant at the public forum.

**Facilitator**

Mr. Bryne Purchase                      Queen's University

**Panelists**

Mr. Tom Wallace	Natural Resources Canada
Mr. David Goulding	Independent Electricity System Operator
Mr. John Hughes	ELCON
Mr. David Nevius	North American Electric Reliability Council
Mr. Scott Thon	AltaLink Management Ltd.
Mr. Tom Welch	PJM Interconnection
Mr. Kellan Fluckiger	Alberta Department of Energy
Mr. Jack Casazza	Power Engineers Supporting Truth
Robert Thomas	Cornell University
Mr. John Wilson	Ontario Electricity Coalition

...UPON COMMENCING public forum on Wednesday, September 28, 2005 at Toronto, Ontario at 8:30 am.

**THE WORKSHOP FACILITATOR (BRYNE PURCHASE):** Gentlemen, if I could have your attention, we're about to begin the Toronto Workshop on Competition and Reliability. My name is Bryne Purchase. I teach energy policy at the School Policy Studies at Queen's University. Prior to that, I was the Deputy Minister of Energy in Ontario when the government undertook the restructure of the electricity sector in Ontario. We took the old vertically integrated monopoly, Ontario Hydro and broke it into five, I always want to say five easy pieces, but it was far from easy as it turns out. Five successor companies, we created a monopoly transmission and distribution company regulated by a much rejuvenated and reconstituted Ontario Energy Board, we created a generation company that was responsible, actually operated under a dictate to divest of assets into operating competitive generation market, we created an independent electricity system operator whose responsibility was to control the grid and was also responsible for dispatch and for the operation of the electricity market, we created an electrical safety authority and then we created a financial corporation whose responsibility was to service and decrease the stranded debt. The market in Ontario opened 1 May 2002. Now I was also the Deputy Minister when a new government came in and added an additional entity, the Ontario Power Authority which has a mandate to do system planning and also to contract for new capacity to meet our reliability standards. In addition, the Government has changed the nature somewhat of the market in Ontario so we now have what is called a hybrid market whereby we have some rate-regulated generation assets and some assets whose prices are determined in the marketplace. Now, needless to say, we in Ontario are not alone in the restructuring initiatives. In fact, many other jurisdictions in North America are similarly restructuring although not by any means exactly the same as in Ontario. Alas, I was also the Deputy Minister of Energy on that ill-fated day in August 14th of 2003 and I'll never forget it and I'm sure that Dave Goulding won't forget it either, they had left 50 million North Americans in Canada and the United States suddenly without electricity. In fact, that's why we're here today to see if there is any relationship at all between those events, that is to say that the restructuring that had taken place in the North American electricity sector, with the blackout of 2003. Now in the aftermath of the blackout the Federal Governments of the United States and Canada established the U.S.-Canada Power System Outage Task Force. Recommendation number twelve in the task force final report, on causes and recommendations, states that, and I quote 'the Department of Energy and Natural Resources Canada should commission an independent study of the relationships among industry restructuring, competition in power markets and grid reliability, and how those relationships should best be managed to serve the public interest.'" Now it seems to me that the recommendation is precisely worded to address the fact that sector governance has undergone significant change and may in its transmission, or transition rather, have created gaps or seams in that governance. But it also facilitates addressing the rate and reliability regulation of transmission assets, the nature of competition and reliability requirements in generation markets and the nature of the relationship between transmission and generation. Note also that the emphasis of the recommendation is on the future and how we can best go forward to manage those relationships in the interest of

everyone. Now the D.O.E. and NRCAN, have, are collaborating to fulfill their respective governance commitment to implement the Task Force recommendations and as part of that initiative they have solicited the independent analysis of ten experts from different constituencies in the electricity sector. I'm sure you've read their papers. They've been available on their website. They're also available on hard copy at the back of the room here and if you've never read them I urge you to read them, they're very good, they're all well done. Today however, you will hear each of our experts address some key questions which pertain to the issue-at-hand. We have three panels and each panel will address two of six predetermined questions all of which they've had an opportunity to consider at length and to prepare their remarks. And these questions are available as you can see on your agenda. Now after each panel has given its own short presentation with respect to the two questions assigned to their panel, I will let them comment on each other's remarks and then I will open it up to the audience for your participation whereby you can make either a short statement, ask a question, or do both if you wish. Now when you're making a statement or asking a question, please come forward to either of the two mics we have here for you and state your name and affiliation. We're making a transcript of the proceedings so this will be very helpful to us. We have, of course, simultaneous translation available, it's a country of two official languages. Those of you who would like to get the translation equipment earphones, they're available just outside the door here and the French is on channel six and English is on channel five. Now I also should mention that this is the second of two workshops, the first was held in Washington on September 15th. Our host at that time was the Department of Energy and I'd like to welcome the officials from the Department of Energy here today. In fact, welcome anyone from the United States here today, you're always good friends and good neighbors and very welcomed here in Canada, Ontario and in Toronto. Now, having said all that, I'd like to introduce our opening speaker. Tom Wallace is the Director General of the Electricity Resources Branch at Natural Resources Canada. His organization is responsible for the development of federal policies and programs dealing with electricity, renewable energy, nuclear energy and uranium and radioactive waste. He has worked for the Government of Canada for thirty years in a number of federal departments. The Electricity Resources branch is the focal point in coordinating the Federal Government's participation in the Canada-U.S. Power System Outage Task Force under the direction of the Canadian colleague Dr. Nawal Kamal. So, I'd like to invite Tom to make a few remarks on the behalf of Natural Resources Canada. Tom. Oh yes, I'm sorry, thank you very much there for reminding me of one very, very important thing. When we're doing simultaneous translation, we'd ask of you, so for the duration of the conference, I'd ask of you if you have a Blackberry to turn it off because it creates a God-awful racket in the earphones of the translators. So thank you, we'd appreciate that very much. Thank you.

**MR. TOM WALLACE:** Thank you Bryne and good morning ladies and gentlemen. I'm very pleased to welcome you to this, our second workshop on Competition and Reliability in North American Markets. I guess I'd like to begin by first of all sincerely thanking each of the ten panelists who are participating today who've given freely of their time to produce some very provocative papers and some ideas that they'll be sharing with us today. Your expertise and your diversity of views, you know, will shed a great deal of illumination on this complex subject. As many of you will know, this is the

second such workshop we've had. The first was held in Washington a couple a weeks ago and I wasn't able to participate but understand it was a lively affair and we're hoping for a repeat performance today. Bryne mentioned that these were, this workshop, really is a response to one of the forty-six recommendations in the Canada-U.S. Power System Outage Task Force. A great deal has been done since the lights went off over two years ago in working to improve reliability and I think, and as probably everyone in this room knows, one of the most significant events was the passing into law of U.S. legislation a few weeks ago setting the stage for mandatory reliability standards in the United States. Last week, the council of energy ministers met in St-Andrew, New Brunswick, and we were pleased to see that they reiterated their commitment to insure that means are in place to enforce mandatory standards in all jurisdictions in Canada. Over the past few months we've been working closely with our U.S. colleagues, and David Myer particularly - who is in this room - and through his work quite closely with David Burpee of Natural Resources Canada to insure that we have an intergovernmental arrangement that will insure that the ERO is able to work effectively as an organization in both the U.S. and Canada. And clearly this kind of coordination that we've had in the last few months, I think we'll all agree, will need to continue. A lot of the Task Force's recommendations have been fully implemented, some as one-time-only actions or others as policies or activities to be implemented on an ongoing basis, perhaps for many years. I think the complexity of this problem is such that one doesn't, it's not something you just wrap-up in six months. A lot does remains to be done. We're committed to working with our partners on both sides of the border, in provincial state capitals and with industry to insure that we continue to move forward. I just want to say, in closing, I'd like to express particular appreciation to two people who really took a lead in organizing this conference: Liz Herbert who was on our staff at National Resources Canada and is now with the National Energy Board or will start next week, I guess, Liz. And Joe Eto from the Lawrence Berkley National Laboratory. Quite a bit of work as you can appreciate goes into organizing such events so I'd really like to thank Joe and Liz for all your efforts in organizing the two workshops. So, just with that, look forward to a lively and interesting debate and I'll turn it back over to Bryne.

**FACILITATOR (BRYNE PURCHASE):** Thank you very much Tom, well, I'd ask the panelists on the first panel to come forward please and take your positions here on the podium. Good, I'd like to introduce our first panel then I won't have long extensive introductions, I'll just give you their names and affiliations. First, I'll introduce them all at once as well, the first up to speak will be David Nevius, Senior Vice-President, North American Electric Reliability Council. Next will be David Goulding, President and CEO, Independent Electricity System Operator in Ontario, of course. And last but not least, John Hughes who is the Vice-President of Technical Affairs of the Electricity Consumers Resource Council. Again, each of these speakers is going to be addressing the two questions that you see in front of you. That is to say, they have been asked to, in terms of the identified causes of many major past blackouts which also contributed to the August 14th 2003 blackout, and how does restructuring affect those causal factors. And then secondly, will the U.S. energy legislation that was signed into law, specifically the call for mandatory reliability standards, prevent future blackouts? And with that I will ask David Nevius to come forward. David.

**DAVID NEVIUS:** Good morning all. Thank you very much. Let me start with addressing the first question and move along so that we can ask each other on the panel some questions and give you all the opportunity to ask us some questions. Let me say at the outset that restructuring and reliability can co-exist. And while restructuring has, or may have changed some of the organizational structures and relationships in our industry, it does not follow that reliability needs to be automatically degraded. Let's look at the eight factors, the eight causal factors, cited in the U.S.-Canada Task Force report that were common to many past blackouts: tree contacts, insufficient reactive reserves, lack of wide-area visualization by system operators, operating the system beyond its physical limits, lack of coordination of system protection relaying, lack of communications, lack of safety nets including under-voltage load shedding and finally lack of operator training. In 1965, the failure of system protection engineers and system operators to communicate about relay settings led to a major system cascading event, an event in fact that led to the creation of NERC. So that my old friend Jack Casazza doesn't need to mention it, there was also a blackout in 1967 in PJM which resulted in part because of incorrectly set relays. You'll hear me say relays several times, keep that in mind. In 1973, Eastern PJM experienced some severely depressed voltage on its 500 and 230 KV systems when unanticipated and unstudied heavy imports into New York City created extremely high reactive power losses on the system and dangerously low voltages. Operators were basically unprepared to deal with these unusual system conditions due to the failure of advanced studies to predict them and because some of the flawed study assumptions. In 1977, lightning caused two 345 KV circuits on the same tower line to trip causing overloads on other circuits feeding into New York City. The utility system operator failed to act appropriately to manually shed load as he was directed by the State Wide Power Pool and the system in NYC collapsed. In December 1994, a 345 KV line in Idaho tripped due to a single phase-to-ground fault. A few cycles later, a 3 phase line tripped due to relaying misoperation. Nine seconds later, a 138 KV line tripped and another tripped about 30 seconds later due to overload and finally the remaining east to west connection tripped due to a distance relay reacting to low voltage and high current conditions. If it sounds vaguely familiar to what happened in August 2003, it's because it's the same situation. In the end the western interconnection broke into four islands and over five thousands megawatts of firm customer load and another two thousand megawatts of interruptible load was shed due to under frequency load shedding relays. To blame these and other blackouts on industry restructuring, many of which occurred long before restructuring took place, is unfair. To say that industry restructuring has not added to the challenge of maintaining reliable bulk electric system is naïve. Kellan Fluckiger, who is another panelist, I don't know if Kellan will be here today, but he said at the Washington workshop that there were natural bridges of communication and coordination that existed within the utility industry and that those natural bridges have in a way been pulled apart or broken due to restructuring. A sound set of reliability standards and a mechanism to monitor and enforce their compliance can improve reliability, can protect reliability and competition, and reliability can peacefully and successfully co-exist. Those standards will need to address some of those natural bridges that were broken and include the communication and coordination that needs to take place between various entities. NERC has taken steps to develop these standards and is monitoring compliance with

them. Once NERC is certified as the electric reliability organization that's provided for under the Energy Policy Act of 2005 and compliance with its standards become mandatory and enforceable, reliability assurance will be improved. In the meantime, we're conducting reliability readiness audits of transmission operators throughout North America to insure their capabilities and readiness to operate their portions of the system reliably, especially under emergency conditions. These audit reports, which are posted on NERC's website, identify specific recommendations that those transmission operators need to take as well as examples of excellence for others to learn from. These audits are patterned after the audits conducted of nuclear plant operations by the Institute for Nuclear Power Operations. Let me turn quickly to the second question. Will the energy legislation, specifically mandatory reliability standards, prevent future blackouts? The enactment of legislation and the establishment of the Electrical Reliability Organization will not, in and of itself, guarantee that blackouts will never happen. Having mandatory and enforceable standards is only one step towards insuring reliability. In addition to monitoring and strictly enforcing its standards the Electric Reliability Organization will work to promote a culture of reliability throughout the industry. Maybe it's to re-establish that culture of reliability that did exist many years ago. We're going to do this through our readiness audits, examples of excellence, sharing the best practices and other efforts. Every time a blackout or other system disturbance occurs there are a lot of lessons that we can learn. Sometimes the event is a result of someone violating a standard, and in other cases it could simply be the result of equipment failure or natural causes. Regardless of the cause however, we can and we must learn as much as we can from each and every event. And more importantly, we must do something with what we learn. That could be in the form of improved training, improved tools or more or different standards. For example, in 1965 we learned and again in August 2003, that using simple distance relays to guard against remote breaker failure can allow high power flows and low voltages to be seen as electrical system faults and lines being taken out of service unnecessarily which worsens the situation. This was learned in 1965; it was well documented and even written about in text books, by Carson Taylor of Bonneville Power Administration. Yet, we still have system protection engineers following the same or similar system protection philosophies. NERC has developed some very specific recommendations for standards in this area that hopefully will address this situation more fully and once and for all. We hope to see these standards approved in the near future along with other standards dealing with voltage and reactive issues, vegetation management issues, operator training issues and much more. I call that a significant strengthening of our reliability standards effort and one that's long, long overdue. Our standards are far from perfect but they're getting better. Our open standards' process which is accredited by the American National Standards Institute allows for open participation in the development and voting on standards. And I would encourage all of you to participate fully and to put your engineering talents to work in making these standards better and better. It's only through the efforts of people, not organizations, but individuals like yourselves and others in the industry, that we'll keep our system operating reliably. Thank you very much.

**FACILITATOR (BRYNE PURCHASE):** Thank you David. Now I'll call on David Goulding to make his remarks.

**DAVID GOULDING:** Thank you Bryne. Good morning ladies and gentlemen. First of all, I'd like to thank Dave Nevius for giving my presentation and not to worry there's always Plan B. In my paper and also in my appearance in one of the sister panels, I guess, in Washington, I noted two circumstances that I think are worth repeating in the context of this panel and I'll start up with that. One is that restructuring of the industry is not taking place against a backdrop that was otherwise stationary. Changes in the infrastructure and hence the characteristics of the system in recent years have been driven by a number of pressures including environmental, political and various ones that could be mentioned. And in many cases these have resulted in generation and demand-side initiatives which don't have the same sort of characteristics and in many cases don't have the same flexibility of some of the resources that have been replaced. One example is coal-fired resources which are generally, in most areas, being taken out of service or have been replaced at this point in time. They have dynamic voltage support capability, automatic generation control facility capabilities, load following capabilities, deep on-line maneuvering capabilities and various other characteristics that quite frankly some of the new generation and some of the new facilities, gas-fired generators, wind, even distributed generation, don't have. That's not due to restructuring, that's due to a lot of other pressures, environmental and other pressures. So I guess, what we've got to do is recognize that these changes themselves have tended to make operations and maintaining reliability somewhat more challenging than they were in the past, even without the restructuring effort. Second point I want to make is that both in terms of the restructuring and the changes that I just mentioned, we are in transition and the transition stage is always a challenging environment. So we should be careful that we don't start making assertions about restructuring on the basis that where we are today is in a stable, restructured state - we're on a journey at this point and time. So against this background, let me try to put some context onto some of the causal factors that David mentioned and that were common in the August 14th blackout. Start off with inadequate vegetation management; I have some difficulty in giving this any attribution to the restructuring since I know that in general vegetation management is carried out by businesses who seek approval of their revenues and expenditures in a regulatory regime as opposed to market forces. And this process has always been in place and through this process entities have chosen to go ahead and verify their need for revenues, verify their need for a tariff for many, many years. And in fact what you might almost say is that the regulatory regime itself was intended to be almost a surrogate for a competitive environment in so far as challenging what the costs should be in carrying out vegetation management. So I think that is one issue. Turning now to operation within secure limits, first of all, I would like to say that operations has become more complex, and I have suggested that's not just because of restructuring although restructuring certainly has added complexities. However, a key factor here is that in order to operate within secure limits, the operator has to know when the limits are not secure. I think that that is an axiom. An examination of the blackout has revealed that it is often been the case that the operator was not fully cognizant of the state he was in. Now I think that this can be attributed more to poor advance preparation, lack of adequate tools and a less-than-necessary level of training rather to any other cause. Regarding failures to identify emergency conditions and communicate these to neighbouring systems: these are in the main people failings not

failings of restructuring. This is an area where it is essential to strike the right sort of balance between the human awareness and the automated tools that are available and are becoming more available. And I suspect that this is also a transitional issue, but it is a transitional issue where we need to be sure that we get more experience and more competence in the ever-advancing automatic and high-speed devices before we can take the human element further out of this equation. Turning now to inadequate operator training; inadequate operator training is just that, inadequate operator training. Now, training programs in the culture of ongoing training have always been a requirement in this industry and revising training to accommodate changes in system configurations and modes of operation have always been needed, and I suggest in some instances have often in the past as well as more recently been somewhat neglected. It is not clear to me that all training programs have been designed or re-designed to fit the changes in operations of the system or the configuration of the system or, in fact, in many instances that the required competencies of operators have been re-accessed in terms of the changing context of today's system. Now, when it comes to inadequate regional visibility, this is an interesting one. This should be one area where the introduction of reliability coordinators with wide-area monitoring capabilities should generally provide a second set of eyes and should actually clearly increase the regional visibility. And, I think that in fact the steps that have been taken in many areas following the blackout have done much to improve that and that the second set of eyes is there now to the extent that we have greater visibility over this network than we have ever had in the history of this industry. Now, inadequate coordination of relays for the protective devices assistance; coordination has always been a requirement across companies, a requirement across control areas and a requirement across regions. Failure in this domain should not be attributed to restructuring but maybe deficiencies in the overall extent to which broader regional planning has taken place. Indeed, I suggest that the work on definitions of functional authorities and more clarity that is being provided in the standards will give it an opportunity for a level of coordination beyond that which we have had available in the past. The bottom line here is that restructuring is often a convenient excuse and whipping boy for poor planning and poor operations. There is no need to take one's eye off the ball when running a competitive market. And, since we happen to be here in Ontario, let me give an indication of our own market, that reliability always takes precedence over the market. And if we go back to February 2003, we had an adverse weather event. We experienced multitude contingencies. As this event started to evolve, the system control centre identified this event and the possible ramifications if actions were not taken immediately. They immediately ordered a nuclear generation station to reduce its output by 1,800 MW despite the fact that they were operating in the marketplace and earning revenue; they complied immediately. Subsequently, we had a number of other events which took out circuits, and studies that we carried out after the event showed that if we hadn't taken the actions and if the market participants hadn't operated immediately in the way they did, that we would have had a serious significant cascading event. Reliability always trumps markets. Turning to mandatory standards now for a while; having had the opportunity within this particular jurisdiction to exercise mandatory compliance and enforce sanctions since opening our wholesale market in May 2002, I can assert with confidence that this is indeed a necessary tool. In fact, the very act of having this stick available can cause positive behaviour. It is also worth noting that our compliance efforts

span not only reliability but are applicable across the whole breadth of market rules which include business practices and market operations as well as direct reliability-related operations, and, by the way, the two are so often intertwined that I think it is essential that we do that. So, we can go anywhere to attack a problem with a meter, as an example. Just to give you an example in terms of numbers, in 2004 we carried out 191 investigations, we assessed that there were breaches in 65 cases and we applied financial penalties in 64 occasions. Now, none of these were breaches that could have resulted in a major system collapse but the point is having the authority to investigate, having the competencies and the resources available, getting all the information is key and correction of any non-compliance events, however minor, will drag participants to policy behaviours. And by the way, any participant can allege a breach. In fact, I have had breaches alleged against me on a total of 6 occasions so far. I have been assessed as being in breach. They have been minor items but never the less very important to get down into the details. So, I won't be much longer Bryan here. Having said that mandatory standards are necessary, I have to say that they are necessary but not sufficient. Individual corporate culture, commitment to reliability is still going to be needed. Let me mention a few points. We need clearly defined roles, responsibilities and authorities. We need refined operator certification, training and testing. We need refined audit processes. We need comprehensive compliance monitoring and rigid enforcement. We need timely standard development. We need integrated system plans that meet future needs in terms of supply mix, diversity, capability to deliver, and operability. We need coordinated actions to prevent or to address issues that often arise between jurisdictions. We need better, ever better, real time tools for operators and for reliability coordinators. We need ever-improved quality-of-system modeling data and data exchange. And in fact even with this, mandatory standards will never eliminate blackouts just as mandatory standards in other industries such as aviation can't eliminate risk. So, overall, I think that restructuring is one of the factors that has introduced changes making the business of maintaining reliability more complex, driven the need for more precision, more enforceable standards, clearer definition of functions, authorities and obligations. This is a good outcome of restructuring by the way and if it is done well, and it needs to be done well, should actually strengthen reliable performance. But we are still in a period of transition and so we do need commitment. We all have to commit to carry this thing forward; we all have to commit to reliability. And just as a closing word, I have to say that the delay in the passage of the U.S. reliability legislation is not a model for such commitment. Thank you.

**FACILITATOR (BRYNE PURCHASE):** Thank you David. Now may I ask John to make his presentation?

**JOHN HUGHES:** Thank you. I want to spend a brief moment explaining who ELCON is. We are a trade group based in Washington, DC. Our members are large multinational corporations and they are headquartered all over the world, many of them have their home headquarters in London, Madrid and Rome as well as places like Chicago, Detroit or Houston. Our member companies have major manufacturing facilities in every ISO, RTO, the IMO in North America as well as outside the footprints of those organized markets as well as every other continent. Reliability of the electricity supply is an

absolute essential for their ability to conduct their business and to fulfill their obligations to the public and to their shareholders. Our members were severely impacted by the August blackout of several years ago on both sides of the border and so we applaud the efforts of the bilateral investigation of that blackout and we especially appreciate the fact that the U.S. Congress has finally stepped up and enacted legislation to establish an ERO and mandatory reliability standards. I share with David Nevius's comments that it is not fair to blame competition for that blackout, but perhaps for a different reason. We don't believe that competition has ever happened yet and competition to us is defined as the interaction of supply and demand in setting prices, and that this has certainly not happened anywhere. The demand-side of the equation remains a vertical price inelastic construct that basically removes all the opportunity of the demand-side of the market to basically help the grid-operators maintain reliability. I can appreciate the fact that a lot of operational catch-up is necessary in the transition to competition during this hybrid stage or whatever you want to call it, but the focus of my remarks this morning in addressing these two questions, and was also the focus of my paper, is the fact that during this long, very protracted transition from the old industry to hopefully the new industry, there has been a rearrangement or realignment of economic relationships and that has in part created some perverse incentives to take risks that jeopardize the reliability of the grid. And so I want to explain what a few of them are. First, there is what I would call strategic maneuvers of incumbent utilities to do a variety of things. They are in the situation where, in the old regime, they had 100% market share and so, by definition, in a new regime, they are supposed to lose some of that, and they oppose that, so they have taken a variety of measures in the transition to try to avoid that and this includes taking advantage of their continued ownership of transmission or generation to discriminate against potential competitors and also, at least on our side of the border, efforts to take advantage of indecisive federal policies. An example of that that's very glaring is the bizarre footprint of the two biggest RTOs in the United States, PJM and the Midwest ISO. If you look at a map of their respective footprints it makes no sense whatsoever from either a market or from an operational perspective. Clearly, as an example that was in paper, we have an instance where this footprint, sometimes called a Swiss cheese pattern, has created some unfortunate loop-flow situations that have triggered some severe TLRs. A second issue is the unintended consequences of state restructuring policies. In the United States, the States take the lead on the restructuring at the retail level in terms of what end-use customers can do or cannot do in terms of accessing the market. Part of the problem with that, and to some extent it is the fault of State legislatures who were lobbied to impose rate freezes and other preconditions to retail competition, led to a situation where many utilities were basically allowed to keep the money of any cost-cutting efforts while a rate-freeze is, in effect. This is a very powerful economic incentive and there are many examples of some problems that resulted from that. One that is mentioned in my paper is the huge utility based in Chicago, Commonwealth Edison, which had a series of blackouts in downtown Chicago that was a major embarrassment to that city and its business community and, after several investigations it was found that the company deliberately cut investments in transmission maintenance and new equipment, basically allowing the equipment to fail before it took any efforts to shore it up. There are other examples of that on our side of the border, I will not try to pretend that any such thing has happened north of the border, and I hope

that it hasn't. Third, and this has been the unenforceability of the NERC standards, hopefully, that problem has been solved. As previous speakers have mentioned, the previous blackouts were caused by the failure to comply with NERC operating policies, but then again they were only voluntary. But even now, all three interconnections have experienced frequency excursions of unknown origin. NERC testified in 2001 before the U.S. Congress about this problem. The NERC Operating Committee just a couple of weeks ago kept talking about the problem. Nothing so far seems to be done to identify the problem, or even worse, to identify potential solutions. Fourth, there is a lot of gaming of flawed market designs going on in the United States and inadequate market power mitigation by federal and state regulators. The well-known California debacle is probably the classic example and that will stay in everybody's mind for a long time to come. But, we believe that the market designs of the ISOs and RTOs in the United States create very powerful incentives to not invest in new transmission. This of course will jeopardize reliability in the face of continuing growth in demand for electricity. Many utilities can make money by maintaining congestion on the system. And this can only be changed by economic policy decisions which go to the way that the markets are designed. Finally, fifth, we are observing some potential risks to reliability because of the financial distress of merchant generators. The causes of this problem are complex and beyond the task here this morning but some distressed generators have threatened to shut-down their units knowing that they serve important reliability requirements. And this again is a transitional issue, is an ongoing issue that hasn't been solved either by creative regulation or by appropriate market-designs. So, how should we deal with these problems? Fortunately, we do see the emergence of mandatory reliability standards in the future with penalties for non-compliance. And hopefully, this, if nothing else, will change the mind-set of the market participants that are currently engaging in sort-of opportunistic behaviour that is putting the grid at-risk. But there are other important steps I think that can be made. As I have mentioned, we need to re-think the market designs to remove the incentives for risky behaviour; this includes structural fixes. We need more separation, or unbundling, of the large utilities in the United States. Second, we need to remove the economic incentive not to invest in infrastructure necessary for reliability purposes. Three, the States need to look at the disincentives and its policies to discourage reliability-related investments. Fourth, NERC needs to strengthen its policies, excuse me, FERC, federal regulator, needs to strengthen its policies for market power mitigation including being more reluctant to authorize sales of power at market-based rates. Finally, what needs to be done to ensure that the risk of blackouts is reduced to an absolute minimum? I think that it is essential that the fragmented lines-of-authority that currently exist between NERC, the regional councils, the ISOs and RTOs and transmission owners is not preserved as we create the new electrical reliability organization. The new ERO must have plenary authority for the development and enforcement of mandatory reliability standards subject to the oversight of FERC and its Canadian counterparts. We want that ERO to be a world-class organization. The 21st Century deserves nothing less. Thank you.

**FACILITATOR (BRYNE PURCHASE):** Thank you John. Now, I'm going to ask each of the panelists if they want to, this is where it gets really interesting, if they would like to rip-apart any of the other panelist's remarks. David, would you like to go first?

**DAVID NEVIUS:** Let me ask my friend Dave Goulding a question. Given that you were involved Dave in establishing part of our new standards-development process, I would be interested in your thoughts on how you see it working. There are some that say because of the open, consensus-based nature of the process that, what will result will be least-common-denominator standards. Do you see that as what is happening? If so, what should we do about it? If you don't see that happening, what can you say about the positive aspects of that process?

**DAVID GOULDING:** First of all, I do not see us going to a lowest-common-denominator, quite frankly. In fact, I think that there is still an appetite out there amongst those who actually get involved in developing those standards; that those are the very people who have a keen interest in making sure that we have a reliable power system going forward. So, the ones who are developing the standards are not the ones who are adding-up the dollars at the bottom of the account to say we have made a profit or a loss or what do we need to do from a business perspective in order to survive. You got the guys in the standards development who are there because they have an interest in a reliable power system, so quite frankly, no I think that the standards are being tightened-up and I think that is quite an appropriate thing to do. Where I have a little bit of a difficulty is having, as I say, had some experience here in terms of actually applying compliance and making assessments, is the depth to which one is able to go. And also, what I still firmly believe are the very strong interrelationships between some of the business practices and the reliability standards. And so going forward, I think that there are two things here. First of all, I think that it is going to be more necessary to recognize some of those interrelationships which, by the way, we do within our market rules in so-far-as our market rules apply not only to all of the standards that NERC puts forward into the regional policies, but also to the way in which we use the market to operate and schedule the power system. So, I think as you get deeper-in that the high-level standards need reinforcing. That may or may not need to be done at an ERO level depending on what they are, they may be delegated further down. The other thing is standards are great, they're needed, but quite often you have to get down below the waterline to see just what it is that is ultimately going to cause a standard to be broken, not in compliance. It may not be apparent from a high-level, in fact even those who are operating may believe that they, and sincerely believe, and make every attempt to be operating in compliance, but there may be something else that is actually not compliant way-down, then I think that is something that needs to be recognized. And it is by driving the participants, you know, to look way-down inside their business, looking down at the facilities that are way-down below the waterline, that you really get the full, what I call foundation, for a reliable power system. A long answer to a short question.

**DAVID NEVIUS:** Just another thing for John, John Hughes, and it is more of a clarification John. You mentioned the frequency excursions that have occurred on the systems of all three interconnections for a number of years and you are correct that the NERC Operating Committee has discussed them ad nauseum. They did recently agree to something that will be done and that is a single-entity in the eastern interconnection will be designated as the frequency monitor. So that when there are excursions that go outside

of 60.05 or 59.95 Hertz that a hotline call of all the reliability coordinators will be initiated to address the excursion and to launch an investigation as to why it incurred. There are a number of possible causes for these excursions in some cases when the 16-hour schedules come to an end, they abruptly stop rather than being ramped-down. This causes the balancing authority a bit of consternation in trying to get under that abrupt schedule cessation and keep the system in balance. The other possibility is that, on occasion, we have seen schedules entered backwards. So, there have been so many of these that we feel that we need to take some more proactive action on it. So, there is something happening but it is just recently that it has gone to this level.

**JOHN HUGHES:** I can appreciate that. My only concern is that it really took a long time to do that and having sat through many NERC meetings where this issue was debated. The concern that I have that I would like both Daves to address is ELCON has been very active at NERC and in the early years of our activity, and also I should add that we are active through our member of NAESB, the North America Energy Standards Board, that deals with business practices. Our big issue is the preservation of inclusiveness in the process by which both business practices and reliability standards are developed and we've observed lately that now with the prospect of having a mandatory standard with, you know penalties, there seems to be an effort by system operators and owners, especially owners, to try to limit this inclusiveness and to, you know, kind of you know, if they're now going to be subject to mandatory standards, they want to make sure that those standards are comfortable and fit with their lifestyle.

**DAVID GOULDING:** I don't know what to reply to that but quite frankly you tend to sound too much like your boss who I've had the pleasure of chairing many of my working groups from time to time where I got a degree in herding cats. Now, I guess I can speak from the ISO's perspective to say that quite frankly one of the things we're trying to do is become even more inclusive. We're forever looking out to make sure that what we've got recognizes all sides of the business from the commercial practices to reliability rules. I should also confess here, that I'm the guy who when Cherry Bond's group went back to the NERC Board of Trustees said I think you should make a pitch for both the business practices and the reliability rules under the one organization. I guess they were much wiser than me and decided not to but I haven't changed my opinion one jot since that particular day. But note John I don't think that we're looking for something we're comfortable with, in fact I think in our particular context we're forever looking to tighten things up to be all inclusive and what we're trying to do is balance things such that we have an extremely reliable power system which also forms an effective basis for trade and for commercial businesses.

**DAVID NEVIUS:** If I could add to that response, John, I've known you long enough; I'll be candid with you. As far as I know, we haven't changed our process for approving standards or commenting on standards. The concept of a weighted segment voting model, where large customers collectively have one ninth of the vote, small customers one ninth, transmission operators one ninth and so on. However, there's a real shortage of participation by the small and large customer members in those voting segments, so the opportunity is there, I think your members need to step-up to the plate and avail yourself

to that opportunity to be inclusive. I mean we can have an inclusive process but if nobody comes to the party, you can sit on the outside and say it's not inclusive. I think there is an opportunity you should take advantage of it.

**DAVID GOULDING:** I have a question. I think that both David and John might want to respond to this. It is for me a very significant issue in terms of coordination and visibility and reliability and that is we have a very large number of very small control areas across the interconnections at this point and time. And I'm even hearing rumblings that there are those who might be looking to form even smaller reliability coordinators than today because they think that they can get by with lower cost in order to do that. This is a big concern for me, but my question is in two parts. First of all, do you agree that this is a concern and secondly what can the industry particularly and specifically what can NERC do in order to encourage people to move in a different direction?

**DAVID NEVIUS:** Let me take a stab at it first and then let John give his thoughts on it. NERC, a number of years ago, developed something called a functional model. And a functional model is to provide a guide for the functions that need to be performed in preserving or maintaining a reliable bulk electric system. It did not say what size or type of organization would be allowed to perform a particular function but it did provide a fairly rigorous set of task and responsibilities for each of these functions. For example, reliability coordinators, supposed to have a wide area of view of a major, a large portion of the grid, to have certain capabilities to see what's going on in that grid and the authority to take actions. Not all reliability coordinators today measure up to all of the responsibilities and tasks that are in that functional model. However, our standards do not require them to as they are written today. I think you'll see further strengthening of those standards as time goes on and as a result some of the smaller entities will either get bigger and stronger to fulfill all of the responsibilities and accomplish all those tasks or they'll go away. So I think in further enhancing the standards, further defining what the obligations of reliability coordinators and balancing authorities and transmission operators are, you'll see a natural evolution towards larger more highly coordinated entities overseeing the reliability of the system.

**DAVID GOULDING:** But I hope you're right David, because I remember when I was on the NERC Board of Trustees sitting closer than you are to me to some guy called Schilling, and him giving a strong case for a control area that they set up which actually had no load whatsoever and was nothing more than a parking spot for a generator and that was a wake up call for me.

**JOHN HUGHES:** I think I share some of Dave Goulding's concerns but there's also big economic problems here. Benefits of increased competition at the wholesale level, to the extent there is, have been somewhat elusive. And efforts in at least on the U.S. side of the border to consolidate control areas has been extremely expensive and I would argue have failed the benefit-cost test. There is an experiment going on called the Midwest ISO by which a single entity is effectively you know dealing with multiple control areas under the umbrella of the RTO, and that seems to be working. I'll let the operators within that organization defend how well it's working for themselves. But, I'll just end by saying I'll

never forget a meeting I had with one of the commissioners of the FERC, the Federal Energy Regulatory Commission, who said that he felt that we should try to create a single control area in the Eastern interconnection. And I wanted to call him a fool. I didn't. Next time I see him, he's no longer a commissioner, I will call him a fool. But I think you have to seriously think about what it is that really trying to achieve? And who's going to pay for that?

**FACILITATOR (BRYNE PURCHASE):** OK, if anyone wants to, on the panel, any more specific questions you'd like to ask each other or comments you want to make before we open it up to the floor? If not, then, I have first question from the floor. John.

**JOHN WILSON (ONTARIO ELECTRICITY COALITIONS):** I've got a comment and a question. So I noted that Dave Goulding talked about the deregulation which I call it, as a journey, or state that we are in transition, and that John Hughes says or hopes, I didn't get this right John, nailed down, someday competition will come. My personal opinion, it sounds like a kind of cult that if we built something in a certain way, something's going to happen. But that's the comment and it provides context for the question. I'm not a believer that the likelihood is great that we'll get the competition. I definitely see where we have the pursuit of unlimited profit, maybe we should talk about the deregulation of that opposed to the competition, but, in the interim, as we struggle to get there, as we hope that one day during the transition period, until then, should governments or other entities under the government, be reaching into the pockets of electricity consumers, their tax pocket, or electricity pocket, and subsidizing industries which are now experiencing pain because of high, uncompetitive electricity prices? And my example would be the forestry industry in Ontario with its 85-90,000 direct workers who are looking at walking away from the province. So I'd just like to know as we struggle to bring competition about, should we be subsidizing and I'd like to hear Dave Goulding maybe from the side ...

**DAVID GOULDING:** Sorry John, subsidizing who?

**JOHN WILSON (ONTARIO ELECTRICITY COALITIONS):** Subsidizing industry that is in pain because of high prices because of a lack of competition as John has pointed out or as you pointed out too and the transition to, or working deregulated system. So, I'd like to hear John Hughes and Dave Goulding and if Dave maybe wants to jump him, let him.

**DAVID GOULDING:** Sure, fine. First of all, you know, what you're touching on is much broader public policy than the electricity segment, John. There are many, many areas in which subsidies do or don't get applied to industries in various segment. So, I don't think it's fair to say 'Can I look at this strictly into terms of electricity?' However, having said that, I guess there is some implied assertions in what you say. And one implied assertion is that costs are far higher than they would have been if we didn't have the infrastructure and the competition that we've got today and I don't agree with that. I would only agree with it, if, in the context within Ontario that we went for ten years with frozen rates and we built up a debt with an excess of 30 billion dollars and the tax payers

were subsidizing that debt. So, let's be a little careful in trying to put the argument only on one side of the equation here. The extent to which industry should or should not be subsidized, I think there are regional policies as well as broad ones here that have to be looked at and I don't think it's just a matter of electricity. I think there are all kinds of costs involved. So if one were to say look at Northern Ontario which is where a lot of these issues happen to be right now, there are a lot of questions to be answered and some of which I can answer. First of all, should that industry be existing anyway? Is it a competitive industry? To what extent is the price of electricity one of the key drivers as opposed to maybe the exchange rate from time to time? What are the competitors doing? So, it's not a simple black and white, should they be subsidized quite frankly, I think you have to look at a whole broad range of public policy issues.

**JOHN HUGHES:** I think its well know that ELCON has been disappointed with the results of the restructuring efforts to date, in part because we think that the market design that was chosen first is clearly not working to balance the interest of the customers and the producers and I think that's probably the heart of your angst. But I will say that I flew here from Texas last night, and I was at a fascinating conference on the fact that ERCOT, the ERCOT market, in Texas is seriously considering departing from that market design that is used in the PJM and New York and New England and is going to, you know, perhaps going in a different direction, a direction that I am quite hopeful that, if they achieve and implement that market design, will produce a more balanced allocation of benefits of competition among all the stakeholders and so I think, I would also add that the Midwest ISO, is, at least the Midwest ISO staff, is attempting to adopt the same type of market framework. The codeword is an energy-only market and so I think what you might want to do is follow closely the development of those two efforts.

**FACILITATOR (BRYNE PURCHASE):** The gentleman at microphone number one.

**ROBERT BLOHM:** Yes, thank you. I'm Robert Blohm. I am a consultant. I'm a dual U.S.- Canadian citizen and I decided to participate in the Canadian conference. Je suis Robert Blohm, j'ai la double citoyenneté Américaine-Canadienne et j'ai décidé de participer à cette conférence pas celle de Washington. Just to give a tribute to French. Anyway, I guess that's all I'll say in French right now. I'd like to address the first point of panel one. That makes sense, that's the first key point. At the risk of repeating myself, I'll bring something up I brought up at the blackout conference that was held here in Toronto and transcribed. It says "identified causes of many major past blackouts also contributed to the August blackout". That's true but that statement allows for unique causes. In fact, there was a very unique cause that made this blackout qualitatively different than previous blackouts, and also implicated the market. And that fact was this was an over-frequency event; alright, two hundred, two hundred fifty mHz depending on the sample, the sample rate, the scan rate. That's equivalent to a power surge of about seven thousand MW. Actually, that was miscalculated in the blackout report as three thousand four hundred MW but the New York Times actually corrected it accordingly, investigated that a little bit, but it was a simple calculation mistake from frequency bias. The point is power surge was, everything about this blackout was about power surge. And power surge is a new phenomenon I'd like to offer and I just want to say this for

comment. I think this is the most important thing and NERC, as I said at the conference, NERC developed the likely solution for this long ago and it's probably the single greatest contribution to the electricity industry, a thing called the Interchange Distribution Calculator. But let me explain. In previous blackouts, the interties were not widely used for scheduled transactions. Deregulation meant we're going to take advantage of them; you know, why leave them unused, what's the most we can schedule transactions over these interties? In other words, we'll open the market for trade; each control area will no longer be self-sufficient. In the old system, in these previous events, basically control areas were largely, at least in 1965 and 1977, were autonomous. So, when you had a blackout event, what happened? They were under-frequency events because if one of the control areas loses generation, it's suddenly pulling unscheduled power over the intertie from its neighbors. So there is a really simple solution: you use impedance relays or transmission relays and you cut the guy off. It was sufficient in those days just to cut load, you never had to worry about generation because it was unscheduled generation and you just cut that load, the frequency would come back to normal, the system's in balance. What I'm suggesting is that we deregulated before we realized that we're going to need something more sophisticated than cutting transmission lines and imagining that future blackouts are going to be under-frequency events. In fact, because of the market, because we have scheduled transactions on those lines, future blackouts, that one and future ones, will be over-frequency events and that over-frequency characteristic, that power surge, is what causes the wide-area effect. Here is what happens. When most of the line is being used for scheduled flow, and you use the old technology of cutting the transmission line, guess what you've done? Sure, you've cut the load, but now you've got scheduled generation that's still running on the interconnection and you've got over-frequency and that generation doesn't know where to go, the power goes on to overload other lines and, so, the problem actually starts getting worse before it gets better. There is a solution to this. And what this means is that you can no longer just use impedance relays to cut transmission lines: you have to do what's called a TLR [transmission loading relief]. A TLR involves two actions: you cut load and you cut generation; you have to cut both sides of the transaction. What we need is something much closer to a real-time TLR that can be done potentially by the minute because we have, we have frequency data already available, NERC data, one minute data that can be fed into a program called the SDX which I believe today is only updated every day but that could be updated by the minute. In fact, the NERC Interchange Distribution Calculator is the closest thing we have today to an interconnection-wide power flow, and it's to NERC's great credit. However, it doesn't square with Standard, you know, the concept of Standard Market Design and economic dispatch. The reason maybe it doesn't really have to is because economic dispatch, all economic decisions, take time. When you're dealing with TLRs and situations, you don't have time to optimize economically; you've just got to go find the quickest action you can take that is as equitable as possible to solve the problem for the interconnection. The problem is that, when that line is overloaded, not only does the line get cut, you've got to find appropriate generation to back down. In other words, we have now that we're embarking on a symmetric industry; it's no longer load shedding; we've got to think in terms of generation shedding, finding the generation, finding the appropriate generation to curtail in order to reduce the power surge. So, I guess my main point is this should have been all thought out well before; it could have been all thought

out well before deregulation. And what I mean by deregulation was opening the transmission lines to wholesale scheduled transactions. And I think it would be very appropriate to explore that. I think, you know, despite the debates about IDC and the proponents of Standard Market Design, I think, you know, IDC's days will come back again and I think that's a very important tool to update, to use, in order to mitigate this very unique characteristic problem of the market with this over-frequency and power surge.

**DAVID GOULDING:** I don't have the time to go through all of the points there, most of which I would rebut if I did, quite frankly. I first heard of these wonderful power surges at the first session I went to south of the border when the guy from First Energy pointed out 6,000 MW surged through Ontario 4 hours before the blackout. It wouldn't have been 4 hours before the blackout if we had a 6,000 MW surge. But, you know, there is nothing new really in terms of transactions between jurisdictions. Ever since we have had interconnections we have had transactions. So that is not something new, not something that suddenly appeared after deregulation. One thing I will agree with is that we do need enhanced tools and I have already mentioned that and there are some enhanced tools being looked at. One of the committees I am on with Joe Ito here for example is looking at wide-area monitoring through phased systems. I have no doubt and have never challenged that better tools are always better, whether deregulated or regulated. And by the way, in terms of these flows, in 1988 Ontario actually had to cut firm load because of flows through Ontario with transactions from New York to Michigan, so that certainly wasn't in the deregulated state to that point.

**JOHN HUGHES:** Just to point out one other aspect of the commenter's statement, we do have measures in place especially in the western United States, the western part of North America I should say, to automatically reduce generation, to automatically insert a braking resistor, to slow down that portion of the system that is in a high frequency situation. So to be fair, there are these remedial action schemes or special protection schemes as the terminology used primarily in the east. There are these measures. So the industry is not ignorant of the need for them nor are they not using them, they are.

**FACILITATOR (BRYNE PURCHASE):** OK, then, we go Jack.

**JACK CASAZZA (Power Engineers Supporting Truth):** OK, I'd like to hit all speakers. First, the previous speaker, I agree completely with David. This statement that the ties were not used for scheduled interchange, these go back to the 1960s, paper after paper. Look at the CIGRE meetings, look at the IEEE meetings, so his assumption as to why we have over frequency is not correct. Second, I wanted to tell John Hughes, are you aware that in France they are subsidizing industry because in the competitive market they can't get electricity cheap enough to compete with the rest of the world, so that's in place? So, I think that you are going to see more of that in other countries where industry, for national reasons, will be subsidized one way or another by the market. And, the third thing is for Dave. As you know Dave, I have mentioned this to you before, the blackout report put out by the U.S. and Canadian governments and by NERC, has a number of things in it which are not discussed which are important for learning about the future

which is the basis of this question. How can we learn from the past to do a better job in the future? Number one, most of the 345 KV lines involved had high speed re-closing, didn't they? When you get an arc like you get off a 345 KV line you burn off the top of the trees. Why didn't the lines re-close successfully? I don't know? That should have been in the report. Number two, about 40% of the generators tripped unnecessarily. If they hadn't tripped, what would have happened? That is not in the report. These are things that are important. And the third thing is the question of the ties to other regions, you know some people say that the ties tripped and saved the world. I don't quite jump to that conclusion that fast. They may have. What we should have studied in the report is what if the ties hadn't tripped? Would there have been enough stabilizing power to keep the blackout from occurring? Or, the alternative, would the blackout have spread over the whole eastern United States and Canada? I think answers to these kinds of questions should be obtained in these kinds of studies and they are not being obtained. And part of the reason is not that people do not want to obtain them, but lots of times that the people making the studies are either under the charge given to them or because of their background don't know to ask these questions and get these answers. This is a basic problem we have with learning from the past, as Dave knows, I have always said, when a blackout occurs anywhere, learn what happened and see how it could effect us and how we could do a better job if we learned from it. There was quite a bit of that in this blackout that was not done by the Canadian and the U.S. governments. And let me tell you why I think that was. I think that because the task force was substantially to provide proper political distribution and stakeholder distribution among all the parties. It was not to get the most competent people but to get people who would have a balanced response is my reaction to it. That is the end of my comment. Perhaps Dave would like to comment. We have 2 Daves up there, OK.

**DAVID GOULDING:** I would really like to object about getting competent people to work on this blackout task force. We certainly did and I certainly nominated some of them and I nominated them because of their technical capability and some of them are in this room today and they should feel insulted by that.

**DAVID NEVIUS:** Jack and I have talked about this and there is, there has been, a great deal of analytical work done. I agree that not all of it has been published but studies were done once we were able to replicate on computer models what actually happened in August 2003. We were able to determine what actions, either by operators, or what different relay actions would have arrested the blackout. Certainly not having zone 3 relays take lines out just because of high power flows and low voltages would have arrested the blackout. Secondly, had load been shed in the Cleveland-Akron area promptly when the indications were available to the operators - that would have arrested it. Or, if we had automatic under-voltage load shedding in that area, it would have arrested the blackout. So those studies have been done. You are correct that not all of it has come out in published materials and certainly I will take that comment back with me, Jack.

**BOB HUNT (Optimal Technologies Canada Inc.):** My question is for John Hughes regarding his comments on ...

**FACILITATOR (BRYNE PURCHASE):** Could you give me your name please?

**BOB HUNT:** Sorry, my name is Bob Hunt from Optimal Technologies. The question goes to John with respect to demand response being in the market and I guess given we are sort of focusing on an ERO with participants from regulators and the ISOs, the RTOs, the question would be who would be responsible for developing the technologies making the market rules and ensuring the implementation and setting targets for demand response if in fact you believe that is a target and I would obviously like to hear the comments from the other participants as well?

**JOHN HUGHES:** I couldn't really hear your question. Speak into the microphone.

**DAVID GOULDING:** Try the other microphone, it seems to work better.

**BOB HUNT:** Sorry, this is much better I believe. The question with respect to demand response is, if you are looking at an ERO format and you've got participants from regulators, you have participants from the RTOs, the ISOs, then who would be responsible for establishing the technologies, the market rules and the implementation guidelines that will be part of your view of demand response which would be in that competitive market?

**JOHN HUGHES:** Right now from what I can tell there are not very good models out there but some are underway. The Midwest ISO has demand response provisions in its FERC-approved transmission tariff. And the intent of those provisions was to make pretty much load symmetrical with respect to generators in providing a resource, and there is a stakeholder process involved in the ISO to, you know, develop the tariff and various stakeholders can go to FERC during the adjudication of the tariff, and to, you know, get provisions. That's one approach. Another approach is what I mentioned earlier when I was in Texas yesterday, to change the market model that is used out there. I think the current market model that, at least our FERC seems to want to support, discourages demand-response and really discourages even my members from seeking it. It's just basically shutting-them-out. An energy-only type market framework in which you replace this God-almighty spot market with a bilateral market in which the large loads like my members can directly negotiate with generators and other entities, then the discussion and opportunities for getting demand-response are greatly, you know, advanced, and this will allow, you know, technology, new technologies, new systems, IT and stuff, to enter the market which so far hasn't happened. Is that an answer?

**DAVE GOULDING:** I thought I heard a different question and I apologize if I didn't, but you were talking about the makeup of the groups at NERC, regulators, ISOs, customers etc. who actually develop the standards and I thought you were saying then, how do you get the technology in there to some extent, because there isn't a group which specifically has the industry of technology available to it. In that context, that's quite right, but nevertheless two things. First of all, the meetings are all open to anybody to attend. And secondly, there is every opportunity through the representatives of those

groups for industry to get involved in terms of what the technology is, but it is quite right that in terms of how the different groups are setup that there isn't one that specifically says those who are responsible for developing and coming up with innovative ideas in terms of new facilities should be, should have a group of their own. So, that is what I though I heard. If I didn't I apologize but I have answered a question that you don't need to ask now.

**Unknown person;** That as well, but the question was more if you were starting here with an ERO format you have regulators and you have ISOs, RTOs, who would be the initiator in setting targets and establishing what those market rules should look like?

**ROBERT BLOHM:** Yes, I am Robert Blohm. I would just like to make three little clarifications, you know, to my comments. The first is the issue of power surge, just to explain to Dave Goulding, that in the blackout, when the so-called power surge was sort of sloshing around the Great Lakes and when you were cutting, you know, inerties, some control areas were being sort of lost; you know this was a many-seconds period and you saw an extreme increase in frequency of, you know, between 200 and 300 milliHertz depending on how you measure it, and then it stayed there for a while and decayed and got, and frequency got back to normal in the usual 10-minute recovery period. The way of converting that mHz into MW is by a term called "bias", and that's 3600 MW per tenth of a Hertz. That's where the 7,000 MW of surge comes from as a standard calculation and, as far as Jack was mentioning, I was referring to techniques such as flat tie-line control. Before [FERC Rule] 888, I don't believe utilities generally planned to depend on each other on a regular basis for power or to construct plants to supply the other guy power. I think the trading that occurred was exceptional; in other words, you know, you have a surplus, the other guy has a deficit, and so on; so, you do these sort of, you know, serendipitous or occasional transactions to balance out. But I think, you know, you see it in the data, the usage or the loading of these inerties. There is a big qualitative change with [FERC Order] 888 and the fact that customers are, large customers, are involved too, and you begin to have dependence, you know, in a planned situation, where power is contracted and regularly supplied on a long-term schedule for basically economic reasons. So, and the final point for Dave, I was actually of course referring to the eastern interconnection where this event occurred and, you know, there are far many more control areas there than in the western interconnection. Granted the western interconnection is more a radial system. It is, you know, reliability has been somewhat an easier job there: you have got many fewer, what is it 1/3rd the number?, of control areas and so on. So, I offer that observation and also that, you know, issues of real-time power flow, of course given the nature of the eastern area interconnection, are very crucial; so anyway ... and congestion, there is a lot more congestion in the eastern area interconnection.

**DAVE GOULDING:** I would just like to point out a few facts here. Back in the early to mid '80s I was actually accountable in Ontario for inter-jurisdictional transactions and let me assure you we had as many transactions then as we do today. We had them both in terms of transactions for need within Ontario and transactions where, for economy, both

in Ontario and with our neighbouring jurisdictions. And in 1989, we had the highest levels of transactions we have ever had in this province pre and post regulation.

**ROBERT BLOHM:** You have these seasonal-diversity contracts which I understand but again these were issues that sort of ...

**DAVE GOULDING:** No, no I am sorry, they were not seasonal-diversity contracts, some of these were longer-term contracts, like contracts with Niagara-Mohawk for a significant amount of power year-round.

**Unknown person:** Let me just say one other thing and I think that Jack Casazza I think can certainly verify this. After the oil embargo, economic transactions increased dramatically across PJM from west to east to the point where the system was operated a great number of hours of the year up against system reliability limits. So, as Dave attests, this is not something that is new, maybe the way the contracts are developed is different but we've had the system operated up against those limits for economic reasons for some time.

**DAVE GOULDING:** By the way, it was 1990, not 1989, I remember.

**JACK CASAZZA:** Just to confirm, Dave, I chaired the inter-company committee that developed the ties to the various regions from PJM. They were justified by transactions that would take place over the ties. No question. You look at the economic studies that are available. The other thing, I did want to apologize to Dave. I didn't mean to insult the people who did the NERC studies; I am talking about the government appointees.

**DAVE GOULDING:** I guess that I won't object to you insulting the government.

**JACK CASAZZA:** They were good people who tried their best but they were limited in what they did.

**FACILITATOR (BRYNE PURCHASE):** Maybe I should object Jack. By the way that was Jack Casazza for the sake of our people taking the transcript.

**TOM WALLACE:** Tom Wallace, NRCan. I guess that I had a question for John Hughes and anybody else who would like to comment. John, in passing when you were iterating some deficiencies in the competitive model, you talked about a slow federal response to PJM, ISO footprint issues, the Swiss cheese problem, and I just wondered if you could elaborate on that. I recall in, I seem to recall, in the Task Force report, that attention was directed at this problem of islands of reliability within another control area, I believe that this is what you were referring to. And I just want to get a bit better sense of what you thing should be done that is not being done and why it is not being done if that is the case because, I know, you know, that struck me as a bit of a layman as a fairly obvious problem so I would be just interested in hearing your views on that.

**JOHN HUGHES:** I think an example of the problem is Commonwealth-Edison which is a large utility based in Chicago and serves the Greater Chicago metropolitan area and a large portion of northern Illinois is dynamically scheduled into PJM. It kind of discombobulates the market in the Mid-West where a lot of ELCON members are, and in terms of trying to just do anything in terms of access, the market to serve load, COMED is interest, is economically-driven, is to use the fact that PJM gas clears, high price natural gas, clears to natural gas more often there than in the Mid-West, so it wants to move its nuclear capacity based in Illinois out East and my understanding of the way the configuration of the two RTOs are, PJM and Mid-West DISO ???, those transactions are creating loop-flows across the NIPSCO system which is Northern Indiana Public Service Company, and it is basically, kind of, a beggar-thy-neighbour type of situation. NERC and FERC are currently trying to kind of resolve that situation, and I do not know the status of it, but here is an example of, I think, where the economic motive is kind of pushing the limits a little bit of, maybe, sound-reliability practices.

**FACILITATOR (BRYNE PURCHASE):** Was there anyone else who wanted to ... fine.

**ROBERT BLOHM:** Yes, just about these scheduled transactions. What I am talking about are continuous-usage transactions, not occasionally, you know, when there could be several hours where the lines are loaded to the limit. Since [FERC Rule] 888, the later part of the '90s, the whole discussion about what is the Transmission Reliability Margin, Available Transmission Capacity, what seemed to be available for usage up to that limit, which is most of the capacity of those lines, came up in any, you know, economic statistics, which show dramatic use, you know, increase in use, of the interties since then for economic transactions and for economic motives and, admittedly too with deregulation, utilities were even further driven by economic motives. Otherwise you have a hard time explaining the power surge and the power surge comes from stranded generation that, you know, is left there because you haven't identified the generation to cut off when the transmission line is curtailed and a whole bunch of scheduled transactions have been cut.

**DAVE GOULDING:** I think that I'll let it go that.

**FACILITATOR (BRYNE PURCHASE):** I don't see anyone else looking like they are going to be jumping up to the microphone or anyone at the microphone, so I actually have a question myself as we have a few minutes here which I could take. This is not a technical question because I really do not, I am really not an engineer, I do not have a technical background as it were. This goes more to the intergovernmental issues that arise however. We have managed towards reliability standards in Ontario. Now, you have them in the United States and we need to blend these regimes together because, as you know, in Canada we have well 10, probably more, maybe 12 jurisdictions that you have to, that we have to bring together to correspond with the U.S. regulatory regime. Do any of the panelists anticipate any particular issues in that regard or are things going well and smoothly from your perspective?

**DAVID NEVIUS:** Under the electric reliability organization framework, the standards that NERC will develop or the ERO will develop, will be North American standards. Once they are developed and approved through the ERO process they'll be filed with both the FERC and the various jurisdictions in Canada, and those jurisdictions will have the opportunity to either approve the standards as submitted or remand them back to the ERO for further work. In the course of that process, they'll be this harmonization of standards that may exist on a provincial level or an individual state level or an individual regional level. Our process does provide for region-specific and even state-specific or provincial-specific standards that are not inconsistent with the ERO standards. So I firmly believe that the harmonization of the standards will take place.

**JOHN HUGHES:** We have some concerns of the potential of states to meddle in the standards-setting process, you know, under the pretence that, you know, they might say we need higher standards or something. New York is a classic example and we have some really strong concerns there. We really wish that the U.S. law would have been written to remove that possibility but it still remains there, and I raise that issue as it is well known that you, if you think about the governmental response to the hurricane Katrina, you know, part of the disaster was the lack of meaningful coordination between the federal government and the states. Well, that's been going on for 100 years in the electric industry in the U.S. and so that type of, you know, failure of coordination really needs to be minimized.

**DAVID GOULDING:** On an international basis, Bryan, clearly there was an opportunity for a lot of issues to arise. I think that the principles that have been put forward by the bilateral group are good guiding principles which will enable us to get over those hurdles ultimately. It is not to say that everything has been resolved at this point in time and representation on committees is one that is an interesting one. It also happens to be one that I'm chairing a group to look at, and every time we talk about Canadian representation, Mr. John Anderson asks me to define a Canadian, so there are still some issues there. I sent in the beer ad and now I have got to get in the tee-shirt. But, so everything isn't nailed down but I am 100% confident that at the end of the day we'll have something that is eminently workable.

**FACILITATOR (BRYNE PURCHASE):** Well, with that, I, we are running about 5 minutes ahead of schedule which is excellent, we'll have a little longer break, so I would like to thank all of the panelists for quite good presentations. Thank you very much.

**FACILITATOR (BRYNE PURCHASE):** Call you back from your break. I would like to get started with panel number two. Now before I begin with panel number two, I did want to, there are a couple of administrative matters I wanted to bring to your attention. First, while we are taking transcripts and so forth of your remarks here, if you have any additional questions that you'd like to submit to us, or comments, you can submit those to our website, or if you happen to have a hardcopy of something that you want to submit you can do that as well; we are really quite open to whatever way you would like to communicate with us on these important matters. My second request is that in getting the headsets for translation, you are required to sign them out and I think that we have a

couple out that actually haven't been signed out. You have to sign them out and leave some identification and so forth at the desk, so if you haven't signed it out please do so, and if you plan on doing it you'll know what the rules are. So, welcome back to panel two which is "Addressing Changing Industry Structure and the Need for Transmission Investment". And, today unfortunately, Jose Delgado from the American Transmission Company is unable to be with us, but we, you do have his paper. We do have, however, Scott Thon from Alberta who is the President and Chief Executive Officer of AltaLink Management Ltd... We have Tom Welch who is the Vice-President of External Affairs of PJM Interconnection, and we have John Wilson who is an energy consultant and professional engineer and a member of the Ontario Electricity Coalition and I am going to take them, ask them to come and make a presentation in that order, so I'd call on Scott first, please.

**SCOTT THON** (AltaLink Management Ltd.): Thanks Bryan. Boy, I feel that I am in the dark up here, I'll tell you, kind of simulation of the blackout or something so I could get in the mood. AltaLink. Let me just tell you a little bit about who we are, we are an independent transmission company so we do not own generation, do not take any other positions in the marketplace, so that is the perspective that I'm coming from. I'm also coming from a perspective of a market that works, and markets do work and yes there are some differences in markets and how you deal with reliability. So I'm going to be very much from the position that markets, that I live in a market that works. Now, I'm going to talk about some of the things that we've realized as we've been down this transitory state that Dave Goulding talked about. Transitory states, long transitory states are incredibly difficult and incredibly risky the longer you take. But, in our case it certainly, we did not understand how reliability can actually support a market in the initial days of that market and also there is an increased complexity so I am coming at it from those two pieces. Now, before I, let me dive at it from two different cuts here. I'm going to think of it from terms of short-term reliability and for me that means the control room operator, and I think that the previous panel did a lot of work in what's happening in real-time. But then I'm going to spend most of my time talking about what is the environment that those control room operators are having to deal with. And I almost liken a control room operator to an ambulance driver. So he's driving his ambulance and he has to react to see the roadway, is his vehicle performing well, does he have everything that he can to get his patient to a hospital? That's the short-term piece, what he is seeing and reacting to in real-time and how reliably can he get his patient to the hospital. First is the longer-term piece for me is what's the environment he's in? Does he have the roadways or the hospitals there that can actually accept his patient, those kind of environmental, long-term things that are more structural that you need to look at? So, let me take a cut at it from both those perspectives. In the short-term, let me just take you, just imagine a bit, you used to work in a control room yourself, maybe many of you have, and for the last 15 years you've been away though. You have been off and who knows what, perhaps you've been attending market redesign conferences for 15 years and you don't know what's going on in the back in the control room and you arrive back in the control room and you look around and you say, well what's changed? And guess what? You know Frank and Tom are still there, and they are doing a lot of the same things that they did 15 years ago. They are, you know, they're adjusting capacitor banks for voltage or whatever they may

have done in the past. But then, as it so on the surface it appears very similar and in fact they're, they're you know, they're getting the very similar training that they had in the past, but you start to notice that there are a few more things. There is an increased complexity in the room, you can just feel it. Why is that? There's a lot more players. There are these things called ISOs that the guys, or women, are dealing with, there are generators, a number of them rather than just the vertically-integrated companies of the past, that they're interacting with compared to 15 years ago. So the complexity certainly has increased for those folks and you can just feel it in the room. The other thing you notice is that there is no generation-dispatch desk sitting, at least not in my control room, because obviously we are now in a market and you do not have control of telling which generator to go when or how based on whatever you may see. Now, an ISO may have that but, you know, particularly if you're running a transmission grid separately you don't have that control. So old Dave that used to sit on the generation-dispatch desk is no longer, he's, he doesn't exist and he may have some role at the ISO, but he's not there today. So, as you walk into the room you certainly noticed that there, it looked the same, the same people were there with the same training, but there is this increased complexity that's going on. But then, it suddenly hits you. You look up in the control board and if you've ever been in a control room you'll know what I'm talking about, and the thing that absolutely hammers you is that there is the exact same number, almost, of lines as when you left 15 years ago. So there is more people, more complexity, a lot more load, a lot more generation from a lot of different places because now we've opened the market up and yet we've got our ambulance drivers trying to do that in a system that has not substantially changed in 20 years. They are trying to use the same road network that they did when you left. So that's the short-term view and now shifting over to long-term, how did we get there, and what did we see and not see? Well, I've already talked about the first piece. Structurally we haven't done anything to the transmission grid on a capacity basis in any substantive way in most jurisdictions for 20 years and that is an incredibly big thing missing for most of our operators. It has led to a lot of congestion, it's lead to a lot of inefficiencies when you have a miss-match between being able to bring new transmission capacity on versus generation, generation is much quicker, and I think the other reality is that there continues to be, in most jurisdictions transmission is probably about 5% of the bill, 5 – 10% of the consumer's end bill, so it's a pretty small piece. So, that's some of the realities of where the structure sits today. Now, I guess in our particular market, what we've learned is that lack of capacity can certainly hinder new generation development. It won't, the most lowest cost in efficient generation won't come forward. We've seen that through some of the gas-fired generation that cannot come on in our oil sands areas. We ended up taking, in the early days because we hadn't thought through the whole transmission reliability piece, the easy way out. We'll have reliability must-run units and they will be high-cost units and we'll locate them as close to the load as we can, and we'll be in great shape. Well, guess what? Those payments for those reliability must-run units total more than you would have to build the transmission. And it also has been a big barrier to renewables. We have one of the largest expanding wind power resources in southern Alberta, in Canada, if not the largest and that has really been severely impeded by the fact that we've had this lack of investment and decongestion of the system. Now some good things that happened early on. So we missed those things, and have had some things. But I do believe, much as Dave and others on the

first panel said, that there are some good news stories that have come out in the early days of the shift to a market. You have companies that are only focused on transmission. Companies like ourselves, we do not compete for capital, care about whether we need to make transmission investment or not. If we do need to make an investment in maintenance which in fact we had because of some of the aging assets, we do it. We are not competing with a generation investment. We don't have any concern about the fact that maybe the particular generator that we might own may get hurt if we make a transmission investment. So, there are a number of good things that have come out of the market. The next is the ISOs. In Alberta we have an ISO and it, let me tell you, they look over our shoulder and it is that second set of eyes that is always asking the question are we meeting the reliability standards that we need to meet? So there have been some very good things that initiated right out of the gate on the shift to a market. But I think what we missed though, we were clouded in the early days and we were only focused on the market. And so we had this idea that the market could just solve everything. We would just throw it out to the market and it would be no problem. Well, in the transmission side of the business, it remained regulated and we needed to think a little bit further about how it actually impacts the market as well as impacts reliability. Now I think we also bought into the biggest fallacy of them all which is in a market that generation and transmission compete and they absolutely do not. If you, even if you thought they could compete in a market you cannot, it is an unsolvable problem because in order for you to figure that problem out you actually have to have all the information on all the generation data and where the generation might locate and might where it might not, and it is an unsolvable problem. What the transmission system in a market has to do, it has to be not unlike our highway systems; it is the piece of infrastructure that is a public good that supports the market. And you don't tell manufacturers where to build; the manufacturers build wherever it is economically prudent to build and they need to have a transportation network that they know can get their product to market. That is the fundamental difference when you shift to a market. The transmission grid has to be there so that suppliers can compete and they can compete in an unfettered way not having to find that congested point to hide behind so they can extract some sort of monopoly price. The second piece that clouded us in the early days was that they were really unclear in the roles and responsibilities. Whenever you have a number of new entities come into the market, in Alberta we have a balancing pool and I won't even get into that, we have market surveillance administrators, we have the independent system operators, we have new companies such as ourselves the ITCs and are really getting clear on who is doing what. If you just let-it-to-happenstance it can cause all kinds of battles and in fact things, balls, can get dropped. So I guess, in answering the question do we need more investment, I think that you're getting the jist that I am a big believer that we do need new investment to really get that strong transportation network. And why do we need it? Well, first of all it affects reliability. Second of all it drives greater system efficiency. There is one project we're involved in right now, an investment that has been a long time coming that will, that effectively saves \$3,000,000 a month to Alberta consumers just on pure grid loss efficiency. And thirdly, it affects the market price. If you can allow a transportation network to be open and relatively uncongested, then you're going to get the lowest-cost generators coming to the fore and providing lower cost to consumers. So not only has it hit reliability, it drives lower costs. Because remember on that bill again,

you've got 5-10% is the grid, the bulk of that bill is coming from the generator sector. Now you are probably sitting there saying, oh ya he's this zealot there and he's going to build a 500 KV line into every small town and community and across whatever nation he can. Absolutely not. You have to have clear criterion and if you think pragmatically about this, we're still a regulated monopoly and in Alberta I can tell you the process is a review by the ISO, there is another review by our regulator, we have the whole issue like everyone about siting transmission, so there is an incredibly small chance that we would over-build the transmission system. And you know what, if we did, the small chance happened, what would really be the cost impact when you see how big we are at the end-of-the-day on the bill. So pragmatically concerns about over-building the transmission really are not there. So let me focus in and close here walking through the five pieces that have really made, what we've learned as we, how reliability, how transmission reliability supports a market and what you need to do because we're now very much on a great path to success. The first one, transmission is still regulated so you need good strong, consistent, balanced regulation. That doesn't matter whether it was before or after any kind of change to a market, but you definitely need to have good regulations. And, one of the key aspects of that is some time limits, and time limits on facilities are incredibly important. You can build a power plant in what, two to six years depending on what kind of power plant you're talking about? It takes you probably twice that to build a transmission line and the big part of that is permitting it in the regulatory process. So what we've done in Alberta is that we've specified two 6-month periods so investors like AltaLink, like the other transmission owners in the province, will at least get a go, no-go decision at a point-in-time. Having an endless permitting and regulatory applications process and not knowing, and the market not knowing whether we are going to get a transmission solution or not, does not work. I'd rather get a fast no than a slow maybe. Secondly, well coordinated roles and responsibilities. I don't know that there's a whole lot to say, that's pretty self-evident, but the ISO has got to be clear on what its role is, the transmission owner, the regulator, the government as a policymaker, all of those folks need to understand where their roles and responsibilities lie so that there isn't a lot of cross-over, and in fact, quite frankly, infighting. If you get, its almost a guarantee, if you create a lot of government agencies like we've created in Alberta and I think that there are quite a few of them here in Ontario as well, there is a propensity for them to step on each other's toes. And getting that clear is absolutely critical. Number three, you have to have a very robust stakeholder concern and vetting process. So you can't not listen to all the market participants, you have to listen to generators, you have to listen to transmission providers, you have to listen to customers of all stripes, you have to listen to marketers. So you can't not listen. You have to have a very good process of getting that listening, but here's the key part. In the early days we wouldn't make a decision. We'd listen and we'd listen and we'd listen and we'd listen and we'd try to find the lowest common denominator. At the end-of-the-day that process in listening has to result in a decision. It's a little bit like my time limits, you've have to give the market some certainty on where you are going to go and where you are going to go next. Number four, and this has been the big one for transmission. We need clear and simple policy declarations from whoever your policy-maker might be. And this is around transmission. In Alberta we've been very clear. The grid is about critical infrastructure, it supports the market it doesn't compete against it, we are about reducing or eliminating in some

circumstances congestion. Reliability must-run generation, high-cost generation that is subsidized, is not workable. It's a high cost, not as reliable as transmission and it is a high cost that consumers are not going to bear. We need a strong stakeholder process. We need mandatory, enforceable reliability rules. So we need all of these policy statements, my, if you haven't done it already or there is a move, you should have, we should have done this prior to our shift to a more deregulated market, but as I said we kind of got lost in the idea that the market was going to solve everything. But we have now, the policy makers have been incredibly clear on what transmission development means in a market and now we have agencies or companies such as ourselves that really can get clear on how we need to move that forward. The last, number five, is planning, planning in a competitive market. Central planning you can't do, I said that earlier, you don't know where the generation is going to go. But, you do have to be proactive on planning. Getting into a chicken and an egg situation of I am not going to build a transmission until generation shows up and the generator is going I am not going to build a generation until, is a circular argument that affects reliability at the end-of-the-day, it affects prices too, but reliability clearly. So you have to get out in front of it and that is another piece that falls out of the policy that we have in Alberta around transmission development; we will proactively build transmission ahead of the market to make sure that we have a robust transportation system not unlike our highway systems. And really, it is not about building 500 KV or 4 lane highways into every small community but it is saying that in our market where is the general move going to be. It's not really rocket science to figure out where the major power flows are going to be and we need to make sure that those particular transportation networks are robust enough to handle it and are built in advance such that the generation can locate and use a robust piece of infrastructure. So let me wrap-it-up, let me conclude by saying that in order to get transmission development you need a strong policy leadership, we have to be clear on our roles and responsibilities in a market, I can't say this enough, I've said it three or four times and I am going to continue to say it: transmission does not compete with generation. It is the underlying infrastructure that the ambulance driver is driving on to get to his hospital. And so really, if I tie this back to my opening piece around Frank and Tom back in the control room, it really is incumbent on us as the industry, whether you're a policymaker or whether you're an investor like myself, is to get that critical infrastructure in place such that with all the new players and complexities that our ambulance drivers in the control room have to handle, that they can do it in a network that has enough capacity to move around rather than having to cut and tight ???, getting, running into a roadblock with your ambulance and they can't deliver that patient to the hospital. It's the single biggest piece in my mind that will drive increased reliability in the evermore complex markets of the power industry today. Thank you.

**FACILITATOR (BRYNE PURCHASE):** Thank you Scott, and I'll call on Tom now.

**TOM WELCH:** Thank you. I am very pleased to be here, I was reflecting on the first panel, I am a recovering lawyer, I've worked for utility, I've been a government bureaucrat and now I have worked for an RTO so I am absolutely certain to be insulted by somebody by the time I leave. Although fortunately I've just been promoted to control operator which is probably a noble calling. I am going to focus a little more on the first of

the two questions, namely the impact of restructuring on reliability and I think it's probably predictable to say in our view that organized markets enhance rather than degrade reliability. I absolutely agree that the degree of complexity has increased with restructuring and with the introduction of competition and in organized markets. But I think it is fair to conclude that the increases, the enormous gains in information technology over the last decades, have more than offset that complexity and therefore enable us to deal with it. We're looking at a grid that was built decades ago, we are looking at regulatory structures that were originally put-in-place 100 years ago. It seems to me that we are doing a disservice to our constituents if we conclude that we are the only industry to which the information technology revolution should not have a profound impact. So I think that what we are doing with respect to organized markets is allowing the efficiencies you can gain from market forces to be introduced into admittedly a very complex system, but to do so not by sacrificing operational excellence but by actually increasing it at the same time as you introduce those markets. Now, reliability to our view has two dimensions, they were touched on a bit by my predecessor. First, there is real-time operational reliability, you know, keeping the lights on, avoiding cascading failures, but there is another dimension to reliability, namely making sure over the long-term supply and demand stay in balance, you have the infrastructures that you need. We think that organized markets can assist in both those efforts, but frankly, the challenges are rather different, one to the other. Now with respect to real-time reliability, you know avoiding the cascading failure that I just mentioned, is a characteristic of RTOs like PJM, that we operate real-time energy markets and PJM in particular operates a noble market, security constraint dispatch, we are the people who do the generation dispatch, with locational pricing. Now what that means is that every five minutes the prices are calculated for each of scores of locations across the PJM system and each price at each location is a function of the available generation load and most importantly for reliability, the ability of the transmission system to move the power and what that also means is that not just the PJM operators, it is not just us, we, who are watching, but basically every market participant out there who has an economic interest in the outcome of these five minute prices, is also watching. This provides an enormous degree of transparency and indeed there is an article written shortly after the 2003 blackout by Fernando Eldorado in which he suggested, and I am inclined to agree with him, that had you had this degree of market transparency and market information in real-time available while the events were occurring in the afternoon leading to the cascade failure, there would have been enough people seeing the kinds of price separations that those events would have triggered the operators to wake up, they were much less dependant on a single set of eyes or even a couple of pairs of eyes looking at it. Because this gradual degradation would have shown up in the price separations which would have raised questions and in a sense you have a hundred alarm bells sitting out there, not just a few alarms, the failure of one of which could be a significant problem. Moreover, organized market with an RTO like PJM adds an important reliability enhancing feature which is namely, and this again was touched on a bit by Scott, the RTO itself as an independent and financially disinterested party has reliability at the very top of its priorities, above profit frankly because we don't make profit, so in a sense our principle objective is to ensure reliability, it's our sole corporate focus. Now one of the things of course we're trying to bring in to all of this is to get the benefits of the broad geography and generation and fuel diversity, bring those benefits

out to consumers. Now some of this benefit, some of this broad geography that we encompass, is economic, it is probably the principal driver, the economic effects but there are also reliability benefits because you can move things around to the extent you need them. And I'll say a little side note here on transmission congestion. One of the things that is occasionally said, I think probably less and less, is that somehow markets create reliability issues because they create congestion. I am not exactly sure that is the right way to think about it. I think what markets do is reveal production inefficiencies which pre-existed the existence of markets, and when you introduce markets what congestion is telling you is you have inefficiencies before the market is trying to bring those inefficiencies to consumers there are constraints on how you do that. It is a problem, it is an issue to be dealt with, not in reflection in somehow markets are bad, it just shows you the cost of not having built the system in a somewhat more robust way. I think that there is further evidence in the compatibility of good reliability and organized markets, frankly in the behaviour that you see with respect to RTOs and those responsible for putting forward reliability, for ensuring it. And I'll speak only for PJM but I think these are representative of how other RTOs and organized market operators work. Our training, there is specific training, operator training standards in the NERC guidelines. PJM's training standards actually exceed those; we require more hours than the high-end of the NERC standard. We have market rules such as the day-ahead market that permits planning for real-time contingencies, a very powerful reliability tool because you can have a sense of what a lot of people think about what the situation is going to look like the next day, you run all the simulations a day ahead so operators could be prepared for what may happen in the real-world. We have an enormously sophisticated data system that monitors 70,000 data points every 10 seconds, we do a security analysis that examines about 4,000 contingencies also to every 10 seconds, so we're looking at everything that could possibly happen, plausibly happen. And again, here again, markets intersect reliability. In order to optimize the economics of the system, the economic dispatch, we gather an enormous amount of real-time information that simultaneously allows us to monitor reliability. One of the things we're doing is developing visualization techniques in order to assist operators in recognizing the kinds of phenomena that would be important to them in terms of heading-off reliability issues. And again, this too is a focus. Our focus is to do our job better, our job is to do reliability better and therefore we have every incentive to produce the kinds of products and invite others to invent the kinds of products that are necessary to ensure a very high level of reliability. In addition we use very similar tools in monitoring border flows with neighbouring systems, again it helps us optimize the economics because we want to reduce the production costs as much as we can not just within our system but also with respect to neighbouring systems. But it also allows us the tools we are putting in place to try to have prices converge at the borders which is something we are actually succeeding in doing. Again, it allows us to get warning ahead of time of any system problems on one side or the other. So it is in our interest to do this kind of coordination and I think we are achieving it. Now turning for a moment to the long-term reliability issue which I think is a more difficult challenge in some ways, maybe not more difficult operationally but more difficult conceptually. One issue is supply adequacy long-term, a very difficult issue with which a lot of markets are struggling. John mentioned there are some differences among various ISOs on how one might go about trying to achieve that kind of long-term stability. We think the boom-bust

cycle is an unattractive approach to it, but it is an issue that markets recognize and frankly it is an issue that exists, the other side, the other side of the issue existed under a fully regulated system, in fact I am, my personal bias comes from being a regulator in a state that had a huge fossil overhang as the result of decisions made in the fully regulated system. So I think it is a question of how you find the tight balance among the two, you know, among the various interest in order to achieve that long-term, persistent reliable supply without costing your consumers an enormous amount of excess cost. I think the question of transmission, and I'll now turn to an aspect of this long-term issue because the second question of the panel is the issue of transmission planning. Right now there is a reasonably robust transmission planning process within PJM but we have recognized that our members, our members and constituents have recognized, that it really doesn't do as much as it needs to do, it takes a relatively near-term look, about a 5 year look, and assesses whether there will be reliability issues and it is very good at fixing those kinds of issues, but it is not very good, at this point, at identifying the longer term issues, the economic benefits, that can be gained, something that Scott mentioned in terms of what are the really big highways that might take 10 or 15 years to build. So one of the things we're working on right now is to try to identify what exactly is the planning process that should be employed in order to capture the breadth of economic as well as reliability interests in a time horizon that allows you to actually build things and finally, as difficult a question as any, how do you, what do you do with the information you get from that kind of analysis? At what point do you step in and say a certain amount of transmission has to be built? I think markets actually provide excellent signals. One of the advantages of markets is that you have data-sets going forward that show you problems as they are developing and give you the tools to assess where the clearly necessary large projects are going to be and where other solutions might come into play. I am frankly not sure that I agree with Scott that transmission and generation never compete. I think in one sense they obviously compete and that is that both are making use of societal resources to provide an answer to a particular question and to use this hospital analogy it is not always the case that the best way to achieve your results is to build a four lane highway between the customer and the hospital. It might be a case that you want to build a little health care provider centre somewhat closer to the customer. There is clearly a public good aspect to transmission. I think that transmission has, there is under investment in transmission right now and I'll touch on a couple of reasons why that's the case and how we might address it. But I do think at some point and I think that one of the advantages that markets can bring is you can get a variety of solutions to the problem if the problem is having to deliver electricity within any particular area at any particular time. So it isn't the transmission that is the obvious answer to every question, but I agree at this point it has been undervalued to some extent. We are actually at the PJM market exploring ways of allowing transmission to compete for particular, to resolve particular kinds of problems both by allowing new transmission projects to obtain financial transmission rights and also through our capacity market model which actually allows transmission to bid in as if it were capacity, as if it could be transmission into a constrained area. So I think the question of whether there can be some competition I think is still an open one.

So let me summarize you know, to the first question, I am not suggesting that markets, organized markets, are the only path to reliability but I think that they can and do produce

some very important tools and I think in the PJM area at least, and I think that this is true for the other RTOs, they produce many reliability enhancement aspects and technologies, so I think that the restructuring at least as it has been manifesting itself with respect to the organized RTOs is reliability enhancing. I think to the second question, some additional focus on transmission is absolutely appropriate. Where the balance should be amongst the various tools for reliability is going to remain a very complex political and economic question. I think organized markets can help provide the kind of information that will inform the judgment of however you go forward. I think that moving forward my list is quite similar to Scott's. I think we need a clear assignment of responsibility, exactly where the responsibility might lie within each market structure might vary between market-structure to market-structure but within each market you need a clear assignment of responsibility. Regulatory clarity on cost- assignment and recovery, particularly for transmission, is vital. Siting and cost assignment are closely-related issues particularly where you have multi-jurisdictional projects that are necessary and the benefits are unevenly spread. Consistent, mandatory and enforceable standards, like the earlier panel said, it's very positive that the U.S. government has finally after 10 or 15 years of being told they needed to do it made the reliability standards mandatory. And I think that we also needed the planning that looks far enough ahead that you ensure the identification of the major projects in time to get them built and the way of integrating the output of that planning process back into the market.

**FACILITATOR (BRYNE PURCHASE):** Thank you Tom, now I am going to call upon John.

**JOHN WILSON (Ontario Electricity Coalition):** OK, we have a couple of simple overheads here that will keep me focused, and you focused. Thanks everybody for coming out and special thanks to the NRC and the Department of Energy people who made these workshops happen. I have been an engineer in the electrical industry in Ontario and the U.S. in design, research projects and transmission in generation, in manufacturing. And as the President of the Society of Energy Professionals I negotiated with the Ontario government and with Ontario Hydro to break up the company and introduce deregulation in Ontario. So the title of my paper is "Sinister Synergies: How Competition for Unregulated Profit Causes Blackouts", not will cause, but does, has. And I've got two recommendations, very simple; you'll see them in a second. Put further deregulation initiatives on hold until we know what we are doing and where we are going and how reliability is being affected. And the second one is to proceed with a truly independent and adequate study of the effects of deregulation on reliability. And it requires, I think, two definitions because by independent I mean an unbiased organization at arms-length from the government and from electricity companies, selecting a commission to conduct an investigation that has a broad mandate and that has adequate funding. Two workshop and 10 invited papers are neither adequate nor are they independent. And for me, simply, deregulation is the pursuit of unregulated profit, unlimited profit. So, the introduction to this paper makes the point that the paper is just a broad overview and that the Task Force looked at low-level symptoms and did not look at deregulation. But I think that it is too important to our security, our safety, our health, our economic well-being not to fund an independent study. And again, the background, there

are two points to be made that we should remember. First, is that the electricity system is made up of people, equipment, organizations across the U.S. and Canada, and when parts of that big machine don't work correctly we have reliability affected. And I don't think it makes sense to talk about transmission-only or generation-only, we have to talk about the people, the institutions, the whole system. And we can see, just to make a point on generation, we watched in California as not enough generation caused the utility to have rolling blackouts. We watched across the U.S. and Canada, we watched in Ontario this summer where a lack of generation caused many pleas to the public to cut-back and caused brown-outs across the province. The second point in the background part, is the importance of electricity and many people look at the bill and we talk about, you know, transmission is part of this bill etc. etc., electricity is much bigger than that. Electricity is like an iceberg and the part you see on the bill is the little part above water and the big part, the part you pay, is the part below water, those are other people bills when you buy a cup of coffee, when you stay in a hotel like this, when you pay your VISA card, when you pay your mortgage, the interest rate, when you look at how much tourism you have, how much business, farming, manufacturing, when you watch jobs leave the U.S. and Canada. And even more that iceberg becomes visible when you have a blackout. And peoples' lives are lost and the economy is devastated. Security risk increases, safety is compromised, telecommunications is vapourized, so we should understand that as we are talking about what we are talking about here to day. So, now on page two, if I can get someone to flip those overheads, we are all done with the first one and we will spend the next 8 or 9 minutes on the second one. And it begins with the main part, the main idea, and that is what I call if the shoe doesn't fit. I am not an anti-deregulation ideologue. Deregulation works great in many places, but I do not believe that electricity is one of them. Professor Myron Gordon who is a world authority on utility rate-of-return notes that you have a bunch of restaurants that are deregulated, it works great; you can shop around, you can switch between this restaurant and that restaurant and if everybody tries price-gouging, you can eat at home. That doesn't work with electricity. Mark Cooper, Director of Research for the Consumers Federation of America has done analysis that shows surcharges of 25% or more in electricity markets around the world. This is a huge amount of money. In March 2004, former Canadian Deputy Primer Minister John Manley's Ontario Power Generation Review Committee noted, with reference to electricity, "we cannot rely solely on markets to solve our problems; no jurisdiction in the world has ever done so successfully". So, I think there are people who are heavily into deregulation as the answer for all, who are beginning to understand that you cannot have an inelastic, volatile, transmission-constrained, peaky, unstorable, capital-intensive essential following the boom-bust of the markets. So, electricity deregulation has a hard time, it has a hard time in theory and it has a hard time in practice. And I believe that is because power producers in deregulated electricity markets have much higher costs and need much bigger profits than regulated environments. And this is because deregulated risks are greater and the greater risk means that your lenders and your shareholders want more money and they want it faster. So, deregulation entails also increased costs, and it has the costs of the profit as I mentioned, it has hedging transactions, middlemen, it has got gaming, manipulation, etc. And the higher costs have pushed people to drastically cut where they should not have cut. And, in addition, the complexity of the markets which everyone has talked about have provided participants with opportunities to manipulate

and to game and to cut corners. So, my thesis simply put is, high costs, higher profits combined with the conditions you find in deregulated markets, do provide both motive and opportunity for bad behaviour, behaviour that reduces reliability. And unfortunately unlike the highway system, the electricity system can fail nearly simultaneously across big parts of our countries. So, the rest of the paper and most of the paper we have here consequences of competition for unregulated profit. And virtually all these points have been made by people in these workshops, other people, and in their papers. So, I don't think you will find a lot new, you will find my examples are slightly different and I come at it from a slightly different way. The only new one might be the conflicting interest, the last one. First one has changed focus. I know in Ontario when we deregulated everyone was focused on deregulating and people kind of forgot that we had a system that was in bad shape and rehabilitation took a second seat. And people plotted billions of dollars into the deregulation side and that money could have gone into transmission and could have gone into generation and could have cut our unreliability. People pay more attention to the short-term, especially deregulated executives, because they know that a big drop in profit, a big drop in share pricing, and you'll be looking for a job. And a small, unmeasured drop in long-term reliability, nobody notices it. People tend to do, do what they are compensated for and do, look out for, what is measured. And we've got ENRON and we have dozens and dozens of companies, we are not talking about a few bad apples, where we've watched people do this over and over. So, the next point is reduced resources. Money is not going to the right spots. So, if you look just at first blush across the industry you can see a big reduction of money, people, knowledge, training, maintenance, rehab, replacement, etc. Bob Thomas, maybe we'll talk about that some more. I think we need a study to take a look at this, where it is happening and what is going on. We watched nearly 200,000 U.S. and Canadian workers being shed in mainly deregulated areas. We've watched knowledge being lost. We've watched people being let go so quickly that there is no overlap with the people that replace them or the people that don't replace them. And we've watched executives and boards being replaced with people without an adequate background. An example here in Ontario, Hydro One, one of the larger transmission companies in North America has a board of directors on which no member has extensive electricity transmission experience outside of the CEO and one worker-union rep who is a line-maintainer. Increased complexity, I do not have to talk a lot because everyone else is doing it. But we know that bidding appears to be a problem in some places, maybe that is why we do not have competition. We've got a small handful of people bidding with each other 24-7 who know what the demand is, who know the cards all the players hold, who know the order they are going to play them in, who know what is going to be bid and what is going to be requested for. These people don't even have to talk to each other; they only have to keep playing to make big bucks. And if that's not bad enough as we watched in California, they can shut generation down, cut supply and drive their profits through the ceiling. They had a rolling blackout on a Sunday. So, it is not a question of does this happen, you bet it happens. Decreased planning and coordination. If you have a deregulated system and a regulated system you need a lot more planning and coordination in the regulated system because it is more complex. You have more players, you have more transactions, you have more relationships. This hasn't happened. Reduced transparency. So, we have motivation and opportunity for bad behaviour and it gets really bad when people can't be seen as they

were seen before. You don't have hearings with interveners where people look at programs, ask questions, probe costs etc., explore projects. Now we have stuff taking place behind closed doors. And I really don't believe we can allow companies to operate behind closed doors and that includes generating companies. We also have on-the-fly implementation. The reason we are in transition is because we started stuff everywhere and it didn't work. We don't have a standard for a deregulated system. And in addition to that, all the systems we have have been radically changed over time; we still don't have a working model. After more than 15 years, Britain is still making radical changes to its system in response to big problems that keep coming up. You can read Steve Thomas about the ongoing fiasco, the British model in Britain failing slowly. If Britain, an electricity island, can't get the broad strokes right after all this time, we are talking about a big pilot than is costing people billions of dollars without providing reliability and reasonable cost. Research by Thomas and Cooper show ongoing market manipulation in Britain. Ontario postponed opening its deregulated system twice, opened it, closed it 6 months later with a price cap. This system has been altered radically several times, again indicating the province is running a pilot project with the economy and with people's lives. Conflicting interests which maybe a new point; it is a new point at least with respect to generation, other people have made it with respect to transmission. There are cases in which justifiable self-interests can lead to problems. This could happen when there is a direct conflict between the common good and an individual's desire to protect an investment and to increase profit. So, there are many reasons for taking a generator out of service, there are many reasons for leaving a generator in service and it is not as cut-and-dried as I find out working as a project engineer in a fossil station. So, when the equipment is repaired during peak periods then not only do you protect your investment but you drive your profit up. So, deregulated people have to seize opportunities to do this kind of thing so if the equipment needs repairs, even if it is borderline, it comes out. Regulated people, and I know this for a fact as I worked in the situation, often work the other way. So that the probability is that you are going to have less generation running in a deregulated environment than you would in a regulated environment. I mean, think of it, the owner of a bunch of restaurants, say 5, closes one during the supper hour. What happens? His profit takes a dive, customer loyalty disappears. Think of 5 generators. You close one down. You don't have a problem with customer loyalty; your profits just go up. That's a problem. And ENRON and others showed us how this works, and it is not just ENRON. There is a list of companies who reads like Who's Who. Sinister synergies, let's sum the whole up, all of these parts and pieces here. The overall blackout risk that we find with these items that I've listed is greater than the sum of its parts. You can see that inadequate maintenance, rehab, replacement, etc., it is an easy thing to see if you had a fleet of taxis let's say and you didn't maintain your taxis and they started to fail and they started to stress the other taxis that you still had in your fleet and you couldn't get coverage and not everyone got service. Well, in the world of electricity that is called a blackout. Now we are at the end. Conclusions and proposals. So, because of the electricity system not performing properly, becoming unreliable, because that is a matter of life and death and it is a huge problem for the economy, and because deregulation hasn't worked as researchers, many have documented, you have got people on both sides of this question, and the situation is being made worse by decision makers who don't have the knowledge and experience to deal with it, we had an accident. On August 14th

2003 there was a horrible accident, the blackout. It cost deaths, it cost billions of dollars, so no matter what our beliefs, we have a duty to Canadian and Americans to begin an independent investigation as recommended by the Task Force that was authorized by Prime Minister Paul Martin and President George Bush. So I want us to start to uncover what we need to know. I am not pointing an accusing finger at any one person. You may be doing a great job but I can guarantee you that there are others out there. Litigation and evidence that is coming up day-to-day shows they are there. So, we need to know what's going on. So, based on the evidence, based on the fact that this is an essential system, that the consequences of failure are horrifying, this is if the blackout on August 14th we had 30 or 40 jet airliners piled up at the end of the runway and a dozen people on the ground. And what we are asking for is what was recommended by that Task Force, an independent investigation. We had a huge infrastructure failure and I think we owe it to the public whether or not you believe that we are headed in the right direction, to make this happen. It is not a question of how much damage deregulation is doing, it is a question ... or pardon me, it is not a question of if, it is a question of how much damage it is doing. So, I think we have got to drop all the analogies, the inadequate ones to gas and to telecommunications and we need to begin to look now at the electricity system as we did in the past. Thank you.

**FACILITATOR (BRYNE PURCHASE):** Thank you John, now I will give the other panelists an opportunity to respond to their colleague's remarks. Scott do you have anything that you would like to add in response to our questions of your colleagues, or ...

**SCOTT THON:** I have more of a question, I think, you know, a question for John. I heard your, the recommendations but the recommendations to me, like sounded like more study. And I guess I would be interested in giving you a bit of a platform here I understand, but what could we change because I hear you, kind of, skirting around the edges of let's go back to the good old days. And I guess my recollection, let's use Ontario, that the good old days weren't maybe so good. There was billions of dollars of stranded costs, there was labour-employee costs probably second-to-none in Canada anyways. And it was an incredible burden on this part of the country. But I am just more shifting back to my question about, beyond more study, what do you say the next steps might be?

**JOHN WILSON:** Well, first I am not saying go back, I spent too many years in graduate history to say go back; you never get to go back to what was. You have to play it, no penalty strokes in golf, right here as it lies. So, what I am basically calling for, I am asking the President of the United States and the Prime Minister of Canada to accept the recommendation of its own joint Task Force and investigate what's gone on in the blackout at a high-level in terms of deregulation. I want to have a look at what's happening with investment and research. I want to have a look at what's happening with the workforce. I want to have a look at what's happening with training. I want to have a look at the bidding system etc. etc. So I am asking, we had a big accident, they had some accidents in California, we had a big accident here on August 14th. We had a huge infrastructure failure. The levee broke and all of the electricity drained out from 50 million people. And their governments quite rightly set-up a task force to have a look and

that task force said let's have an investigation on what the heck went on and is deregulation contributing to this. And so I am saying lets do that, lets do what was promised, lets not go through the façade of setting up the Task Force and then cherry picking its recommendations. Lets have some people come in and I think it will be a boon for everybody because everybody is in transition, everybody is making changes. We have to know what's working and what's not working and we have to know where real damage is occurring. That's what I'm saying. I am not saying go back, you know. I am getting to be an old guy, wish I could go back but you can't go back, but you can move forward and you can move forward smartly.

**FACILITATOR (BRYNE PURCHASE):** Tom, did you ... ?

**TOM WELCH:** Yes, I'll also address John but then I have one for Scott too. But, I sort of share Scott's view, there did seem to be a bit of nostalgia for a past that I at least I never knew existed. I think there really were some issues with the preexisting system to which restructuring was an attempt at an answer. But I did want to comment on a couple of things. One of the assertions is that somehow we're seeing some systematic level of strategic adages on the part of generation. Frankly, one of the things that PJM does under our charter is prepare a market monitoring report every year through our independent market monitor. Looking exactly at that question, there are a number of other independent studies as well. It turns out that the capacity factors in PJM territory have actually improved. We are not seeing the situation where people are not running at peak loads, in fact people are desperate to run during peak periods because that's where they make their profits, that is exactly as the market should work, that's how it does work. We are also, we also, one of the things we study is the relationship between input costs and price with respect to whether or not the outcomes in the market with respect to market price, again speaking for PJM, are consistent with the competitive result. And studies inside and outside of PJM suggests that they are. That in fact the relationship between expected input costs and prices are consistent with the competitive result. We looked at, more recently, we've looked to see whether the distance between the fuel cost and whether fuel-adjusted prices were going up or down and they are going down which is also what you expect from competition. Now, does this prove that competition is necessarily better than another model, I don't think so. I think it suggests some evidence that in fact things are trending towards a competitive result. There are obviously issues that continue to be, needed to be worked on, but I, but I, the, what troubles me about your recommendation, I am not troubled at all about the notion that someone is calling for another study frankly, we're always happy to have people examine what's going on so we can get a picture, a better picture, of what's going on. I think a study which is cast as let's do a study so we can prove that competitive markets degrade reliability, which is what I hear the study being described as, is not necessarily one that I would subscribe to, but I think a more objective analysis of how things are going makes perfect sense. Frankly, I think that is what the blackout report did. I am troubled by the recommendation that the entire universe be put into cold storage until the outcome of this study evolves or at least the outcome that John would like evolves in the study because I think one of the things that all of us have a responsibility to do is to ensure that, as we move forward, you know, as we, as circumstances change, as new evidence develops, as

new market tools develop, new infrastructure, new technology develops, that we adapt both our markets and our regulatory structures to deal with those. So the notion that somehow you could say, well let's not do any more of this, where the this is rather undefined, I think is somewhat troubling.

**JOHN WILSON:** I guess I am referring to the relationship between competition and reliability, etc. Recommendation number 12 in the Task Force report, I mean, PJM may be doing fine in which case I would say you would want to have a look at what's going on across the board because if you are doing fine and other people are not doing so fine, they are actually giving what you are doing a bad name. Probably I'll get in trouble here but Paul Kruggman, the Princeton economist that writes for the New York Times had a column on the mess in California and he started it off with a quote that's about 200 years old and it says if, I'll paraphrase it, if treason succeeds and none dare call it by its name. And he said, when I am in a world of deregulation what I think I'm seeing if deregulation fails it wasn't deregulation. So I think that it is time to have a look at what's going on across the country. At the very least it would pick out good practices and bad practices. But it is not just another study. It is the study after an accident that cost dozens and dozens of lives and burned tens of billions of dollars. It is a study that our government owes to the people of Canada and the people of the United States. So it is not just another pie-in-the-sky, it is a study that needs to be independent. We don't need, you know, to have people sit down and say our policy is good and what we are doing is good. The public wants to have a look. It will gain you credibility because it will enable you to remove the bad stuff, the chaff, and leave the wheat.

**FACILITATOR (BRYNE PURCHASE):** Tom, I think you had a, unless Scott you wanted did you want to respond to that, Tom has another question he wanted to ask you?

**SCOTT THON:** I, I just wanted to support the work that was, has been done already on the blackout report, I don't think that there was any sinister treason going on. I think that the two governments did a great job in procuring panels whether it is what we are doing here today or in the blackout report itself. There are some very, very knowledgeable people that put that together. About independence, NERC, and I think the governments have answered the call for looking at this thing in a very independent way.

**JOHN WILSON:** I wasn't saying it was ...

**SCOTT THON:** The words like sinister and treason, I do not think that that applies.

**JOHN WILSON:** I wasn't implying that to the government and I wasn't implying that to the Task Force, Scott. What I was, my sinister synergy's were saying that when bad behaviour happens in the electricity industry it multiplies the effects of a blackout, so it means that each item contributes more. My quote on treason, perhaps it was the wrong word to use, just means to say that people say if it works it was one of those, if it doesn't, it wasn't one of those. And I think that's all nice to talk about but what we need is, and I am supporting the Task Force report because I am asking them to carry out one of their recommendations. So, I am not bad-mouthing the report, I am saying let's do what was

said. Let's get that independent, adequate study of the relationship between these things. I certainly do not want to bad-mouth it.

**FACILITATOR (BRYNE PURCHASE):** Tom.

**TOM WELCH:** All I can say about sinister is that it seems a little bit like assassination-by-illiteration, but that is a, a question on one of the points you made repeatedly Scott is the assertion that transmission and generation can't compete, that there is no competitive thing, and I guess, was just wondering if you had a response to both the general observation that, in a sense, they necessary compete because you cannot have a system entirely of generation nor can you have a system entirely of transmission? At some point you have to find a balance of how much you want, where. And have you had a chance to look at some of the things that PJM and others are doing with respect to trying to introduce some measure of transmission competition vis-à-vis generation? For example allowing merchant transmission to bid into markets pretty much in the same way generator does, giving some of the FTRs to people who add generation, transmission capacity, recognizing I think, and here I think we do agree, that you do have to have some robust level of planning underneath it. But do you see some role for at least some competitive model in the transmission generation issue?

**SCOTT THON:** I guess my biggest concern about generation competing with transmission is that it de-focuses you from what we, what this, at this point in time, and to John's point about we are playing the ball where it lies and we need to move forward, we have a critical shortage of transmission capacity and so by continuing in an analysis of, you know, generation or transmission I think we need to get on with the fact that no we are not going to build a four lane highway to every customer. But we know where our clear, that we know how power moves in our own jurisdictions and we need to know, that we have a robust four lane highway that goes between those points. Now, generators will decide after market signals and PJM does a great job at doing market signals where they want to build their onramp to that particular highway system and they are going to be responsible for the costs of building the road to get to the highway, so I guess my point was that a central planner in a market can not make that call. But they do in a transmission planning sense have to get out in front of the whole process, build those major transportation networks and then allow the market to come forward and build the lowest-cost generation that will meet it. Just a small point on merchant transmission, odd coming from a transmission guy, sorry merchant transmission, I fundamentally don't think it works. I think it is incredibly difficult to finance given the type of investors in the segment. We've certainly seen a lot of difficulty in having that coming forward and I think that in any commodity market as soon as you build between, on a basis differential, that obviously that basis differential goes away as soon as you relieve the congested constraint,. So, no transmission to me is a piece of infrastructure that is a public good and so merchant transmission is really an incredibly difficult concept in that world, in my view.

**FACILITATOR (BRYNE PURCHASE):** OK, we've had, I am going to take some other questions, we have a question right here actually. I'm sorry, I saw this hand first, so this gentleman, first and then there was one there and then I'll take you.

**JOE ROSSIGNOLI:** Good morning, panel, Joe Rossignoli, National Grid. I would like to weigh-in on the transmission competing with generation debate if I could in support of Scott's views on that. We like to think of transmission helping generators compete with one another, not transmission competing with generation, and that way it sort of resembles, or transmission manifests itself, as one of its principle roles is to enable free trade between markets and let me just try to use that, further that analogy a little bit more. Take a nation with very high tariffs and very little trade coming in and out of it. If you add a single supplier to that protected market what you have is a situation where that new supplier only has to compete with the least efficient supplier within that particular market that has been fattened by such protection over time. If you increase trade by, between that protected economy and other economies that have been made lean by free trade over time, supplies in those unprotected economies not only have to compete with the suppliers in the protected economies but also with each other for the business of the customers inside the laws of the protected economies. So, when you look at it in that way, one MW of generation can't possibly provide or produce the competitive pressures that 1 MW of transmission can provide. That's why transmission does not compete with generation. I'd also like to weigh-in a little bit on the issue, and this is something the National Grid has discussed a lot, is the problem of transmission under-investment in the United States and, I think it was Scott was right in citing independent stand-alone transmission companies as one institution that could help solve that problem and help better serve the cause of long-term reliability. What I didn't hear in the comments was the problem in the U.S., particularly the fact that we have literally hundreds of transmission companies, transmission owners in the United States and what market fragmentation in the transmission sector does to long-term reliability. We feel that the cause of long-term reliability and the greater investment that long-term, that in transmission would help long-term reliability, that cause would be better served by a situation where you have both acid (tacit) ??? ownership and management, ownership and operation consolidated under a single independent transmission company over a wide area. That those companies, what we found and I am a veteran of a lot of planning stakeholder processes in both PJM and ISO and to some extent in New England is that when you have transmission ownership fragmentation it makes transmission cost allocation extremely difficult and contentious, it makes planning extremely difficult and contentious, it makes accountability extremely difficult and contentious. Greater ownership consolidation, ownership and operational consolidation under independent for-profit transmission companies, I think would go a long way toward getting more cost-effective transmission built in the United States and help with long-term reliability. I would like to hear what the panel has to say about that.

**FACILITATOR (BRYNE PURCHASE):** Anything to add?

**TOM WELCH:** Well, I mean that the ITC model is certainly one of the competing models out there, you know, ITC vis-à-vis the RTO, various others. We think, obviously

that there is, that the opportunity to achieve the kind of robust planning that you need to do exists within the RTO structure. Whether the PUCA reform, or the PUCA repeal, under the new Energy Act has some, it could have some very interesting implication for industry-consolidation. Although the kind of industry consolidation you would need to consolidate transmission companies would probably get the Anti-Trust authorities on the generation-side a little nervous unless there was some further industry restructuring that could deal with that. I think there are the, my sense is that it isn't just or perhaps even primarily the ownership fragmentation that makes it difficult to build substantial transmission projects that cross jurisdictions. I think it is the jurisdictional, governmental fragmentation that is at least as much as a problem and that goes, that is not just state-to-state that's all the way down the local community. I remember when I was with the Maine Commission I spent two very unpleasant evenings with roomfuls' of people about 10 miles worth of 34 KV line and when I think of multiplying the exponential aspects of trying to build a 500 KV line from anywhere to anywhere across numbers of states I think that is really where it comes in. I can hear ... the Energy Act there too may have some beneficial effect because people are just now assimilating the significance of the DOE, the Department of Energy and the FERC backstop where states don't act then the federal government can step-in and sort of achieve some common good. So, my own sense is that the current level of fragmentation doesn't, certainly doesn't rule out the kind of consolidation you are talking about. I think the operational model we had at PJM if you could deal with the cost allocation issues, cross jurisdictional issues, cross jurisdiction and some of the planning issues, I think that it would work at least as well, that is my own sense.

**SCOTT THON:** One comment. Although I am not in the debate that has been often going on about whether you have just an independent transmission company acting as a grid co and doing all the ISO functions, oftentimes that has been the debate. You have got that model versus an ISO model where you can have people, vertically-integrated utilities, and everyone co-exists. So, I live as an ITC under an ISO and that is a great second set-of-eyes for us on reliability as well as our ISO is a not-for-profit as Tom was talking about and so any, any disparaging, sinister type of things that might come at me because I just want to go and fill the rate base or whatever it might be, the ISO oversees it and will say no, this a reliability concern and we should address it. So actually having those two co-exist is an incredible benefit in my view from, rather than having these two models competing against each other. I think that independent transmission companies with an ISO, as long as everyone is clear on their responsibilities, is very positive for reliability. Good.

**ROBERT CAREY:** Robert Carey. I am consultant. First, a comment. I have not seen a deregulated market in North America. If I take the Ontario example, we had a deregulated system until 2002 at which point we opened the market; until that time Ontario Hydro was self-regulated. Moving on though, I just would like to comment on the transmission generation issue. We're really not talking about generation as free-standing; generation comes with a fuel supply. What we are talking about in many cases is competition between transmission of the fuel and transmission of electricity. Certainly when you look at it in the economic context that's what you have. But finally a question

for each of the three panel members touching on things that you have all eluded to I think and that is that we have significant siting problems. You Scott talked about planning activity involving market participants and various stakeholder groups, still comes up with a central plan. Tom you referred to the Energy Act and some of the changes there in backstop regulations. How do you reconcile those central planning activities with local interests that normally come to the surface through environmental proceedings?

**FACILITATOR (BRYNE PURCHASE):** Gentlemen?

**SCOTT THON:** Let me make just one comment on your fuel comment which I think is absolutely true. But in many, at least in Alberta, what you end up, what we have found in the market as the generation markets evolved that where generation locates is as much driven by the fuel as anything else. So the coal guys want to be close to the coal mines, the wind guys have to be where the wind blows, natural gas, now that is a little bit of a different story but it does, it is about pipeline capacity. And so, we are in a thermal market, so that's as big a driver, with the natural gas guys it is probably more where can I do a co-gen, get the best efficiencies, so I'll try to co-locate near somewhere I can do that. So those are the things that drive location as much as the transmission. But to your question, that is not local interest in siting transmission is not an easy exercise; there is no doubt about it. I can tell you a little bit of the strategies that we've employed over the last three years had been much more one-on-one than it has been large group consultation. So the consultations that I was speaking about really get you to the plan, I think and then I can stop in my speech. Now you're talking about how do we implement the plan? And really what we call it for siting we call it a kitchen table discussion with every single landowner that you are going through to site the transmission. And, for us that means sending out someone who has a technical background as well as someone who is non-technical more in the public consultation. So that you can sit down with every landowner with a cup of coffee across the kitchen table and understand their concerns. Now, in every case you will certainly not be able to solve it, but I think that it is very important for those people to know that their particular issue has been heard and you've attempted to, if not, address that. And I can tell you over the last three years we have not had a landowner intervention in any of our lines that we've built. Now, have we built 300 kilometers like we are in the process of doing right now between Edmonton and Calgary? No. And of those 3,000 people that we're talking to individually are we going to get some objections? Yes. But, to minimize those, I really believe that, it costs money, you need to spend the money and time upfront to meet with everyone one-on-one. That's the only way that you have some chance for success.

**FACILITATOR (BRYNE PURCHASE):** Thom, I think that you wanted to ...

**TOM WELCH:** Yes, I certainly agree with the level-of-difficulty and the need for individual contact, it is a tremendously expensive process and, candidly I think, my initial reaction when you said you had no interventions was that we should just move our whole system to Alberta because I think the probability of getting no interventions on a line from say West Virginia to New Jersey is astronomically small. The issue, we are currently engaged in trying to address exactly this problem and really trying to do it at

two levels. One at the, at one level we're trying to ensure that the people who are going to be most directly responsible for building the transmission which is to say the transmission owners have the appropriate economic incentives and assurance of timely cost recovery that they need and right now that really doesn't, isn't, in place, and needs to be in place, that's both at a state, retail and federal, more conceptual, level. At a somewhat different level, we are looking at a project, sort of a classical example moving coal by wire for example from West Virginia to New Jersey where you've got the load, West Virginia has a lot of coal and the desire to build some coal plants. As to what it would take in terms of governmental and NGO approvals, cooperation, whatever in order to have that happen and one of the key pieces of that is being able to articulate very clearly what the benefits are of doing it because nobody is actually going to like seeing those 500 KV towers anywhere close to them and finding a way of either ensuring that benefits accrue to basically every significant subset that you are going through or finding a way of taking some of benefits that go somewhere else and reallocate them at bit. Very difficult equation. There is a situation right now in southwestern Connecticut which parenthetically is the richest community in North America, you know, in terms of counties, where they have been struggling for years to find a way to build a 345 KV line which everyone agrees that they need but of course it is across the most expensive real estate in the world, more or less, and, you know, they haven't quite found a way to solve the equation. So, we're trying to sort of get behind that a little bit, figure out if there is a way of at least matching the benefits and, but, I don't have any doubt that at some level the, whether or not the federal backstop, the ability of the federal government to step in and require a project to be built will actually be invoked but I think the possibility that it will be invoked may moderate exactly how some of the state and local siting authorities behave. And just based on experience one of the things we saw in my former state of Maine, it was the, under United States law the natural gas pipeline siting has been for some time under federal authority. A major pipeline was put in the state of Maine. From the time it was first proposed to the time they flowed the gas was, I think, under three years; extraordinary. All the same people were objecting but they knew that at some point they were not going to persuade local authority and that wouldn't be enough. So, maybe that is going to help get through it. I think that the comfort that people have with that is going to depend exactly on what Scott was talking about. You really have to go to them individually and say, listen we know this is an issue; we'll accommodate you to the extent we can and buy you off to the extent we can't.

**JOHN WILSON:** I think in a deregulated environment we have much more just-in-time things happening, and I used to represent community people who went into areas across Ontario to try and talk to owners, owner by owner, across the province, and we just tried to put a transmission line and generation into the province and neither one flew. Both of them, people didn't want them in their back yards, again it is a community that's upscale and growing rapidly but getting it through, and it didn't look from the outside and I'm no longer on the inside as if we devoted the time to do that. Who you're missing on the panel today, Jose Delgado from the American Transmission Company and that was his view, you start a long way ahead and you go owner-by-owner-by-owner and you sit down and you sell the job. Now when we are putting in generation and we're putting in

lines and it is at the last second because that is the most economical thing to do, we should expect to have some big problems.

**ROBERT BLOHM:** Hi, I'm Robert Blohm, consultant, I would like to address ...

**FACILITATOR (BRYNE PURCHASE):** Just one second before, could you keep it fairly ... Thom

**ROBERT BLOHM:** Yes, I would like to address the two questions that are on the board and for comment, and one is how is the best way to mitigate restructuring's negative impact, to make markets complete, and markets today have been very incomplete because they haven't dealt with the very important reliability component of interconnection which is unscheduled power. Unscheduled power has not been priced properly and what happens is that it has been used as a workaround around scheduled markets; sometimes it's free, and so on. Its value also, the attempts to value it, there have been attempts, is to somehow do it on a basis of the energy value alone. The value of unscheduled power is reflected in frequency or instantaneous deviations. These are deviations from scheduled power. All scheduled transactions are balanced and, when power is delivered or taken as scheduled, frequency will stay constant at its target. The fact is that it never quite is and there are deviations, you know one way or the other. Some deviations go in the direction of hurting system frequency and moving it off. There are other deviations that compensate; those are good, those are called ancillary services. They aren't paid enough and in some cases not paid and the parties that cause the deviation, the instantaneous deviations, aren't penalized. Until we get our handle on that and can create proper pricing for that, the scheduled markets aren't going to work properly and that is the key to reliability errors. Scheduled markets do not address reliability in terms of system stability, and reliability in the proper meaning which is emergency reliability, not economic reliability, and we have to get those two concepts clear because number two is sort of a question here about transmission, is sort of addressing the economic reliability. Congestion is not a reliability problem: it is an economic problem because there is a segment of transmission that deals with what is called ATC, Available Transmission Capacity. Well before you determine the ATC, you reserve a portion of transmission for reliability needs, and that's it and, so, building more transmission to relieve congestion is irrelevant. Number two, transmission: a lot of transmission can be counter-productive. For example, local generation actually turns out to be more reliable than remote generation because in remote generation you've got two things that can fail. You've got the generator but now you've got the transmission line as well. So that is not an unproblematic issue and in fact, you know, there are two or three solutions to congestion; you know, transmission is one, and so is local generation and also load-response. You know, you know, I was involved in a case in New England in Vermont with, you know, in a problematic case like this where there is a lot of imported power. In the New England ISO, in reserves, the deliverability of reserves doesn't count. There's 6,000 MW of remote stranded generation. There is a preference within the system to build transmission in order to deliver this remote stuff as opposed to having local generation. There is also a misunderstanding. In fact this came out in the proceeding where the system, the resident

of the ISO, actually stated that loads have no reliability benefit in terms of frequency control like generation does and that is patently false. Texas has a program called LAAR, Loads Acting As a Resource. They, those are loads that voluntarily relay to be cut off. They account for, every day, at least half of the reserves, the control reserves. So, what I am trying to say in these proceedings, you know, is sometimes, sometimes transmission is appropriate, sometimes it's not. There is a lot of bias that enters into it and you get people who just aren't used to looking at loads one way or looking at transmission the other way. Take into account environmentalists, in the east and the west ... .

**FACILITATOR (BRYNE PURCHASE):** Sir, sir ...

**ROBERT BLOHM:** Just a concluding comment. You know, environmentalists love transmission in the west because it delivers wind power but environmentalists hate transmission in the east because it is an eye sore and even wind power is an eye sore. So you've got all kinds of factors involved here that make these issues worthy of much closer examination as well as of focus on what are the true physical reliability issues that we have sorely overlooked in favour of economics that, of scheduled-transactional economics, that's irrelevant to reliability. And we haven't applied economics to the ancillary services issue which Standard Market Design put off and said we'd do later. That was the key thing we needed to do.

**FACILITATOR (BRYNE PURCHASE):** I would like to thank you very much sir. I do not know that, that warrants, I don't think there was a question there but it looks like my panelists are anxious to respond, so I'll give them an opportunity

**TOM WELCH:** I hope that I'll be shorter than the question. First, you are right; markets do need to be completed. Frankly, I urge you to look at markets like PJM, we do price ancillary services, we allowed demand to play an ancillary services, we count on demand as actually, for exactly as you described, in terms of having that the situation is addressed. And I think the point on congestion is a fair one. I think it is at some level fundamentally an economic issue but it does require you to pay attention to the reliability. Reliability always comes first in the hierarchy of what we do but you tend to operate close to the limits because of the economics. I think that is certainly appropriate. You're getting efficiencies.

**SCOTT THON:** Ancillary services should be paid for, and are and I do support the load-response piece, absolutely. Those that are on for a free ride, unscheduled flows, will be found and they will be penalized; totally agree with that. Generation is not more reliable than transmission, local generation. If you think about reliability must-run, so this is a guy, he is higher cost than the markets, receiving some kind of payment to run. He has a whole host of other economic drivers for him that, that reliability must-run, contracted, receiving from the ISO or who ever, often does not makeup a big part of his income stream, so he, ya, he's under that contract, but boy he has some other market forces that are driving him whether he wants to run or not. And that always is a very conflicted kind of decision from the management of that particular plant, so I don't submit. And then congestion, sure, there is an economic piece to that, but fundamentally if you do not have

enough generation in an area and you don't have the transmission to deliver the power you've got a reliability problem. So it's not black and white it is not just a commercial issue and it's not just a reliability issue.

**FACILITATOR (BRYNE PURCHASE):** I have one gentleman who hasn't had an opportunity to say anything this morning and wants to have a question so I can exercise my discretion as chair and acknowledge him, so Sir, you would like to come up?

**RANDY HUGES:** I will try to keep it brief. My comments actually will be addressed to Mr. Wilson on his, on the nasty assertions for the generators. My name is Randy Hughes, and I am from Bruce Power. For those who don't know, Bruce Power operates 6 nuclear reactors here in Ontario. We are the largest independent power producer in Ontario and the largest nuclear operator in North America. Bruce Power was formed as one of the de-merger companies when Ontario Hydro broke-up the generation into a number of successor companies. Since the time that Bruce Power became private, we have re-started two nuclear reactors that were shutdown by the previous owner. Also, since that time if I could just rime-off a few other things, from safety performance, nuclear safety, the nuclear waste production is reduced considerably, the doche-rate ??? for employees have been reduced significantly, the forced outage rate has been cut by a third, the capacity factor has increased from 75% to 82%. In 2003 we operated four of the five top CANDU reactors in the world. In fact, in 2004 Bruce Power produced 20% of the electricity consumed in the province of Ontario. The world nuclear family thought so highly of Bruce Power that in fact they have selected our CEO, Duncan Hawthorne, as the chairman of the World Association of Nuclear Operators. The point that I am trying to make is that there are success stories in an open market, in a private market, and you don't have to look very far sometimes to see them.

**JOHN WILSON:** Right, I am not really pointing the finger at Bruce Power. I know a lot about Bruce Power, I have done a lot of studies on it including your predecessor-owner, the British nuclear people from England, but what I was saying is that there are generators who are doing bad things and if you want to sit down and go through the proceedings that are taking place in California you will find that some pretty evil things in generators have shutdown etc. etc. So I am not pointing the finger at an individual. I am saying in a situation where people have pressures brought-to-bear upon them, in the wrong direction, you will find more people behaving badly than you would in a situation where they are not, and that's a tough one to deny.

**FACILITATOR (BRYNE PURCHASE):** Thank you very much. We will now break for lunch. You are on your own for lunch and I'll see you back here at 1:15. Thank you.

**FACILITATOR (BRYNE PURCHASE):** Welcome back. We should try to get started and we can end a little early perhaps. So, welcome to panel number three, but before I introduce our topic and our panelists, let me deal with a couple of housekeeping issues. First, I would like to remind you to fill-out your evaluation forms before you leave, so, in a non-exciting moment when you are sitting there you might want to tick those boxes off. And, again, I want you to remember that hopefully you will get an opportunity to speak

here and I definitely encourage you to come forward with your questions and/or statements. And, but, if you do not, you know you can submit comments to our website, again, and we'll show you what the website is at the end of the session. Now, panel number three is entitled "The Appropriate Role of Markets and Technology in Safeguarding the Public Interest in Reliability", and we have again two specific questions that we've asked the panelists to address. I am not going to bother reading them you can read them for yourself presumably on your agenda or on the screen here. But, we have, once again, three very-well qualified and independent experts on these issues. To my immediate left is Jack Casazza who is a, who for many years worked in the power industry and he is now, in fact, is a founding member I believe of the Power Engineers Supporting Truth, otherwise known as PEST. Then we have Mr. Kellan Fluckiger who is the Executive Director of the Electricity Division of the Alberta Department of Energy. And then we have Professor Bob Thomas who is a professor of electrical and computer engineering at Cornell University. And so I'll ask each of these gentlemen to come and speak in turn starting with Jack. Jack, please.

**JACK CASAZZA:** Thank you Bryne. I am going to start with first an apology followed with two comments and the last part of the introduction is to admit some serious errors I've made in some of the things that I have said and done. First, my Canadian background is poor. As you probably know, when I say something it is because that's what works in the United States, it isn't necessarily true in Canada, so if I say some things that aren't correct, forgive me. The little I know has been helped very much by Dave Goulding and Scott Thon. I've read their papers again a second time and I find that I know a little bit more now. As far as comments go, I am still unhappy with the title of this session. It's Competition and Reliability in North American Energy Markets. It should also say competition and reliability in North American energy systems. Remember, if I leave you one message, systems deliver power, systems are where the reliability is determined, not the markets. Scott Thon has made this point a couple of times; markets do some things but they are not the determinaters of the reliability. Second comment I would like to make is, recommendation number 12, and I am going to support John Wilson on this. What the recommendation number 12 which lead to these meetings say, it recommended that a government commission, independent study of relationships among industry restructuring competition reliability, it made the strong point that the relationship between competition reliability is important and complex and it also recommended, and this I got a copy if anyone wants to read it, that in this work 11 different items be taken into consideration as part of what we are doing. It so happens that this workshop is not doing that and my hope is and I think that we are accomplishing some good things, but my hope is that this workshop will lead to the kind of investigation that was recommended originally. Alright, let me make one other point. I sat here this morning and tried to listen to what was being said, very carefully, because sometimes I get tied up in my own ideas and I don't listen carefully enough, but I tried to listen carefully this morning. The discussion this morning was predominately concerned with how-to-fix the system we have, how to fix what we are doing; it was concerned with procedures. Very little of it was concerned with what should we do; that is an important point it didn't decide what we should do. My view, as an engineer and I think as an executive, was to decide what it is what you want to do and then you figure out how to get it done; don't do

it the other way around, we tend to do that all too often. Let me talk about question number one, the market principles, are they limited to safeguarding the public and if so, what are the limits and ability to address these limits? Scott Thon made important comments basically telling us learn what the markets can do and can't do. Now we may have disagreement as to what the answer to that question is, but that is certainly something that needs to be done. I believe that there is a fundamental problem in reliance on markets to solve completely very difficult scientific and technical problems. I have been involved with system design now since about 1950, that's a long time, and my experience is that markets cannot get the right answers to the system design; you have to get them and let the markets function within them. Electrical power systems are very complex technically. They are different from any other system. In fact an electric power system, the older I get, I begin to realize the miracle that it is. We take a piece of coal or some atomic fuel or some water in one location in one form, convert it into electron vibrations, send it huge distances and convert it back into some other form of energy controllable with a switch; lights, computers other things. The scientific achievement of electric power is an amazing one but it is also a very complex one. Don't forget that it is all done with electron vibrations; electrons don't flow. It is the electron vibration that does the work. Now, in such a system there are complex technical decisions that have to be reached. My experience has been that these complex technical decisions require cooperation between the participants whether or not you have got two or 200; cooperation is needed. Right now we have, as everyone has pointed out, many more participants which makes this a more difficult problem. I'll give you a specific example, Mr. Tom Wilson is here from PJM. In designing the PJM 500 KV system and the ties to other regions and so on, a line was put in, a transmission line was put in that carried no power, absolutely no power but it was essential to maintain the stability of power flowing in the opposite direction. 500 KV line costs a lot of money. Now, this kind of line would never be built under the present competitive procedures simply because the payment for lines is based on the flow on the lines, not the lines' value for reliability. There is a fundamental flaw in the way we charge for transmission services. We do not charge based on the value to reliability, there have been quite a number of articles written on this subject. What are some of the solutions to this problem? I think one way to do this is determine the system reliability requirements without regards to markets, without regard to who owns what. This is a technique used for quite a number of years, I chaired in PJM the coordinated planning committee for about 5 years and the approach we took and I wanted to take it is, let's forget what company you're from, we all wear the same uniform, we are all trying to get the right answer for the region here and what we want to do is analyze the region as if there were a single owner, us, and we are going to operate and develop the system in the most economic manner for the consumers that are supplied by this system. That meant that we had to use reliability criteria in the studies, that meant that we had to base the operation on the minimum generation costs, incremental costs. This was done and we would come up with what transmission lines were necessary if we were all a single owner. I think we can still do the same thing today. We need to take a look at, not what the market causes us to require but what does a system cause us to need. Look at it as if we were all a single owner and come up with the answers we need. These will be the reliability requirements. Now, you've heard about transmission constraints, I agree with this morning, a number of people that transmission constraints are economic

limits and they will change from time-to-time. You put another generator in, the fuel costs change, the location of marginal prices will change, they can change hourly, they can change all the time. The transmission limits that we're looking at are economic limits and as such we need to be concerned, but they are not the reliability limits. The answers to those limits is to deviate from the economic schedule and when it gets to the point with a deviation, the cost to the deviation, is greater than the cost of remove it, you remove it. But I think the reliability requirements, we need to get a far better answer as to what they are and I know, Joe, you asked me to talk about what types of studies I think we need, that's one study we absolutely need to make. Forget who owns what, let's get the right answer for the public and based on that, that's not necessarily a blueprint, based on that, the rest of the work can be done recognizing where the true reliability problems are. There are some other techniques for finding where the reliability problems are, not where the constraints are reported. Every system dispatch computer is checking continuously every few minutes or whatever time-cycle they use as to all the different signal contingencies. Whenever you get one where a signal contingency would cause an overload and a possible cascading in some other line, if it tripped out, it is a hit, I call it a hit. Records are kept of these things in logs in companies. Keep track of where hits are coming, where the risk, where you have been in thin ice and how often, and if they are occurring in certain regions repeatedly, these are the areas where you've got your reliability problems, not where there are economic constraints. The economic constraints you adjust for them with transmission load-relief and that kind of thing. In doing this kind of thing, you need cooperation of all the participants. One technique that has been used in the past, I think that it is almost all forgotten, I have probably negotiated about 20 of these contracts in my life, called coordination contracts. Basically, companies get together, two, four, six, and say look, we are going to operate our systems as if they were a single owner, we are going to operate in the optimum economic manner that as of a single owner. And someone will say, ya but that'll cost me money. The answer to that is you have a contract where if Company A does something that costs them money but benefits Companies B and C and the benefits to Companies B and C are greater than the benefits to Company A, you should do it, and you sign a contract that basically recognizes that you will reimburse Company A for their extra costs plus a share of the savings. We could use in the States and a lot of other places coordination contracts right now that would help us to obtain this ideal of optimizing as if they were a single owner even though you've got different owners; it is an approach that could be used to help solve that problem. Let me talk for a few minutes now about the next question which deals with aging work force. That's a sensitive subject; I don't know why I got that one. When you get old it is like good wine if you take good care of it. What are some of the facts relating to this? One, median age. I've got a lot of data because the unions give me this data and I get some from the professional societies and other places. The median age of utility workers is significantly higher than the workers in all industry, all U.S. industry; the utility workers are older. One half of the utility workforce is over 45, that's, and people take early retirement. The personnel affected by this aging problem are the unionized workers, the crafts workers, the professionals and they are the management, there's a lot of them. There are some effects, in fact the Post study about 2002, DOE's Post study, there was some data presented which I've looked at, the effect on maintenance, and also another study, is that the maintenance expenditures were reduced

by 25% and the time between routine maintenance, if you did routine maintenance on a circuit breaker every 2 years, they changed it to every 4 years, it doubled, the routine maintenance doubled. This is, in part because of the driving for cut costs and make more profits and in part because you didn't have as many workers around. I am not sure which came first, the chicken or the egg; fewer workers or efforts for profits, but they were related. The decline in U.S.A labour force over 10 years was as follows as the Department of Labor data. Power generation, the people in 10 years involved in generation, declined from 350,000 to 280,000. And transmission and distribution declined from 196,000 to 156,000. In 10 years, there is no question that there is going to be a major shortage of skilled people, line gangs and so on. Let me talk about why and then I'll try to give you some answers. Part of the reason, and I am going to keep repeating this is the inadequate qualification of the managers in the industry and in some cases government and the university. I think part of the problem is that university faculty sometimes doesn't understand the functioning of the utility business. I served for about six years on a visiting committee in a major university and I found that the department of electrical engineering was very interested in solid state physics and computers but not very interested in electric power. There is a lack of understanding what people really do, how they learn; there is a lack of understanding. Most of us learned by the, I call it the Dr.-intern approach. This is the way we've learned from our parents, they showed us things, they set examples and in industry we learned from the persons that were there before us. Unfortunately, a lot of these, there is a gap between the people who had the knowledge and the new people, so there has been a gap in what people know. Programs were adopted by companies to encourage early retirement. There were some very important reasons for this, it added to the profits. When people retired, and I think that it is about 43 years of age, there is a net benefit to the company anytime after that because their payments after they retire are transferred to the pension fund and don't show up on the company books. It is a separate fund and they come off the payroll and the people who have retired are replaced with somebody at a much lower salary. Another problem has been the dissolving of technical knowledge amongst various organizations. For example, the planning departments in most systems which is where, and I know this is true in Ontario Hydro I knew so many people up here that are excellent, most skilled technical people are in the planning department. That is where they sort of gravitated because they got the kind of interesting technical work they like. But the planning departments were done away with in major companies, company after company. A company I worked in, we used to have a planning department of about 100 that doesn't exist anymore. AEP, CONED, you look around, they did away with the planning departments because the market was going to take care of determining when we need, you didn't have to sit here and figure out when we were going to need this line or what voltage it should be, that kind of thing; it was done away with. I have a copy, I'm going to put it outside, of a letter that I received from a retired engineer which I think you might be interested in. This was in the past couple of weeks. He's retired from a company where they used to have more than 200 engineers, they have 26 now. And this company is putting in some transmission, a transmission cable in fact it is a 345 KV cable which involves some special switching problems, and they weren't going to look at the problems that come about from the recovery voltages and a lot of the other things, the problems, you get in when you switch a large cable which acts as a big capacitor. So,

they called him and he said, well we had problems with that kind of thing in the file back about 1988, look in the file and you'll find a lot of information to tell you the nature of the problem. They threw the files out. Management threw the files out with the engineers. This is a real-world. I've got a copy of that letter out there and it is heart-breaking cause he tried to help them, he was not trying to get them to do the wrong thing, he was trying to help them. But this kind of situation where the personnel is no longer available to do the work, hasn't had the training, is going to lead to reliability problems. If they had put that thing in and don't recognize the problems with the transformer specs involved and other things, you're going to have reliability problems. If not there then somewhere else, you're building up the chances for it. I sent a copy of this letter to the head of, a man who used to be the head of the engineering department at another major university, did I send you one Bob, I don't know? This letter is interesting because this professor said we used to have courses to teach the procedures how to do this, and why you needed to do this, he said, nobody took them. The net result is that we don't run these courses anymore cause universities doesn't run courses for which no students are available. So, he thought this was exactly the problem of the university faculty the fact that they're not doing the studies that they need. And this again is partly related to the shortage of personnel because the, and the age of the personnel, failure to transfer knowledge what needs to be done is important. Let me talk for a few minutes about solutions. We need new training programs at all levels. At the executive level, unfortunately some of our top people in the U.S.A. don't have the technical background they need. We would love to give a course to the Federal Energy Regulatory Commission, all the Commissioners, helping them understand how power systems work. They are not interested, they don't think that, is what the law says, that's all that counts. Some of these courses should use, and there are a lot of people out there, retired people who have knowledge and can contribute it and do it at a reasonable cost. So a lot of the work we do we don't get paid for it, we just do it. And one of the questions was what's the effect of technology? It may help in some problems, it may make them worse. When I got out of the service in 1946, I was in a training program for the company and I asked to go to line school, and I went through line school and qualified as a lineman. I wanted to understand the problems of the lineman by doing some of this and some of you others have done this kind of work. Those days, you climbed poles with what you called hooks where you put the hooks in and you just went up, you began to realize that it was pretty hard work going up a 30 foot pole, especially when the wind is blowing. Then low-and-behold, new technology: bucket-trucks. Nobody had to climb anymore, they sat in this thing and they got lifted up. That helped, that was a technical achievement that helped relieve a shortage of workers, it did. Now, are there other similar, and this is thousands, tens-of-thousands of linemen out there, this helped make life easier for them. Are there other similar technical things coming along? I think we are going to have increased safety problems, very severely increased safety problems. Distributed generation, energy storage, when people start to have some of these things behind the meter or else out on the line in the substation it makes the problem of the linemen and the personnel far greater. Safety is important. I've, one thing I'll always remember is that I sent someone out on a job once and he was electrocuted; I'll remember that all my life because he was a friend of mine. It's easy to have people killed on a job. I know people concerned with safety in the IBEW and they are concerned about new technology, how it will affect safety and what can be done about it. But the,

there is going to be much more complicated equipment. The days when you had a relatively simple device is, now you're going to have devices with sensing in and feedback in and smart things you need for smart systems, you are going to have much more complicated things which are going to make the job of people much more difficult. And as far as what can be done about this, a couple of more items I think will tie-in with what John Wilson said and what I said before about the need to look at the system as if they were a single owner, is to do a thorough study of what the reductions in personnel have meant to reliability in this system. I have got specific examples but this should be included in an investigation, is what has reduction in personnel done? I think we've called for this in the report we wrote and we think that this is something that should be concluded in any future work we do. Now, I've used some names on some of this. I said let's make a National Power Survey, somebody else has said let's do an investigation of the blackout. My, I don't think it is important what we call this thing, and some people say we don't want any more study. I think you need these analyses, don't call them studies, call them investigations, call them what you want but we need to take a look at how these things have effected our industry, our company and the public we serve. In conclusion, I would just like to thank the people from Canada for the courtesy for taking care of us so darn well, and thank you very much Tom and Bryan.

**FACILITATOR (BRYNE PURCHASE):** Thanks Jack. And I am now going to call on Kellan now. Please.

**KELLAN FLUCKIGER (Alberta Department of Energy):** I appreciate the opportunity to speak again today. I had the chance to talk in Washington and I was on the first panel there and the last panel today. I didn't know if that was because I was so boring that day that they put me at the end today or I was so noisy that they decided I should be after lunch to keep everyone from going asleep. So, you can decide. The questions were interesting and the first question deserves a direct answer. You know, are the principles, are market-based principles limited in their ability to accommodate the public interest in electric reliability? The answer is absolutely yes. One of the things that I have said, and I do not mean this in a bad way and that is nothing to slag on markets, something that I said in Washington that I am going to say again and that is the most serious mistake we can make is to assume that markets do things that they don't do. They do some things very well, they allocate risk and capital, they create price signals, they drive efficiency, they do those things and they do those things well. Markets do not have a conscience, they do not create social policies, they don't do things they are not paid to do, and that's OK. We need to assign responsibility to markets for things they actually do and do well, and things that are not in that category, we need not to sort of imagine they will be handled. Jack mentioned we sort of assumed the market would take care of stuff, and the word stuff included a whole bunch of things that were actually not specified and named, and that has gotten us into trouble. So I want to specifically talk about, not just articulate a problem, but to talk about it in the context of reliability. In the world of an integrated utility, it takes certain things to manage the reliability of a power system which Jack alluded to. It takes certain technical things and those things were accomplished in a vertically-integrated utility in a regulated fashion. That's fine. If we want to make sure that we have the same kind of reliability now that we had before, I have the following

suggestion. We need to articulate specifically what elements were required to maintain that reliability, both technical elements and other elements that were in terms of cost-recovery and management of the assets. So specifically, what elements were required and who did them, was it the vertically-integrated utility, and why did they do them. One of the interesting points about that is that when you have engineering and those kinds of disciplines in a vertically-integrated utility sometimes the reason things got done is because they needed to be done. So engineers said we have to have a certain amount of reactive-support, or we have to be able to support this you know, first-swing instability with this or that, and so they built in those factors and they built them in they simply needed to be done, and cost-recovery principles allowed those things to be done. As we have segregated markets we've broken the bridges. We've taken generation and put it over there, we've created transmission companies or wires companies, we have marketing entities, we have risk, you know places where they lay off risk and so forth, we have distribution companies, we have customers, we have metering companies, and we have broken all the bridges. We need to take the same list of things that are essential to maintain reliability and perhaps add to it. And I would suggest that there are more things that are required to maintain reliability after the breakup and I'll give you an example. Some new things that are in the lexicon since deregulation are market-monitoring, market-behaviour, those kind of things, are new elements that didn't manifest themselves because under a regulated regime, power trading was, you know, split-savings, and it was a boring, regulated exercise. With the introduction of the profit motive, which does bring the benefits of markets, drives efficiency and those kinds of things, we have new offices. Offices of market investigation and oversight, we have a market monitor in California, we have market surveillance administrator in Alberta and so forth. But we have to take the same list and then decide, OK, who exactly is going to do this and how are they are going to get cost-recovery because market elements do things for profit as they should and they don't do things they are not paid to do. So, if we find that in breaking the bridges of the historical reliability matrix we have left some things in limbo, they have to be directly assigned and you have to figure out how the cost-recovery is going to take place for those elements of reliability and if we don't do that they won't get done. One example of this that has nothing to do with, and so the question comes up in the context of the eastern blackout, did markets or do markets cause blackouts and the answer is no they don't. Perhaps our failure to understand what things do and don't get done by market forces may contribute and perhaps breaking some of these bridges and failing to assign responsibility correctly may contribute, but markets themselves simply do what markets do best, allocate risk, capital, respond to price signals, create efficiencies and do those kinds of things. So, the suggestion that a cause of blackouts is not, is not grounded, but it is in our interest if we want to see the market elements successful in places they can be, in the provision of electricity and maintenance of reliability, it's critical that we understand what they do, what they do best and let them do that, and then residual assignments for other elements that are not priced and sold in the market context need to be done in the regulated context. As prices started to go up with the oil prices of '70s and overruns in nuclear and QF miscalculations about gas futures and all that kind of thing, we ended up with a huge squeeze in the places that I worked at least on regulated companies, cut costs and so-forth. We ended up, perhaps, doing less maintenance than we wanted to, we ended up with trees in lines as the cause for a number of blackouts. That

had nothing, that was perhaps as much regulatory failure as anything else. That was failing to recognize the effects of things that we were doing to the regulated utility. We've now done a similar step, we've created deregulated generation markets in some cases deregulated distribution and meter markets depending on the design in different places and the critical element, again, is to recognize where each of the responsibilities lies and where each of the bridges that we deconstructed by deregulating or by restructuring, where each of those bridges and the essential information went. One of the casualties of deregulation has been accuracy of information because we have now created a whole class of information that is competitive and is closely held, trade secret type information, the accuracy of information and its timely availability has been a casualty because of competitive forces. And it is the ability and the requirement to have accurate information to run the system, as Jack calls it, is critical, and we must find a way around that by defining the information, who has it, when do we need it, who needs it and get it there on time in a way that doesn't compromise, or minimally compromise, its financial value, but at the same time maintains the integrity from a reliability perspective. I am going to elect to talk here in my initial presentation shorter and leave more time for discussion at the end because I think that is where the value is. So I am going to stop with the first, some discussion about the first question, except for one other comment, and then I'll make a brief comment about the second question. NERC has started this process with its functionalizing and you know, looking at the functionality as opposed to the historic look of reliability criteria and that needs to be carried to a much greater degree having to do with information, having to do with all of the pieces that are required to maintain system reliability and then overlay them on the new context of the competitive marketplace. And so, the beginnings that NERC has made with that functional analysis is important and we need to carry that through and make sure that it is complete in the identification of needed actions and who does them and particularly how they get paid for them. In the old regulated world everything was cost recovery and in the new world where some things are driven by profit motive, again there is nothing wrong with that, but we can't pretend that there is going to be extra frills associated with those entities that are driven by the bottom line because, again, markets do not have a responsibility for reliability; they do not have that. They have a responsibility to respond to price signals and construct and locate generation where it is economic to do so and to pick the technology accordingly. The second question about an aging workforce, I think all industries face that issue. With respect to electricity, because of its technical complexity, this is particularly important. Many utility companies, engineering staffs, technical expertise were raided and put into different companies scattered out across the number of market participants. Alberta went from a dozen or so to 200 market participants. If you look at the number involved, a number of those disciplines are financial but many of them also involve understanding the technical nature of the grid. Where is it good to own options and swap, and you know, power plants and transmission rights and those kinds of things? A lot of that information came from the technical knowledge of the technical staff, engineering kind of folk. And so as we have scattered those out amongst market participants. It is no wonder that the coverage at the traditional utility has become thinner, that can be a concern. It is for me and I believe, and this is the last thing I'll say about this, I believe that it is actually more complex both from a technical and a regulatory perspective, more complex from a technical and regulatory perspective, to run a power

grid where portions of the provision, the supply chain, are deregulated and subject only to market forces than it is to run it as a regulated utility. That doesn't mean that it is worse, and that doesn't mean that we shouldn't do that or that we should back-track. I'm not suggesting any of that. I am suggesting that it is more complex regulatorially, more proceedings, more market participants, more issues, you know, less clarity, and it is more complex because the number and nature of transactions has also gone up exponentially as all of you know. Given the fact that it is more complex from a technical and regulatory perspective, it requires more expertise, more effort and a constant ability to learn from our experiences and apply those learnings to improve the future iterations. Thanks.

**FACILITATOR (BRYNE PURCHASE):** Thank you Kellan. Now I'll call on Bob.

**ROBERT THOMAS:** First, let me say I am pleased to be here in Canada. I was born and raised in Detroit, Michigan, and we used to go across the border all the time; back then it was nothing we didn't even notice. I don't think I learned that Canada was a foreign country until I was about 16. Somebody pointed out that there were two different flags and I have a lot of friends in Canada so it feels in some ways like coming home. I understood that the charge to this panel was to comment on the relationship between markets and restructuring and to provide recommendations on how, in our opinion, to best manage that relationship as we go forward. It's not about whether restructuring caused the 2003 blackout, I think we all recognize and understand it was a contributing factor in lots of dimensions but that's not constructive. We want, in my opinion, to learn to manage the severity of blackouts because after all we have had them prior to restructuring and we will most likely have them again in the future. It is not what this is about, it really is to ensure that we don't excite the same modes-of-failure that caused the August 2003 blackout or the 1965 blackout or the '77 blackout, we want to learn from these incidents and we want to improve the system designs as we go forward. This is I think the most complex system constructed to-date. It was recognized by the National Academy when we had the turn-of-the-century change as the most important invention of the 20th Century and one of the most complex systems to design and manage that there is. So we all take pride in that and we all know how difficult this is to do. My take on the question though is, and we talk about reliability and we talk about economics that no matter what, reliability has to trump economics in every situation. It has to be that way because this industry has such an effect on the economies of our countries, of our respective countries, and we cannot fool around with it too much. Second thing is that reliability is far too important to leave entirely to markets and I think that Kellan made the excellent point that markets shouldn't be asked to do things they cannot do and they have been and we need to understand that better. When I talk about reliability and when we talk about it amongst ourselves as a technical topic we are really talking about two things. And one is the operational reliability and that concept is that we have the required assets to meet the demand in the face of all credible contingencies. Contingencies are the key to reliability in an operational sense. The other part of it though is adequacy and that is that it takes a long time to build things, to plan and build things. By the time you go through the process and Jack knows more about this than I do but the adequacy problem is a very difficult one and it is one that markets are failing to solve. And it is probably the most important part of the reliability problem that we have to work on now. So the legacy

transmission system that we have out there has not only to support all the market transactions, something it wasn't really designed to do, but it also has to have the real and reactive reserves and in the right locations in the networks that allow the system to survive the credible contingencies on a real-time basis. So reliability is a constraint on the economics. If we go back to the designs of the '60s, that was a highly, in a vertically-integrated environment, that was a highly reliable cost-effective system. It was cost-based rather than value-based which is what the markets are and it also became over the long-term very cumbersome to make changes in that system. It was full of one-of-a-kind components, there were no training standards, there were loose reliability standards and so on. It really lacked the incentives for technical innovation and relied on massive redundancies for reliability and in some sense, thank goodness, that the system was built that way because we're the beneficiary of that philosophy today as we are in the middle of this transition. It would be far worse if that hadn't been the case. The system of the past is one that would have as it evolved would have eventually ignored the information in terms of the communication and computing revolutions and the institutional arrangements that were created as the result. Having said that let me talk about markets for a little bit. Markets are about creating incentives for people to take risks and about paying those who take the risks in an appropriate manner. Regulation is about, in my opinion, removing risks when it is in the public interest to do so. So an important notion or concept that I talk about in my paper is one of the notion of private versus public goods, and the question is why is that an important distinction to make? Well, economists believe that efficient markets can be created for private goods while regulation is essential for efficient use of public goods. If operational reliability or security is a public good, the amount provided and the price paid for it should be regulated. And if reliability trumps economics both planning and operations will be significantly affected by the choices made. So what is a private good and what is a public good? Well, a private good is where the consumption of the good, my consumption of the good doesn't affect your willingness to pay. If I buy a hamburger at a fast food stand, there is lots of hamburgers, and the fact that it costs x dollars, you can decide independently whether x is an OK price to pay for it or not and its not going to effect if I am going to buy one or not, or consume it. A public good is one that you can think of as exhibiting a free-rider effect. That is, a good example would be air quality. If I decide, if we decide we need to pay for air quality, I might decide that I would be willing to pay more for air quality than you are. So, we are both breathing the same air though and it's being cleaned up for both of us in the same way and eventually I'll learn that you are paying less for the same commodity as I am. So I will reduce my willingness to pay down towards your willingness to pay and you'll do the same and eventually the stable solution to that problem is nobody pays anything. And so it is important that whenever a public good is being talked about, that we, that markets are not something that typically work in that environment, and you can construct them, but they typically do not work well. And it is more, it is important that a public benefit entity inserts themselves to determine the fair price and make sure that it is collected from everybody, and in our business that is regulation. And it is a proper government function to act in the best interest of the whole to determine fair prices for shared commodities. Electric power reliability is a public good and as such requires rules not markets. Electric energy itself is a private good, and markets surely can surely be constructed for that and can work well if done correctly. So it is important to identify

what public and private goods are in this collection of commodities that we have in the electric power business, and one of the important reasons for me as a researcher in a university is there is a whole underlying mathematics that go with once you have identified those things. There is a whole set of tools that you can bring to bear on the solutions of those problems. OK, let me talk for a second about the questions that are up here. The first one is are the market-based principles for organizing wholesale electricity trade limited in their ability to accommodate public interest? And I guess that I just answered that by saying yes, in fact, markets shouldn't be asked to do things they cannot do and we need to identify what they are good at and what they are not good at and we need to, in effect, integrate regulation with markets in the right sort-of-way. The second one is about the manpower problem which is a problem that is near-and-dear to my heart as I have been talking about it for a least two or three years because I see it more severely in universities and also it's manifesting itself in industry. The industry is going to lose a substantial part of its workforce. Jack talked about the statistics of this, but the bottom line is that over the next five years a lot of very qualified, trained and capable people will be leaving the workforce. And in the university it is even worse, the average age of the college, in the U.S., of a college power engineering professor is in the 50s or more, the number who are headed towards retirement over the next five years is substantial, the number of power programs that are disappearing in the universities is substantial. Without some intervention at this point my guess is that you will not see a power engineering program in a top research university in the U.S. in 10 years. How do you fix that problem? Well, by the way, the role of the universities is not about training people to go out and, in my opinion, and do day-to-day calculation kinds of problems in the power industry, in the power engineering programs. It's to teach people to think, to teach people about other disciplines and integrations of other disciplines and to give them basic knowledge so they can go into the industry and be functional. It is also, it is part of the industry's task, to then take those people and to train them to do specific jobs that are important to the particular companies that they are involved in. So, one of the things that you have to do in a university environment, you have to do research, you have to stand toe-to-toe with your colleagues in nano technologies, in bio, in communication systems and in every other discipline, your work has to stand toe-to-toe with theirs and they have to understand how it fits. And people who work and bring their expertise in bear in power then create the courses. You can't mandate that a course has to be taught in a university and have it done; it doesn't work that way. And I think part of the disconnect between universities and the industry in our environment has been the understanding, in particular, how universities work. So universities have a responsibility to educate students and teach them to think and the industry has a responsibility to supply interesting jobs and competitive salaries with other industries. We have made, I think, good strides towards that but there is a lot more that needs to be done. Let me talk a little bit about the recommendations I made in my paper. The first one is to ensure that the transmission system is up to the job of supporting the market structure. This is a legacy system; it relies on an old technology which can raise questions about its long-term reliability. It was designed to serve fixed patterns of generation and load, and designed to operate reliability while minimizing outages and protecting equipment and economy where everyone shares in the benefit of operating least-cost generation. Now its main purpose is to service the market functions in real-time. And, there are large volumes of transactions

that we have never seen before, there are lower reserve margins in, occurring in some systems, which is stressing the grid-operations. We have to figure out how to design the network which is the fundamental transportation mechanism, or getting generation to load in such a way that it can support these new functions. Our experience in testing is that any volatility that is in the market will show up in the network. And so you have to have networks that will support those sorts of things which are not things we saw in the past. My second recommendation is to, is that the federal government should support the building of what we call a national reliability centre. This is consistent with the idea that reliability rather than economics should be the focus of grid operations. This would be a centre that would be, and there may physically be more than one of them, but it would be a centre that focuses on the tools needed to get visualizations over a large or, that would focus on things like procedures, plans and tools for standards control and design, grid and market monitoring capabilities, algorithms for analysis, real-time communication protocols, data collection, protection and dissemination and other essentials that are needed to ensure complete real-time visibility and reliability of the grid. These functions are not carried out by NERC presently. NERC provides a very valuable service of providing the reliability frameworks and they will do even more, and I assume that they will become the ERO. But, no one in the industry provides the standards, for example, for control rooms. I happen to think that is very important that a control room operator can move from one utility to the next and expect to have a standard set of tools, a standard look-and-feel in the industry. This is not to compete with private industry who would supply these things but it is to do the work, the research sort of work, necessary and to get a large-scale visibility of the system. And I think as we move into this more complex market environment the more eyes on the reliability problem the better. And this would be another set of eyes with an eye towards building tools. That could be very helpful. My third is to solve the manpower crisis especially in universities. My recommendation is, in the U.S. anyway, is the formation of national centres of excellence that will focus university eyes on the declining problem in the professoria. And finally, my fourth recommendation, and these are not exhaustive, they are meant to complement other recommendations by other people, but the final recommendation is to test market designs before we set them out there to be in use. All I am saying here is that it is a good idea to bring good engineering design practices, to integrate markets and systems, that is the marriage of engineering and economics is something that is important in this market design. We can't afford any more experiments of the whole, like California for example, and there are ways to test new market designs and we have not done this before. And finally, we cannot go back is my final word. We can't start over, we can't re-regulate the system, we can't make it look like it did 10 years ago. We are on a path and I think basically it is a good path and can work, but we are in a transition and we need to be able to manage that path. Thank you.

**FACILITATOR (BRYNE PURCHASE):** Thanks Bob. I am going to use up a little bit of the concluding time here to provide the panel with a little bit more time. Are there any comments that you would like to make on each others presentations?

**JACK CASAZZA:** This working? Bob, I have one real difficult problem with what you have said and it is a philosophical problem. It bothers me when people in universities say

things like this. You said the purpose of our systems in the future is to serve the markets. I disagree violently as my ethical code calls for. You read the code of the IEEE, it calls for us to protect the public interest. I think the purpose of the transmission system should be to best serve the public, not serve the market. That is why I made this comment about the title for this whole session. The emphasis shows sort of a fundamental bias in favour of markets and assuming markets are right. I do not know as I agree with John Wilson, but I certainly think trying to develop a system that serves markets without considering the impact on the public is not in accordance with my ethical standards.

**ROBERT THOMAS:** I am not sure if you just called me unethical or not, but that is not what I said. What I said is that the system has to be designed to support markets; not serve them. I believe that is true and I also said that reliability has to trump economics every time. So, reliability is where the public good is and where the public service is. So, none of what you said is anything I said.

**JACK CASAZZA:** Well, perhaps I misunderstood but I wrote down here, I thought you said, serve the markets. But, let me add one other comment about transparency. In preparing the material we sent in our original paper, I tried to get data on transmission line outages for transmission lines, what were their maintenance outages, outage per 100 miles per year, outage rates, what were their forced outages because you need this kind of data to do the right kind of analysis on reliability. I found that this data which used to be published widely is now considered as confidential, proprietary information and is not available. I called a number of different councils, tried a number of different places. To me this is a kind of thing that markets are producing which is just plain wrong. I think that those of us who are going to design systems should be concerned with getting good data in order to make the necessary analysis. There has been a lot of areas where this kind of thing has been withheld now because people feel, well, somebody knows my outage rate they can do something to take from me, take profits from me. Yet it is preventing the design of a good system.

**FACILITATOR (BRYNE PURCHASE):** Kellan?

**KELLAN FLUCKIGER:** Well, I heard everything that Bob said and I heard what Jack said and actually thought that they agreed with each other, so maybe I was the one who wasn't listening. What is clear to me, in all of this, is that we are not in a position to reverse course, that is what Bob said at the end. We have to figure out how to manage the interface. We have created an interface between an enormously complex technical matter which has a public good aspect, and the private good aspect of the market, and we have to manage the interface that has to do with the confidentiality of information, we have to let each of those aspects do what they do best but not trump the other to the detriment of the public good aspect. We have to create a renewed emphasis on people to get the right number of people and we have to acknowledge that this is harder to do in the current framework than it was in the old framework. And harder does not mean worse, it just means more complex and we have to put our brilliant minds, collectively, to solving this problem and then move it forward in a successful way.

**FACILITATOR (BRYNE PURCHASE):** Bob, did you have any comments that you wanted to make? OK, in that case I am going to turn it to the public; I'll take ... you first.

**DAVID NEVIUS:** Dave Nevius, NERC. Just to elaborate something that Jack said about not having transmission availability data. It is a critical element. There is a private subscription service that 27 large utilities participate in that provides a system very much like GADS is to generate availability but for transmission availability and it is paralleled very closely by a system that has been operated for a number of years by the Canadian Electricity Association. Now should something like this be more industry-driven and industry-supported as opposed to private subscription, I'll leave that to others to argue, but there are these data, they are subscribed to by a number of utilities including our former employer, that has a great deal of detailed data, that helps the designers and operators and maintainers of those systems understand where the bulk of the outages, planned and unplanned, are coming from. And I'll give you the reference and the contact person.

**JACK CASAZZA** Excellent, I am glad to know that but what I am concerned about why, I tried NERC for this data, I tried the Reliability Council, it used to be published by the IEEE, regularly, there was a task force that used to publish it. Why is it now being done by this procedure and obviously there is going to be a charge here. Maybe that is part of the new competitive world, charge for everything. But I am glad to know it Dave, thanks.

**IVAN HARVIE:** My name is Ivan Harvie, I am with Natural Resources Canada and these are really comments more than questions that I would like to make about three points. I have been in the industry for about 30 years with the utility regulator and the federal government. My first experience with deregulation was when I had an employee who had been in an operating control centre. He came on secondment with us for a couple of years with the regulator and then he went back into a control room. He very quickly called me and said Ivan, I can't believe it but we cannot talk to generators now and ask them when they are going to take their units out of service. He said I don't know how I am supposed to operate the system when I don't know which units are going to be out. He also said that they have done away with all their planners. I can say that in this particular jurisdiction that they had blackouts on some very mild fall days when capacity shouldn't have been a problem. So, I just raise this point to make the illustration that, I think, it is undoubtedly that markets can cause reliability problems if they aren't used properly. Fortunately I think that we have learned from those experiences and we no longer rely totally on markets to do generation outage planning or for other planning. Have we taken our eyes off the reliability ball? I think all you have to do to answer that question is look back over the agendas of conferences and workshops for the last 10 or 15 years and you will see that reliability just doesn't appear very often on those agendas; I don't think that you have to go any deeper than that. Now the focus has been on a myriad of acronyms, ICAP, LMP, etc. and it is just impossible to find any discussion on reliability. I would like to close with a little story of when I was in my teens, lived in a fishing village, we used to have some lobster traps and I was rowing the boat and I had two adults in the boat with me who would get over-the-side and pull the traps and I can

tell you it is very difficult to keep a boat straight when you have two adults leaning over the same side of the boat. I think that is what happened a lot, unintentionally, but with reliability over the last 10 years. We have had everyone leaning over one side of the boat looking at markets and not looking at reliability. As a final point, I think it was mentioned possibly by Jack, comments on building transmission. And I firmly believe that competitive markets make it much more difficult to build transmission for reliability purposes. I too used to be one of those people who did planning with neighbouring utilities and we did sit around and look at the system as a whole and we looked at the reliability benefits, we looked at the trade benefits, we looked at the operational benefits, and if you could add all those up and they would cover the costs of the interconnections, then you had a go. Today, you can all sit around and agree that yes, this line would be economic, but nobody gets all that money, it goes into several pots. So, the transmission doesn't get built. I thank you and those are my comments.

**FACILITATOR (BRYNE PURCHASE):** Thank you, any comments from the panel?

**KELLAN FLUCKIGER:** I just had one. Ivan you made the comment that markets cause problems or reliability problems if not done properly. It is like saying that a hammer causes problems if you try to turn a screw with it. Of course they do, of course any of it does, and so I do not want to blame unduly any of it, I think your analogy about the boat is probably the one that helps here and that is if we don't pay attention to the right things, to the additional complexities and learn from these mistakes, then we are doomed to repeat them. So, have we done everything right in building markets? Of course not. Notable failures have demonstrated that and so learning from that and recognizing this complexity and moving forward. I don't want to either sound too excited or not excited. I mean they do what they do best and we should harness that energy and let them do that, but not excessively run around blaming things for their shortcomings which perhaps are operational errors.

**ROBERT BLOHM:** Hi. Robert Blohm. I would like to dispute the idea that there is necessarily a disconnect between reliability and public good, reliability or public good, and economics. I want to say that in connection with the first issue, what is the public interest in reliability and how is the public, you know, doubly-harmed by deterioration in reliability? Clean air is a public good but the EPA has managed to marketize it by, you know, levying an extremely high penalty and letting the market create a price for pollution allowances. So you can imagine the same thing deriving from say a NERC penalty system and then the market coming and trading versus, you know, waiting to have the penalty levied. So there is not necessarily a disconnect. But the key issue is this. For consumers today, reliability has deteriorated since the market in two ways I will mention and haven't been mentioned and the consumers are paying for it. We have had a steady drift of frequency towards over-frequency that gets corrected and it's due to over-generation. It gets corrected by a technique called time-error correction, the cost gets spread-out among all the utilities, but eventually it gets passed down to the consumer. PJM says that it buys ancillary services, yes. Do you know how it gets recovery for the costs of those ancillaries? It doesn't charge the person who caused the error like the generator that was over-generating. It doesn't bother with that. It just creates a thing

called uplift and it gets spread out to the consumers so that, to the people who are causing these errors, still there is no cost allocation, they are not being penalized for the deterioration on the system. What has happened, for example, is in very early morning hours it is cheaper to generate at a negative price than to undergo the cost of shutting down and turning on your generator again; it is things like that. Governor response has also deteriorated because generators aren't paid to have these governors maneuvering their generators and wearing them out and the interconnection agreements conveniently left that out. Consequently the ability of the interconnections to respond to sudden shocks has basically been cut in half over time. Now, the providers of this aren't paid for it, the value has not been determined properly and the costs aren't applied to the people who are responsible for it. Attempts have been made to do it but the problem with the attempt is that it has been based on the concept of energy-only without recognizing what is the value of an ancillary service. It is a thing called speed. Speed has a value of its own. The quickness of response. Reliability in the strict sense, you know what reliability is? It is the ability to keep the system under instantaneous control. If you deliberately shed load your system is still reliable because you are in control but, when the system is out-of-control and relays have taken over and you can't do anything, the system is out-of-control. So, it is this instantaneous aspect, the instantaneous ability of a generator; for example, governor-response is the most valuable response. Now, that value depends upon, that deviation from schedule, depends on whether you're helping or hurting the interconnection. If the system is in an over-generation condition and you are over-generating, you are causing the problem; if you are over-consuming, you are helping reduce the problem. You should be rewarded for over-consuming, paid for that even though you have to pay for the energy part; but you should be rewarded even more for helping the interconnection and, you know, this issue has not been fully understood. NERC set up a task force that issued a report, a white paper on this; it is posted on their website. These issues of the deterioration in governor-response are documented also in a white paper that has given rise to development of a frequency-response standard. The deterioration in frequency, the upward-drift--the New York Times published a graph that I made of it for them about a week after the blackout although the investigation did not determine that governor-response, or the lack of it, had a direct ...

**FACILITATOR (BRYNE PURCHASE):** Sir, could I ask the panel to respond to what, your comments so far, I have got another individual behind you ...

**ROBERT BLOHM:** Concluding, FERC is trying to levy a thing called an energy-imbalance tariff but you know what it does, it just pays for energy. If you took unscheduled energy, you pay more money than the market price. But it doesn't look at when you took it. If you took it when the interconnection was in an over-frequency condition you're helping; so, the [FERC Order] 888 situation has really failed to understand that. Now, the NERC results I published in an article in the August 2004 Public Utilities Fortnightly magazine and it is also on my website, blohm.cnc.net. So, and the final point: Texas, ERCOT. One solution was that Texas tried to say "let's not get involved with this. Let's just eliminate control areas so we do not have to worry about one control area taking energy from another." They ruled that the local and mutually offsetting control area function move into a single massive control area for the whole

interconnection, and frequency control deteriorated. There are two reliability functions on the interconnection. One is transmission loading; the other is frequency control. Frequency is the public good but best controlled on a decentralized basis. Transmission loading is best controlled on a wide-area basis. In everything that has been done so far in deregulation, FERC has focused on transmission only and transmission-loading. Nobody has looked at frequency-control because only control operators in the control room know this. They are rare birds; they often have no college education, and no economist has ever talked to one ...

**FACILITATOR (BRYNE PURCHASE):** Sir, could I, sorry to interrupt you but ...

**ROBERT BLOHM:** ... that is why there is partly a lack of understanding of this second most important part of reliability which is instantaneous frequency control. The pricing, by the way, is best done as an option, for example you have to understand option-pricing and so on, and so, and so anyway.

**FACILITATOR (BRYNE PURCHASE):** Yes, I am sure that you are making very valid points, it is just that the length of them is an issue, I would love to see it all written down and sent in and submitted. Thanks very much. Does the panel wish to respond in any way?

**JACK CASAZZA:** 10 seconds. I don't understand why frequency-response is a factor in reliability and I spent my life in this industry. I'll stop there.

**FACILITATOR (BRYNE PURCHASE):** OK, rather that preside over the war that will erupt, I would like, on that, I'd like, sorry Kellan go ahead.

**KELLAN FLUCKIGER:** There were a number of points there and I think a number of them made the same point which is the difficulty in creating market signals around every technical aspect of controlling a system. And that is, that underscores, the importance of making sure that we let markets do what they do well and keeping the technical pieces that are not done well there in mind and doing them and making sure that they get done. So a number of valid points about the difficulty in moving to market signals on every technical point . So that is valid, that is true and that is what we need to make sure we do to make sure that markets contribute in their way to reliability.

**ROBERT THOMAS:** I agree with, particularly the point about people who make trouble ought to pay for it. But part of the problem that we have is data. I mean, we often do not have enough data, timely data, and even people to look at it to tell what is going on in real-time. And we really do need to get a much better handler on the system in real-time for that reason.

**EVAN BAHRY:** Thank you. My name is Evan Bahry. I am with the Independent Power Producers Society of Alberta. I thank you for the opportunity to ask a question. I want to pick up the points made by a number of the speakers which is about what markets are asked to do and what they can do. Not so sure that markets are asked to provide

reliability. Energy markets are asked to provide energy. If the value of lost-load is \$12,000 a MWh, \$15,000, Alberta is capped at \$1,000 a MWh. Many markets have a similar cap. Our average price year-to-date is about \$55 a MWh. So if there is a massive disconnect between the value between reliable energy at \$12,000+ and the energy price itself is some fraction of that, I ask are energy markets asked or being incited or able to provide for reliability in light of price caps? And I wonder if I can get the speakers to address that question?

**Unknown:** I think that the markets in certain senses are being asked to provide reliability, the adequacy part in particular. It is the market signals that are being relied on for long-term investments and they are not working is the biggest problem. Also, you know, when generation has to be backed-off in order to accommodate contingencies they need to be paid and they need to be paid in the right way and they need to be paid for reactive power when that's needed and it needs to be in the right locations and sometimes it is and sometimes it isn't, so markets are being asked to provide reliability functions.

**FACILITATOR (BRYNE PURCHASE):** Sorry, Jay, I had one other gentleman before you, but I will get your question, I am sorry ... go ahead.

**ROBERT CARY:** Rob Cary again. The first statement here, the first question, talks about public interest, Robert talked a lot about reliability being a public good. My understanding of the way that Alberta is going in its policy is that reliability should be moved more towards a private good where individuals decide the level of reliability that they desire. Have I got that right and how do you reconcile that with this public good concept?

**ROBERT THOMAS:** Thanks for the question. No, we haven't decided that reliability is a private good. With respect to, you know, if there is a way to differentiate, this again goes to the complexity of the technical aspect of electric-systems and the free-rider aspect. Conceptually if someone wants to pay for less reliability and be interrupted, from a conceptual standpoint, we do not have a problem with that. The difficulty comes in applying that concept when one, the decision by one entity to accept reduced reliability, isn't something that you can do, as a practical sense, without affecting others. And so, conceptually if someone wants to have less and pay less, you know, that's OK, but it is not going to be allowed to trump reliability to the general public which is expected in the framework of Alberta to be maintained at least at historic levels. Part of the issue, this goes back to something that Evan asked which is about both price caps and what, you know, the market is actually paying for, if you only pay for energy but you are expecting it to provide these other services which is voltage support and, you know, transient response and those kinds of things, then you have a disconnect there. You have equipment that it is expected to provide something else by its very nature and perhaps by peripherals that are put on it that are expected to respond in a particular way but the market framework doesn't compensate for them. And so that, answering those difficulties is exactly what's needed to sort out what markets can and should do and how they should be paid.

**FACILITATOR (BRYNE PURCHASE):** Jack, I think that you wanted to ...

**PETER FRASER:** Hi, my name is Peter Fraser and I am with the Ontario Energy Board as the electricity regulator here in the province. We regulate transmission and distribution and we also regulate the system operator. In light of the discussion today my question is, well what role is there for regulators in ensuring that transmitters, distributors and system operators meet, say, reliability targets or ... what, should we just measure, for example, we could make a performance-based regulation incenting them to improve their reliability performance, or what other kinds of, what roles do you think that regulators have to play in this?

**FACILITATOR (BRYNE PURCHASE):** Jack, did you want to go?

**JACK CASAZZA:** I think I've got an answer to that. First, performance-based regulation if you can do it is certainly the right answer. Second and this is a practice I found out about because someone taught me about 40 years ago, anytime you are around a dispatch centre, go in and see what is going on with the appropriate approvals. Talk to the operators, find out what lines they have out-of-service, what units they've got out, ask what their biggest problem is. Basically become familiar with the problem of the man-on-shift because he is the one who is really flying the plane. And get to know what his problem is as background to doing your regulatory approach.

**FACILITATOR (BRYNE PURCHASE):** Kellan, do you want ...

**KELLAN FLUCKIGER:** I think that regulators have critical roles. As I noted in my discussion, I think that regulatory, the regulatory regime under deregulation or restructuring, is more complex, so the first thing that has to happen is a paradigm-shift. The regulator has to understand the nature of the new structures, which things are being done by what entities. There are standards development and enforcement with respect to the mandatory standards and all that has come out of this blackout and the development and enforcement of those standards is critical particularly when you are trying to figure out who they need to be enforced on, who is responsible for them. Again, in a regulatory, in a sort of integrated world the utility did everything and in the new world understanding what the regulator regulates and doesn't regulate, and then having input into, you know, I don't regulate this piece, I do this, but there are pieces that are being expected to be managed by the market, in other words the output of generation if it's voltage support or transient-stability or whatever it is, that has to be managed in a particular way in order to achieve these reliability-standards and you can't just yell at the transmission operator to get this done. So there has to be a coordinated effort, and so, new education, understanding what is regulated and what isn't and which piece of the structure, whether it is the regulated or deregulated piece is providing that, is critical. So, paradigm shift, new education and the development and enforcement of the standards are critical roles for the regulator in the future.

**ROBERT THOMAS:** Ya, I agree regulators are critical and in addition to what, and I also agree with Jack that performance-based regulation, or reliability, would be good.

But, I think a critical role, in what a regulator does, is that they determine the fair price for the commodity and they decide who should pay for what and how much. They are really surrogates for the market in some sense. That is a really hard problem to deal with. In terms of payments of things, I mean we know there is a huge difference between what people value electricity at and what they are willing to pay. For example, generation-production costs are about \$30 a MWh competitively and people pay for the transmission services and everything else around \$100 MWh and yet the surveys tell us that the value of lost-load to a customer is around \$10,000 per MWh, so somewhere in between there is a value of reliability to people.

**FACILITATOR (BRYNE PURCHASE):** Yes, sir.

**FRANCOIS BOUFFARD:** Hi, Francois Bouffard, McGill University. Actually, you have touched the last point because so far no one has talked about training. Professor Thomas talked about, that energy is a private good, security or reliability is public, but, when you are, I guess, a control room operator and the situation, you are reaching some emergency, where is the market stop and where, you know, because you know, one extra MW, it is a network industry. If I consume one more MW there, you will affect the rest of the grid. And are the operators trained, not just to respond to normal load-following but also to price-following, or I remember, I recall a conference George Gross gave some time ago about this event that occurred in Illinois where they had reserve prices going through the roof and the operators had to make decisions not based on the state of the system but rather on prices. That is number one. And number two, I would just like to bring out that there are initiatives out there for training new engineers especially this side of the border. There is the University of Waterloo is very active in getting a program, actually they are training, I think if I remember what Professor Kennisaris from Waterloo told me, they do a lot of training of people at either one and also in Quebec, Hydro Quebec, has sponsored this institute for electrical power engineering, and these initiatives, I don't know how it is south of the border, so I would like probably Professor Thomas to get to that and also Mr. Casazza. Thank you.

**ROBERT THOMAS:** Well, I'm thrilled to hear about the programs at Waterloo in Ontario. By the way I, 10 years ago, began a national science foundation center called PSERC of which Hydro-Quebec is a member and that was started principally to try to help with these programs in universities and we have talked about the Canadian universities joining as well. It is a problem, you know, all over the world in terms of programs declining and I'm happy to hear about this stuff in Canada. And you are right, the question about what a MW is worth is really a good one. I do not know if I would want to be an operator trying to figure it out right now with the tools we have. I mean, there are cases where, for example, there are fixed reserve-margins. In New York, down-state I think it is 18%. So suppose you need 1 more MW to get an 18% reserve-margin and it costs you \$10,000. Is it worth it? Nobody answers those questions but operators face them every day. So, I do not have an answer.

**FACILITATOR (BRYNE PURCHASE):** Anyone else on this question? Kellan?

**KELLAN FLUCKIGER:** With his question you asked first is, it felt to me at least, is where do markets stop, and reliability takes over, and a lot of that is time-sensitive, in other words, reliability starts in the timeframe where nothing can be done except intervention to maintain stability and integrity of the grid, and at that point operators historically and in market-driven systems, are charged to do whatever they have to do to keep the lights on, and should be, and if our systems are not yet sophisticated enough to allow the operators to do that and sort-out pricing and other details later then that is a flaw that must be addressed because reliability, or the ability to deliver energy, is still the public good and if we can differentiate reliability by price in another context that's OK. The other thing that is critical, I think, in terms of the operator training about, OK, is it price or is it reliability, is in areas where you have markets and reliability interfacing, the rules have to be transparent and clear so that the markets understand when operators intervene and it doesn't feel arbitrary and random in terms of, every place that I have operated in California and in Alberta, there is always a concern that operators intervene to save prices as opposed to manage reliability. And that nexus right there is something that is critical for the integrity of a market design and the integrity of a market operator and its pricing.

**FACILITATOR (BRYNE PURCHASE):** I have, this will be the final question actually.

**JOE ROSSIGNOLI:** Joe Rossignoli, National Grid. The point about reliability being a public good is well-taken although I would like to tweak it a little bit. The way I understand reliability, I do not understand it as a good, I understand it as an outcome. There are goods that produce reliability and one of those goods is transmission which is truly a public good. We heard some folks earlier in the other panel or at least, I think it was Scott, discussing how it is a public good. The problem is that we've had policies in some of the RTOs that are attempting to treat transmission as something other than a public good. Trying to treat it as a market product which it is not. It doesn't work very well as a market product. Only in very niche cases does it work well, market-to-market DC lines being one and those alone will not maintain reliability. So, in terms of supporting long-term reliability and its policy implications, I think it needs to be recognized that transmission really is the public good to the extent that, you know, it produces reliability which it does in tandem with generation, then reliability is really an outcome of that public good.

**KELLAN FLUCKIGER:** I have one thing to say about that. In Alberta, we have created recently a transmission policy and regulation in the law that attempts to recognize that, that you will not get any benefit from a competitive generation market until you have sufficient transmission and we have, I'll say this exactly, but sort of said, that congestion is off-the-table, in other words we will have sufficient transmission in every or nearly ever case to simply eliminate congestion so that the competitive market can function and you don't have sort of these perverse incentives to do things strangely with generation, so we recognize that completely and agree with you.

**FACILITATOR (BRYNE PURCHASE):** Jack, you wanted to ...

**JACK CASAZZA:** A real quickee. I understand, Dave, correct me if I am wrong, that in this HR86, this new legislation that has passed, there's money in there for training. Is that right? I have been told this by a couple of union leaders. Let's assume this is right.

**KELLAN FLUCKIGER:** I can't verify that.

**JACK CASAZZA:** Let's assume its right. I know of one union, fairly large one, where they have decided that a lot of this money should be used to train our soldiers over in Iraq when they come back in the United States because they are going to be coming back looking for jobs, so you have a situation where the people coming back, their old jobs are gone in many cases, looking for jobs and what you should do is try to train these people to solve our utility labour shortage problem, They are working on things like line restoration, things of that kind, over there so that if there is that information in the legislation I would think that we should move forward trying to do that, and to the extent these will invite out friends from Canada to participate in it, if we got the money.

**FACILITATOR (BRYNE PURCHASE):** With that, I am going to bring this panel to a close and I would ask you share your appreciation, I think that it was well-done ... (applause). That brings us to my concluding remarks and I just have a couple of housekeeping things that I want to make sure, please fill out that evaluation form. Make sure you submit any comments or if you have very lengthy statements, I know that there is one gentleman who must have written this down, and it would be very good to get it in writing, and you can submit it to the website or give us a hardcopy here. And then finally, if you have a headset, please turn it in before you go. So, in terms of my own concluding remarks, I am not obviously, I was not a public servant for nothing, I am not going to summarize or say that I found a key bit of consensus here that we can all march forward arm-in-arm. I think that it is obvious that here is still a considerable difference of opinion on some core issues. That said, however, I don't think that anyone suggested that there are not improvements needed or that there are in fact, you, know, there were major points of agreement it seems to me, and what hopefully we can do is tease out those points of agreement and as we go forward with a focus on improving the situation that we are in. And everyone agreed that we can neither stand-still nor can we go-back. So, the, I would suggest that were some ways in which I would have organized issues. I think for example how much of our reliability problem is a transitional problem is a theme I saw through several papers? How much is related to monopoly regulation, not anything to do with competition, but monopoly regulation and the appropriate regulatory incentives in that regard? How much of the reliability issue is related to competitive generation markets and the incentive created within those competitive generation markets, and their relationship, again, to capacity-adequacy? And then finally how much of the reliability problem is related, I think, to the new relationship of the monopoly wires business in the competitive generation market? A thing that is not fully articulated or clearly thought out in the models we have now, and many people raised that issue. So, in terms of next steps, officials from the Department of Energy and Natural Resources Canada are going to take the transcripts in Washington and in Toronto along with the papers, they are going to prepare a report which ultimately will be made available to the public. It is a report which

obviously also will be submitted to the Power System Outage Task Force and of course the respective Cabinet Ministers in both governments are on that task force, so hopefully before Christmas we will see the report, and I would like to thank you very much for attending today. Thank you. Good bye (applause). Thank you very much.