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RAPPORTEUR'S SUMMARY*

Session One.
The Benefits of Going Green: Good or Too Good to be True?

A green transformation of electricity systems is a major thrust of public policy. Controlling greenhouse gas emission, promoting renewable energy sources and encouraging energy efficiency could provide a portfolio of opportunities to address environmental and energy security objectives. But not all green options are created alike. A cost benefit framework could serve as a guide for deciding where to invest and how far to go, to maximize the difference between benefits and costs.

Application of this simple idea confronts many complications and challenges. How do we evaluate job creation and job loss? How do early investments in technology pay off in later reductions in costs? Are there first mover and competitive advantages? Is it possible to spend too much? Or are the opportunities so great that there is no danger of being too green? What are the pitfalls of cost benefit analysis? How does policy pick the low-hanging fruit? Would a major transformation of the electricity sector be free; or costly, but worth the benefits; or too good to be true?

Speaker 1.

I will give some background so you understand the context of my comments. I am not an expert on the economics of global climate change. However, I started in the solar industry doing research in 1978. The Solar Energy Research Institute did an 18 month multi million dollar study called the SERI Solar Conservation Study in the late 1970s. This was to figure out what would it cost to get to 20% solar by the year 2000. Let's look at that for fun. The conclusion was that the U.S. could get 20% solar by the year 2000 with existing technology at a cost of around 800 billion. This was compared to a $1 trillion nuclear estimate extrapolating the results of the highly troubled nuclear experience at the time. What is fascinating is that the questions and issues that they were struggling with back then are still very much on the forefront today.

What is the problem to solve here? Is it energy independence? 30 years ago, that was the primary goal. Every budget proposal examined how many billions of barrels of oil equivalents could be displaced with certain technologies. Environmental issues were secondary whereas today there's more emphasis on them. Energy independence and cost reduction do not seem to be as important. Being clear about which goal is being pursued creates different implications for what the nation does, how much it'll cost, and who should pay.

Public opinion concerning renewable technologies and global climate change is very strong. The World Public Opinion Group shows that 88% of U.S. consumers believe alternative energy should be promoted. There was a second follow-up question, should utilities be required to invest in alternative energy even if it's more

expensive in the short run? This reduced the positive support 20% but two thirds of the respondents still agreed. The third question, do you believe that pursuing alternative energy will be cheaper in the long run or do you believe it will cost so much that it will hurt the economy? 79% believe it will be cheaper in the long run. This is consistent with my anecdotal experience and the general press. The problem is if that belief is behind the strong public support and it turns out that renewables are a lot more expensive then there is an enormous communication and education challenge, at a minimum.

There was no question about carbon taxes. The closest to this was a question about should we tax inefficient appliances as a way to encourage efficient use? 52% were opposed to that. This background should be kept in mind during this panel. Whatever is done in this area, especially with far reaching impacts, then strong public support will be needed to succeed.

So, are the benefits of going green worth the cost? Will it be costly but worth it? My honest opinion is that the net costs of making a significant dent in global climate change and reversing it probably come out as a net zero. I say that ignoring unforeseen technological change which can happen and which I believe in. It's one of the key reasons I'm a strong supporter of markets. Lots of people work on ways to make money to solve problems. My reasoning is also based on the cost factors that were emerging before the current global financial problems. The costs of conventional technologies, coal, nuclear, were substantially related to growth in the global economy, demand in India and China. This includes basic materials costs, steel, concrete, transportation, copper, skilled labor to build facilities. These also drive up the costs of the renewable technologies.

Second, there are known costs on the electric side but no national estimate of what they might be. The classic example of this is wind. If all the wind implied by renewable portfolio standards is built then there will be huge infrastructure costs, and build-out of transmission. The good wind resources are away from the load centers. Further, quick start capacity will be needed to take over when the wind stops blowing and balance the load. Those costs will be extensive but there has been no attempt to estimate them. Certainly NERC is concerned about it.

The big concern is that this will be more expensive than the general public thinks it will be. So if it's going to cost more, what are the costs of not doing it when environmental damage and far ranging impacts are also incorporated? I try to remind myself of the perils of long-term forecasting. In 1984 Niagara Mohawk forecast that it could save if it bought power from an independent power producer instead of generating or building it themselves. Their forecast was for large cost reductions and the actual savings were non-existent.

Certainly the industry does need to struggle with long term studies. However the uncertainty is unavoidable because you can't predict unforeseen technological change except in an arbitrary way. Despite the problems I've outlined in the solar conservation study and long term forecasting I still argue that the industry needs to do more. They need to get as rigorous a handle on what this will cost because there's so much at stake. Even though it's daunting and hard to do, one of the benefits of going through it is that the process of developing long term estimates creates a better level of debate.

The industry seems to have a better handle on what the problem is than agreement on what the solution is. If the main problem is global warming and the consumption of fossil fuels then a carbon tax is appropriate. From an economic perspective this should be the first option and maybe the development of technologies in tandem.

I want to end with a provocative idea. The central issue concerning markets is centered around price level. Some argue that because price levels are lower in regulated states it proves markets don't work. However, if the goal is to promote energy efficiency then prices that reflect marginal cost plus the externality cost work very well. They should be a priority policy instrument.

Prices that are low based on the accounting costs of old, fully-depreciated coal plants that are some of the most polluting set harmful incentives. Paul Joskow has argued that trying to address climate change and yet keep retail prices low, especially in regions with the biggest carbon emitters, is going to be very hard. They are policies had conflict and won't be effective in aggregate.
I have some data concerning price elasticity that drives into this argument. I've heard many high level decision-makers argue that customers don't respond to price. They claim that discussing price as a policy tool is negligible and that the conversation should just be about what should be built. However, that's simply not true, there is demand elasticity, and consumers do respond to price.

Neenan and EOM put out a paper on price elasticity for EPRI in 2008. It is a meta-study of several other papers, and demonstrates extensive levels of response to differing prices. It also explains why these estimates vary. When we go back to the issue of global climate change and the price signals then these considerations should be at the top of the list.

Speaker 2.

I will talk about two things today in California. First a summary of economic analysis of California's electricity sector that the California Public Utilities Commission did via a consulting firm. This was to analyze the 2020 goals of greenhouse gas emission reductions. The second is to look farther out to 2050 in the context of US greenhouse gas emission reductions to consider how the longer term goal may change one's perspective on the shorter term 2020 greenhouse gas targets.

For California to achieve 1990 levels of emissions by 2020 requires a 1% per year reduction in emissions. In California, about half the electricity sector's emissions come from imported electricity and half are domestic. To put this into perspective the 2050 goal is to hit 80% below 1990 levels by 2050. Governor Schwarzenegger issued an executive order for this. That translates to some steep emission cuts, about 5% per year.

The modeling approach looked at just the electricity sector to 2020. It starts from a bottom up basis estimating energy efficiency and renewable energy cost as well as demand forecast scenarios. The goal was to create a plausible 2020 reference case. This case is inputted into a production simulation dispatch model of western generators. It's called Plexos. This was all done to create a spreadsheet output that would be a transparent, easier to use tool that is less burdensome to run.

The spreadsheet tool, the greenhouse gas calculator, allows users to play with some of the key variables, natural gas prices, resource costs, and potentials. One can see changes in emissions, average retail rates and costs compared to the reference case. This uses only publicly available data and can be downloaded. It's a big spreadsheet tool but it's all available.

To summarize, the analysis shows that by 2020 reductions on the order of 30% over the reference case can be achieved. That's in line with what the resources board [California Air Resources Board, CARB] has recommended in its proposed scoping plan. The 30% reduction scenario below the reference case has costs of $3 billion net compared to the reference case. This assumes the state can achieve unprecedented levels of energy efficiency and very aggressive levels of renewable energy.

Ultimately, the cost isn't really a deal breaker. Rather, the bigger challenge here is implementation of such an aggressive reduction in emissions. There are extensive permitting and siting challenges of developing the renewable energy and its associated infrastructure and grid needs, especially reliability.

Let's take a look a three scenarios. The "natural gas build-out" case is the business as usual case. It ends efficiency programs today, removes the renewable portfolio standard [RPS] and builds nothing but natural gas until 2020. The reference case is the "current policy" case. It is a continuation of the state's current aggressive energy efficiency programs. The state meets its

20% RPS by 2010, and maintains those levels out to 2020, and attains a modest level of distributed generation. The "accelerated policy" case is similar to the air resources board proposed scoping plan for the electricity sector. It more than doubles efficiency implementation, sets a 33% renewable portfolio standard by 2020, and substantially increases distributed generation.

Let's consider emissions. Today the California electricity sector stands at about 108 million metric tons of emissions. If they ended efficiency and renewable programs and only build natural gas those emissions would increase to about 130 million metric tons by 2020. Alternately, the "reference case" maintains a flat-line of emissions. And that's interesting because the electricity sector emissions have remained relatively flat since 1990. The "accelerated policy case" provides a 30% reduction in emissions compared to the reference case, about 80 million metric tons of emissions by 2020.

Let's look at cost. Rates are increasing in real terms over 2008 in all three of these scenarios. The "accelerated policy case" is about 14% over the "reference case." That's because there is a double whammy going on here. Costs are going up and retail sales are going down in the denominator.

If one focuses on utility cost, that isolates the numerator of the retail rate equation. In that case, the accelerated policy case is slightly less expensive than the reference case. It's about 3% less, not much. So on average for the state bills are coming down. However, the distributional impacts of these measures are very different depending on which utility one is in and also which customer class.

Now, if one considers customer cost as well the story is different. Remember, a lot of these measures, energy efficiency as well as rooftop solar PV, have a large customer cost component. The utility will only incent a portion of that rooftop solar PV unit that you stick on your roof, for example. Now the accelerated policy case is again a little bit more expensive. This ends up being $49 billion in the reference case and 52 billion in the accelerated case. They are very close. Thus, the real concern is implementing an accelerated case.

The measures needed to achieve these cuts are unprecedented. This is about eliminating load growth to zero, or even negative. It also means building extensive new renewable generation so that some conventional generation is being retired or backed off. It requires seven new major transmission lines. This is enormously difficult in terms of permitting and siting. Finally, integration of renewables like wind and solar has significant challenges in terms of reliability and infrastructure.

So given this cheery picture I've just painted for you, let's look at 2050 where the emissions reductions are even steeper. The PUC has a preliminary simple model of US greenhouse gas emissions out to 2050. Again, it's a simple spreadsheet tool. It has electricity, transportation, and then all other sectors grouped into a separate category. Its main purpose is to calculate emissions and make some estimates about cost. Using EIA data, 2030 estimates were simply extrapolated to 2050 and then demonstrating what 80% below 2005 levels looks like. This is a pretty drastic story that we're talking about here. Standard EIA estimates are 9750 MMT [million metric tons of greenhouse gases] in 2050 and the 80% model is 1060 MMT.

However, they estimated cost in these two cases as well. Both the base case and the compliant case are really in the same order of magnitude in terms of cost. The net present value of the compliant case is a bit higher because new low carbon technologies are invested in sooner. The costs are equivalent because even though there's extensive investment going into low carbon generation, there's large investment switching the transportation sector from fuel use to electrification. This is offset by a big increase in energy efficiency, about 2% reduction per year, and the offsetting of fuel use.

So what does this really mean and can we get there? The 2% per year reductions from efficiency is similar to the 1970s reductions during the oil crisis and in California during the

2001 electricity crisis. The compliant scenario maintains that level of efficiency reduction over a 40-year time horizon. It's aggressive. Further, it means de-carbonizing electricity and fuel switching for the transportation sector. While that may be a bleak picture, it's an incentive to get started sooner. Waiting to make this transition to a low carbon economy will only make the prospects more challenging. The risks of waiting are that the big technology breakthroughs and low cost technologies won't be developed without proactive action. Further, if the U.S. takes a back seat and lets the rest of the world develop low carbon technologies they will lose the beneficial spillover effects associated with that research and development. There are some very positive outcomes for the economy that can come from that development that are not incorporated into many of the economic models looking at these issues.

In these deep reduction scenarios the backstop price of energy in the economy becomes de-carbonized electricity. It's critical to drive down those costs. It's also critical to the broader global picture of greenhouse gas emissions. Global targets for greenhouse gas emissions will have similar levels of GHG reductions. Helping the U.S. achieve these cuts will also help China and India reduce their greenhouse gas emissions, and significantly improve the ability to get global action on GHG reductions. Getting started sooner will be beneficial for all.

Question: Is the cost of the transmission included in the cost of the accelerated policy case?

Speaker 2: Yes.

Question: What percentage of the transportation fleet gets electrified in the 2050 case?

Speaker 2: It's basically almost all vehicles. They're not assuming electrification of the aviation sector, for example. There is some fuel switching to biofuels. Essentially the whole fleet.

Question: Your presentation shows 105 metric tons in the electricity industry versus 500 for the total industry in California. That ratio seems low. Are you counting CO2 emissions generated outside California to supply California citizens?

Speaker 2: Both California and the west in general has a different emissions profile than the US as a whole. Transportation makes up about 40% of the state's emissions. The data I've discussed includes imported electricity.

Question: Do the costs for the compliant scenario include the implicit subsidies for distributed generation? The various scenarios obviously have a lot of distributed generation. For instance, rooftop solar PV. There are implicit subsidies for that kind of generation, are they included in the total costs?

Speaker 2: Yes, the incentive paid by the utility would be included in the utility cost. So in California there will be some incentive paid for say combined heat and power or for rooftop PV but then the remainder of the cost of that will be included in the customer cost.

Question: Is there any state or federal subsidy to the capital cost that's not counted? What if neither the customer or the utility is paying it, meaning the federal government or the state's paying it? In California right now, the PV subsidy is very large.

Speaker 2: The tax credits are netted out of all of this. Government spending is not in these numbers. All spending by utilities and by customers is included. Government subsidies are not.

Question: Does the study on the US 2050 scenario use the methodology as the earlier 2020 study?

Speaker 2: No, the 2050 model is a simpler model. It's also a multi sector model. They are a bit different.

Question: How are the energy efficiency goals derived for this analysis?

Speaker 2: The high goals for EE are based on a study that Itron did for energy efficiency potential in California.

Question: The study estimates costs for seven transmission lines at 6.4 billion. However, the two transmission lines that are currently being built, Tehachapi and Sunrise, are more than half that amount.

Speaker 2: These transmission costs are arguably way too low. They need to be adjusted considerably.

Speaker 3.

I'm going to discuss how to think about some of the cost estimates as the industry attempts to design policies. There are three key messages. First, details matter in the development of cost studies and in the subsequent development of policies that might be informed by them. Second, price signals are very important for doing this cost effectively, particularly with so many heterogeneous approaches to emission reductions. Third, consideration of potential negative cost emission reductions require a consideration of market failures. Many cost benefit tests may not truly capture all the costs. They may conflate market failures and market costs.

This presentation is informed by a study by Stavins, Jaffe, and Schatzki analyzing cost benefit analyses of climate policy. Their study raised concerns about the cost reliability estimates and the kind of information being given to policy makers as they try to find a prudent way forward. I want to focus on how negative cost emission reductions are being considered.

There is a new context to consider. Climate policy has gone beyond just climate policy to some extent. It's now a key part of an economic stimulus package and it's part of energy policy in an energy security context. Any discussion should include consideration of whether or not climate policy to address only in terms of environmental benefits or whether it also fits into these other policy areas.

There have been a couple of studies showing significant policy initiatives that produce emission reductions at a net negative cost. A well-known study from the McKinsey Group found that many emission reductions would produce net economic benefit. Some studies are even finding that, on balance, the net economic impacts of an entire climate policy would offset the associated costs of implementation. To be clear, this means that the economic costs of taking those measures to reduce emission reductions are more than offset by associated economic benefits. These benefits can include savings in reduced energy costs or environmental benefits.

These studies differ significantly in the costs they estimate for supply side measures, i.e. emission reductions achieved during the production of energy. This includes emission reductions achieved through lower carbon electricity generation technologies such as renewables, nuclear, or coal-fired generation with carbon capture and sequestration. By contrast, negative cost emission reductions primarily arise from demand measures like energy efficiency measures that reduce energy use. By contrast, studies by groups like EIA and the EPA don't find negative cost emission reductions. Their estimates are primarily driven by market responses to price signals. This includes a market based policy like a cap and trade program.

While these studies differ in their forecasts of demand side measures and costs, they are conceptually similar concerning supply side forecasts. They all find that some level of incremental emission reductions will impose costs, especially for the level of emission targets being considered in California or in federal policy. Specifically, the marginal cost of emission reductions will be positive. They also agree that supply side measures are needed to achieve climate targets, demand side measures will not do it all.

This has several important implications. First, negative cost studies don't necessarily imply that different climate targets should be pursued. Logically, targets should be informed by the cost of incremental reduction to the marginal cost. That is, when the additional benefits from reducing more carbon are not worthwhile given

the additional costs. The studies are finding that the incremental costs are positive.

Second, one should consider the effects on competitiveness and distributional impacts. In a cap and trade system the allowance prices will reflect the marginal costs of emission reductions. The studies do not show extreme differences in the marginal costs of emission reductions. There is some uncertainty over what allowance prices will be, but they will clearly be significant. This will affect competitiveness.

Disagreement or confusion seems to occur over whether price signals alone will incent cost effective emission reductions via energy efficiency. Other policies may be needed to create the right motivations for efficiency adoption. Generally one assumes that as efficiency increases, its implementation is paid for by increasing cost reductions and emissions are also reduced. Over time both companies and individuals will adopt efficiency investments via a natural diffusion process as technologies naturally increase and improve. However the studies do not assume incremental energy efficiency out to 2020 or 2050.

There are two reasons that people don't undertake energy efficiency investments. The first is market failure. In these situations, a market intervention can increase efficiency. For example, there may be inadequate information about the life cycle costs of alternatives. Information is a public good. Providing access to information is often under-provided. There's also principal agent problems. For instance, housing problems where landlords and home builders don't have sufficient incentives to make efficiency investments because they don't reap the benefits. There may be price distortions. That is, the prices consumers face in their energy efficiency decisions may be lower than the actual marginal costs of their energy use.

Overcoming these market failures through policy intervention may impose certain costs in and of itself. Households vary significantly in their energy use in both intensity and quantity. Some measures that address market failure may not adequately address that heterogeneity. Price signals do address that heterogeneity, but a uniform performance standard, by contrast, treats all individuals alike. Thus a uniform performance standard imposing efficiency requirements with light bulbs, building materials, or air conditioners may impose costs on people for whom the economic energy savings payoff doesn't offset the cost of those measures. Thus, some policy interventions can decrease economic efficiency while energy efficiency increases.

The second bucket of reasons for non-adoption of efficiency measures is market barriers. In essence, unobserved costs such as learning about and transitioning to new technologies. They also may arise because of changes in product quality. So for example, vehicle performance standards may be lowered when fuel economy standards are implemented. This is a well-trodden debate going back 15 years that has focused on when does energy efficiency lead to net economic savings?

One way to consider this is to examine discount rates that people use when they undertake energy efficiency decisions. Some argue that implicit discount rates are high compared to actual discount rates economists see in capital budget decisions or home efficiency decisions and their payback periods. In essence there are unseen transaction costs that lower the discount rates. Further, it's really a question whether these are market failures or barriers. It's very hard to distinguish between the two.

Even if energy efficiency may be potentially costly when considering immediate economic costs, it doesn't mean that the environmental benefits are not valuable. There may be energy efficiency measures that address market failures. Further, other measures may be worthwhile in terms of environmental benefits despite the marginal costs. Many of these studies may incorrectly estimate the extent of negative cost emission reductions available.

It's important to think about how one uses these studies and what they inform in terms of policy design. First, concerns about the quality of economic studies doesn't suggest that negative cost emission reduction opportunities don't exist. We clearly need to look for and identify

these sorts of policies. Further, a timely and serious climate policy is probably warranted.

However, the details really do matter. One needs to identify policies that are valuable beyond price issues. These studies need to look at the incremental cost effectiveness of individual measures and not just the costs associated with an entire package of predetermined policies. Uncertainty needs to be incorporated into the modeling. Different levels of stringency in different types of programs should be addressed because the models are not necessarily linear. The country needs a better understanding of the kinds of factors that are motivating and influencing individual decision making. Some policies will mandate behavior, and others will be set in a decision-making paradigm like people's health care or personal finances.

Third, the economic consequences will probably not be low. Thus, a serious and careful design of policy that can achieve emission reductions in a cost effective fashion is needed. The assumption that emission reductions will create an economic boon may lead to haphazard policy implementation.

Fourth, this discussion implies that a market-based policy based on price signals is an important core of any cost effective climate policy. Both supply and demand respond to price signals.

Fifth, the uncertainty of these emission reduction estimates suggests that cost containment policies that address uncertainty are important. This is necessary for the long and short term. A market based policy will be complemented with cost effective policies that address market failures. Price signals alone may not achieve these investments. However, policy should be justified based on its ability to address market failures. The industry needs detailed specific cost studies. many of the current studies have used very general numbers. They have not provided details about specific demand side programs.

Question: You discussed policy actions that may decrease efficiency but increase emission reductions. Can you expand on that?

Speaker 3: Designing policies that distinguish where there are market failures and where there are simply people that are not undertaking energy efficiency investments because it isn't worth it is hard. Uniform standards is one example. Building standards on new homes should be very different in Maine and California. One could obviously design different standards for those states but over time there is a tradeoff because the plurality of these different standards over time increase. Further, one wants standards that adapt with technology over time and are fluid. It's very challenging to design programs and policies like that. Some policies may create unintended consequences.

Question: You've identified price distortions like retail electricity prices below the marginal cost of generation. You would identify this as a market failure because of the lack of the metering technology. Thus there's adverse incentives for consumers to over-consume in a peak period?

Speaker 3: There are many flavors of price distortions in this context. It could be price distortions the earlier speaker discussed where rates reflect embedded costs that don't fully reflect the marginal costs or block rates that don't reflect changing time regardless of whether or not it's real time or not. Simply, when people don't see price signals then they don't make optimal decisions.

Speaker 4.

I love the modeling and theoretical approaches that my co-panelists have presented. I'm going to try to complement them with a realistic approach to these issues. I've been engaged pretty actively in the design of cap and trade issues in RGGI, California, and Oregon. I'll try to incorporate this all into my discussion.

Many environmental economists believe that high carbon prices will be enough to drive change. Consumer advocates, both industrial and low income advocates, already want lower prices. They do not want higher prices. There is little appetite in Congress or the states to impose high prices on people. The country just had $2

increases in the price of gas but now that gas has come back down there is no state that would pass a gas tax. In Vermont they want a 5 cent tax to fix bridges that are falling down and they can't do it.

Let me focus on my conclusions at the start. I don't think the country can raise prices of carbon, and therefore energy, high enough to get the 50 to 80% reductions that science tells us are needed. Second, carbon prices are in fact useful but the foundation to significantly reduce carbon in our economy is portfolio policies. In the electric side, that means renewable portfolio standards, energy efficiency programs, conscious rate design innovations, the California loading order, and strategic investment choices by utilities. These are policy decisions rather than the carbon tax approach, which relies principally on prices to drive change. Especially efficiency.

End use efficiency is the cornerstone of cap and trade, but I'll come back to that later. Ultimately politicians will ask how much is it going to cost consumers per ton avoided? The carbon price and the cost per ton avoided are not the same thing. Ultimately, my primary message is that the country needs to immediately get to aggressive energy efficiency. The country will learn when to stop if it needs to stop rather than trying to decide the cost of efficiency a decade from now.

Then finally, cap and trade design has to have efficiency incorporated into the system, not added on. In RGGI they initially started as add-ons. These sorts of things should be cornerstones of cap and trade, not complementary, not ancillary, cornerstone.

Nobody has a crystal ball. Lee Raymond, the CEO of Exxon Mobil argued that in business planning the real question is, "we don't know what prices are going to be; what should we invest in?" Price prediction is usually wrong. One shouldn't bet their retirement, or the future of the planet on it.

The first speaker discussed the problems of long-term projections. However, one can get pretty good projections too. The DSM (demand side management) forecast that the New England Power Pool used in the late 80s showed that savings might be higher than people initially expected. Between '87 and '91, they realized there was more efficiency than initially predicted. It was cheaper than projections and the savings grew at much higher rates. I argue we can expect the same kind of experience if we are aggressive about energy efficiency in the United States as a carbon strategy over the next decade.

So, where are power sector carbon reductions going to come from? In RGGI everyone initially said the carbon price will simply drive change. However, some ask the question, exactly what change are you counting on happening? There's a limited set of places where changes will occur. It's either change the existing fleet, the level of consumption, or change the new generation facilities that get built. For each of these options, how much is it going to cost consumers to avoid a ton of carbon dioxide?

Everyone knows there's a large reservoir of low cost efficiency. However, how much it costs depends on how it is acquired. If well-designed building codes and appliance standards are adopted then the cost of efficiency can be very low. If expensive programs are implemented on an ad-hoc basis then it might be really expensive to acquire efficiency. Could we acquire too much or pay too much? Sure. Least cost analysis should be used but when alternative generation resources are cheaper than traditional energy efficiency then we should get it.

Obviously, a multi strategy policy that focuses on different resources is necessary. Energy efficiency should be considered the first fuel, not the fifth fuel. Every conversation about efficiency assumes the low hanging fruit is getting picked and that subsequent efficiency will be more expensive. This is a problematic way of thinking. There are economies of scope and scale in all resource regimes. The industry expects the price of wind to keep going down as more is deployed. The same for solar. It should be the same for efficiency. The price of efficiency should decrease over time.

Vermont is spending a higher fraction of utility system revenues on efficiency than almost any other state. Many there thought the low hanging fruit would get tapped but in the last two years the yield rates are improving and the cost per megawatt hour avoided is less. There are increased economies of scale from deeper programs. There is a lot of low hanging fruit.

Let's address the political realities of the assumption for a big carbon tax or a cap and trade policy with an auction. The idea is to have the chips fall where they may and let the magic of the market solve these problems. First, if one considers the places in the world where efficiency is going in but will it affect demand? It is hard to affect demand with price increases. People are very resistant to this. However, on the power side, well designed energy efficiency programs deliver a lot more carbon savings than a mere price increase.

Let's consider a heartland state like Ohio. If one models traditional price non-elasticity of demand for electric there are small savings due to the price increase. However, suppose a system benefit charge is implemented for efficiency or rates consequences are tied to an energy efficiency performance standard. If rates are raised by the same dollar amount, i.e. consumers are paying the same amount of extra dollars in their bills but that money goes into well-designed efficiency programs delivering cost efficiency savings at three cents a kilowatt hour. This models out to seven times the amount of savings. Over a 20-year period it stabilizes at seven times as much efficiency and carbon savings to the economy.

Victor Niemeyer at EPRI has looked at the effects of a large carbon tax. It takes a very big carbon tax to change the merit order dispatch of the fleet in either regulated or market environments. We all know the reasons for this. The low marginal cost units are already running when they can run. A large carbon tax cannot improve the output of nuclear or wind plants. It gets down to a fight between gas and coal and how large a carbon tax is needed to move from coal to gas. Niemeyer's analysis in Maine showed that one could essentially double the wholesale price of electricity in that region and reduce emissions by about 4%. That will not fly politically. In Texas there's a different version of the same problem. They will have gas chasing gas on the margin and little actual change in the environment by a big carbon tax. The folks at EPA and the air directors do not know this. They believe a carbon auction or tax of politically acceptable dimensions will change the dispatch, and very simply, it won't.

The folks working on RGGI are in organized wholesale markets with single clearing price auctions. When the cost of the marginal unit goes up due to a carbon cost, either an opportunity cost or an actual cost, everybody in the bid stack gains the benefit of the price increase. This creates windfall gains to the infra-marginal units. It also significantly increases the cost to consumers. It will not be politically acceptable, and we should not be betting the environment on this approach.

The price driven top down approach to carbon management is an expensive way to try to reduce emissions. In the RGGI design process a growing realization occurred among the air directors that most of the savings in carbon reductions come from the RPS' and the energy efficiency programs that the states have. They're not coming from the cap and trade program in RGGI. They're coming from the portfolio policies and that's what should be expanded. That's my essential point, frankly.

The E3 analysis for the California PUC showed that a carbon auction price or tax would have to be in the $100-150 a ton range to create incentives for new renewable energy beyond California's current RPS. The California RPS is already delivering a large fraction of what could be realistically be expected to be built and put online there. It's the RPS, not the carbon price, that is creating this.

Instead we need a more consumer friendly climate strategy. I want to emphasize that carbon prices are necessary via cap and trade, or through a tax. Nonetheless, trying to deliver the goods in the power sector by virtue of that high price is politically doomed and costs consumers much more in transfer payments than is fair. State policies focused on portfolio based

resources are needed. This includes efficiency, codes, portfolio management, and the RPS as well as some discrete attention to low income customers and the opportunities for savings that arise in that sector.

So how might one design a cap and trade program that does these things? First, the cap and trade program should be designed with a major objective of delivering aggressive end-use energy efficiency. Carbon scrubbers on coal plants should not be the main policy objective. Improving efficiency on the ground can include an allocation of allowances specifically to support end use efficiency. Generators in RGGI assumed that a cap and trade program for carbon should look just like the cap and trade program for acid rain or NOX, It would be principally based on free allocation of allowances to emitters on their usage patterns. The idea that allowances would be given to trustees for consumers was shocking to people. Air directors at EPA assumed it wasn't necessary and they were used to working cooperatively with generators on this point. Many folks had to seriously reevaluate their understanding of the program to finally understand that it would be far less expensive to consumers and fairer if RGGI would award allowances to consumer trustees. These funds would be reinvested in clean energy resources, particularly energy efficiency.

Initially RGGI was simply going to award allowances but now about 90% will be auctioned and about 80% of the revenues will be dedicated to efficiency. Most of the remaining allowances are for other clean energy resources. That's ten states, governors, legislatures, PUCs, and air directors learning through this process about this significant improvement on the cap and trade design.

The folks at RGGI conducted analysis of what happens if they double spending on energy efficiency. It has consistent positive effects. Carbon prices drop, the need for fossil capacity drops, and customer bills go down. This benefit continues if one triples or quadruples the funds. Federal legislation needs the same approach. A focus on portfolio-up policies for clean energy resources like renewables, efficiency, combined heat and power, R&D on low carbon resources and other. Windfalls need to moderated, particularly in the organized wholesale markets, by auctioning allowances or by allocation to distribution utilities on behalf of customers rather than generators. A significant fraction of the allowances need to go to efficiency.

I'll discuss a national carbon allocation for efficiency. This is a proposal for federal legislation to encourage states to promote end use energy efficiency. It's built on the premise and the understanding that a lot of the smart action will be through policies that are best suited to state action and that don't necessarily just require the expenditure of money. This includes smart growth strategies, building codes and their implementation, rate design of utilities, and fixing the utility throughput problem. One way to implement this is to distribute allowances to states on a performance basis for their improvements to energy efficiency.

Question: You've stressed that a carbon tax won't make change in the dispatch order in the electricity sector. Would a carbon tax have a salutary effect on the transportation sector even though it won't have the same good effect in the electric sector?

Speaker 4: Prices have effects to some degree. However, there was almost a 100% increase in the price of gasoline over the course of a year and only a 4% drop in vehicle miles traveled. It's bouncing back too. If we want a 50% reduction in emissions through prices, it's unlikely. It's the spending side that counts more than the taxing side here. It's how the country spends the money on programs and policies that is going to have a bigger impact on emissions than just imposing the price. That's true for transportation and for electricity.

Question: I'm curious about this implied carbon price for low carbon capital investment. These technologies imply over $100 a ton for some of these investments. Wind is $150 or 175. It's unreasonable. You didn't discuss nuclear and an aggressive RPS scenario leaves nuclear out in the cold. Where does it fit in?

Speaker 2: The wind costs are quite reasonable. It is around 125 to $150 a megawatt hour and avoids gas at $90 a megawatt hour. If one accounts for the carbon associated with natural gas versus wind it translates to about $150 a ton.

Question: So there's a natural gas or fuel inherent cost, and a carbon tax on top. How does that add to a $125 or $150 wind cost?

Speaker 2: This is just the difference between the cost of wind on a dollar per megawatt hour basis and the cost of gas, that differential divided by the differential in carbon.

Speaker 4: I'm agnostic on nuclear. We may need a national proactive approach to nuclear. The question still holds: how high would the carbon tax have to be to bring nuclear into the dispatch on an economic basis and bring investors to the table to build it? A carbon tax will not provide that incentive unless it is at a level that is politically infeasible. If you're pro-nuclear or pro-wind it is the same problem.

Question: It seems like your proposal for Congress is to just pass an RPS standard with energy efficiency and be done with it. However, you've got themes about cap and trade, etc. What would you actually have Congress do in the area of climate change legislation?

Speaker 4: It's a three part answer. First, get going right now on what we know works. That is, energy efficiency programs ramped up on a state and federal level. This includes a national RPS with a national efficiency standard as part of that.

Second, cap and trade is a good thing. It will expose efficiencies across sectors, it will allow trading that incents innovations and low cost resources. However, we can't design the cap and trade program as though the carbon price is going to deliver the goods all by itself. Auctions will be required that provide revenues which are reinvested in low cost answers. It should be "cap and invest," not "cap and dividend" or pure carbon tax.

Third, we need to enlist state and local governments, industry groups, the owners of real estate, and other stakeholders to provide efficient answers. The national program should be focused on policies in the states, not via EPA rules in Washington. A performance based allocation of revenues, of auction allowances, to the states will inspire and support those distributed actions.

Question: I'm interested in the energy independence implications of building more renewable energy. Energy independence with renewable electricity is different because we're not worried about oil dependence; oil fired generation is such a small percentage of our mix. There is a concern for relying on the development of renewable technology from other countries. I'd like your thoughts on this potential problem.

Speaker 1: Is the question whether energy independence is part of the goal and if so how that affects that?

Question: Yes. I wish politicians would stop saying that renewable energy is the key to releasing us from foreign oil. That's wrong. There is another energy independence problem if we have to rely on technology development from other countries for wind turbines or nuclear technology or others.

Speaker 1: The concern 30 years ago about being self sufficient in everything is less of an urgent priority because we're so interrelated in a global economic sense. There is mutual shared destruction. For me the stakes are not the same.

Speaker 2: Developing these innovative technologies domestically has huge spillover effect potential in the U.S. However we shouldn't be striving to manufacture all of these renewable technologies domestically. There is a huge advantage to working on developing the technology domestically, less in terms of security and more in terms of economic development.

Speaker 4: Well I agree that we're all interdependent. However with oil the geopolitical problems caused by petro dollars mean we are spending and exporting a lot of money out of our economy, and it's not

necessarily advancing global wellbeing. When it comes to oil, the benefits of energy efficiency cannot be overstated. Our policy over the past 20 years has been idiotic, especially when one considers heating oil dependence in the northeast.

I've looked at data that show that the New England states, even before the run-up in oil, were spending and exporting more money out of New England to buy oil than they are spending on education. They are buying carbon that they don't want to emit, instead of spending it on education. It's an enormous economic drag.

There is a potential connection between renewables and oil in the future with plug-in hybrid vehicles. How does the country reduce emissions from the transportation fleet through electricity? This is exciting because there are potential win-win solutions here.

Speaker 1: I'd like have a rumble with Speaker 4. [Laughter] I do agree with one thing that you said. [Laughter] We do need a variety of strategies and I'll stop with that.

There are two areas of contention. First, global climate change is a non-market problem that needs long term forecasting. All the problems with forecasting also affect our ability to determine optimal building codes, the right renewable portfolio standards, etc. The forecasting problem exists with carbon taxes, and with all the other kinds of policy proposals.

In the discussion of carbon taxes, you pointed that prices don't work and that gas prices went up and there was almost no reduction in miles driven. However, this is a difference in short run versus long run thinking. There was an immediate and huge impact on the demand for gas guzzling versus energy efficiency cars. The full effect and benefit of pricing works over the long run, maybe 5-10 years, not 50. In the short run, people are locked into their energy consuming goods or patterns.

I'm in favor of carbon taxes. They should be one of the first things we do but other policies will be needed as well. My chief argument is that customers will respond to prices. The real benefit is that we don't have to determine from a command and control system what the national renewable portfolio standard or building codes should be. Instead, there is a price signal that the consumer sees and millions of those consumers, businesspersons, and entrepreneurs figure out how to respond to that.

Let's consider dispatch costs again. There is a difference between short and long run investment costs. A utility is locked into its fleet of generating assets. There's a limited amount it can do in the short run to change what it operates. If the carbon tax kicks in then consumers will use the market to stimulate creativity, innovation, and efficiency. I agree that if there are windfall gains then what to do with the money needs to be determined. It should not be given to suppliers, generators, or grandfathered assets.

Speaker 2: I recently saw a conversion of the recent increases in gas prices to a carbon price that was equivalent to $150 a ton. There is a disconnect between the idea that prices in carbon will drive substantial changes and what prices politicians will bear. It's the same thing with the E3 study of renewable energy equivalent to natural gas at a cost of $150 as well.

However, there's an important role that carbon prices will play for all the reasons just discussed, especially in driving innovation. However if the country is focused only on the short term least cost solution to reducing greenhouse gas emissions the big infrastructure investments needed for our long term goals will not get accomplished. We'll be stuck in the $5-20 range for carbon prices. That price level will not drive deep technology and infrastructure development.

Speaker 3: Speaker 4 is correct. If leaders don't tell folks that the costs of climate goals are higher then there will be backlash. People need to know that these prices are going to rise. Global fuel prices are high, and climate will impose costs – there will be no cheap or free lunch.

This is a long run problem. Most of the climate models need the globe to hit 2050 or 2100

targets in the short run to reach the 450-550 ppm goals that are needed to reduce global warming.

Price signals are needed to give incentives for the large infrastructure changes. Certainly efficiency is part of the problem. However, this is a long run problem. Looking at the fact that fuel switching costs are high because of the rise in natural gas prices relative to coal really provides a small part of the overall picture.

Speaker 4: The question is not how high do prices have to be to make consumers act efficiently. Rather, the question is how to design a portfolio of strategies to reduce emissions rapidly.

Moderator: At any cost or at the lowest cost?

Speaker 4: Cost effectively. We know that energy efficiency is under deployed in society because low energy prices. In Hawaii electricity is 40 cents and they waste electricity in Hawaii just as much as Atlanta. There are many market barriers in the system. We need to be more nuanced. A high carbon price will not get efficient solutions and a lot of low cost solutions will be left on the table.

Question: I'll continue on this theme. This is a long run project and the sustainability of the various policy proposals is critical. If the country does something which works for a few years and then collapses we will be in serious trouble. The arguments about transfer payments are misplaced. The maximum number of times one can expropriate rents is once. Eventually these costs will come into the system if we're trying to reduce carbon emissions.

The McKinsey lower cost curve was set up with careful accounting so that you can add up the two of them and it turns out to be zero. I am skeptical of this if one integrates all the data across the whole thing. Trying to obscure the conversation so customers don't notice that their rates will go up even if the costs go down will not work. This is what we saw with the California story.

Some of these proposals are promising people that it will be cheap, that the government can direct the money more efficiently but we're implicitly taxing them in order to get the money to pay for it. This kind of policy is setting ourselves up for a huge fall. It will be rejected and collapse because of it's not being true.

By contrast, a cap and trade carbon price tax gets the price up. One Washington proposal uses the Alaska solution where high energy prices are good because voters get bigger checks in the mail. People actually receive the money, not the claims that they're saving on energy efficiency or better insulation. It is much more sustainable politically. A lot of this strikes me as delusional. It will be very expensive to eliminate carbon. However, it's worth it and a really good idea and the country needs to be on this road sooner. We just need to be clear that there will be costs or it will be defeated.

Speaker 4: Don't misunderstand me. It is not a free lunch, and it won't be cheap. The governor's decision to impose a safety valve in RGGI at 7 dollars is a bad policy.

However, trying to address the market failures with respect to the delivery of greater efficiency in the economy by whacking consumers with higher prices more likely to lead to political backlash than the false promise scenario you've just described. Both are a problem. The high price consumer pain approach is also political suicide.

Let's ask a question. Should the country repeal the renewable portfolio standards? By your logic we should and just have a carbon tax instead.

Question: Yes. The RPS' are mostly irrelevant. They will not be implemented and they're riddled with exemptions. Governors can come in as soon as it starts to hurt and remove them. If I thought we were going to enforce them I'd be more concerned but I don't think we are. [Laughter]

Speaker 3: It will be costly and we must be honest about that. Concerns politically for measures that increase rates too quickly and it seems that an administrator can control them or pass the buck to someone else are relevant. This

requires some compromises. Dividend checks to consumers is a great political strategy.

However, the McKinsey studies, really identify areas with lower costs and imply very targeted programs. The political momentum should be focused on these issues. There is a real risk of setting some unrealistic expectations about what this is going to cost.

Question: The proposal for a carbon tax with givebacks to the public via income tax or earned income was proposed by Al Gore and got far in Congress. This implies a situation where the pain isn't quite as severe but if you want to live a better lifestyle you engage in conservation because the prices are higher. It provides a natural market effect. This is preferable to a program where the national government has to decide which state gets what for what every year. That will be very difficult to implement.

Speaker 4: Let me start with a fundamental point. There are extensive opportunities for low cost energy efficiency that are going untapped in our economy. We need to do whatever we can to tap those opportunities and relatively quickly because it is both a short-term and a long-term problem. I'm in favor of CAFE standards, appliance standards, and building codes. I assume everybody in this room agrees with those things.

Comment: No. [Laughter] CAFE standards are a good example. They have all kinds of funny exceptions and partitions and caps. People started buying all kinds of light duty trucks that were actually SUVs. Those standards don't work well.

Speaker 4: I'm not in favor of bad CAFE standards.

Question: It would have been much better if we put on a big gasoline tax.

Speaker 4: Yes, I agree. However, I have a perspective of green realism. First, I want to reiterate the fundamental point that price signals to end use consumers by themselves will leave a lot of low cost efficiency untapped and it will be more expensive to the economy. Second, it will therefore reduce fewer tons of emissions. From both an economic and environmental point of view we need a more complex strategy that takes advantage of policy opportunities – call them command and control, portfolio. whatever. We need these as well as price signals. Price signals by themselves are not enough.

Question: There are two delivery mechanism models in the states for energy efficiency. One is a competitive model where aggregators bid into wholesale markets in New England or PJM, and they have a competitive clearing price. The other model is the old IRP [integrated resource planning] model. The utility commission holds the distribution company responsible and directs various programs to happen. Are these incompatible?

Speaker 4: The two models can coexist. I support the creation of the open resource auction in the forward capacity market in New England. However, most of the heavy lifting for efficiency in the region is done by state programs or utility directed programs. Those are working well and should be expanded. They coexist well.

Moderator: Other comments on that or should we keep going? I think we're ready to keep going. Brandy, please.

Question: How might national allocations for efficiency allowances work. If the feds were assessing this how would they ensure there was uniform measurement and verification so that the comparison between states is accurate?

Speaker 4: The background on this is that if we want to create federal incentives for states to adopt beneficial policies like smart growth and building codes then monies would go to states with the most success, not purely in proportion to their energy consumption or their population. So then the question, how do you measure success? How does one compare Indiana to California? However we can't compare them. Instead we should compare them to their own historic baseline. So Indiana gets compared simply to Indiana. Measurement protocols would be needed in order to make that decision. The EPA or the DOE would have to set

measurement standards for states against their own baseline.

Question: I want to address cost benefit analysis. One of the critical issues is the natural gas supply curve. The price of the gas is always the best alternative and there is a lot of bad modeling to determine that. There is a major change in the gas supply outlook because of deep shale gas. Forecasts in the 90s and 2000s were problematic. They were used to justify all the merchant power plants and because of Enron a lot of this stuff was buried deeply and is not knowable. It alarms me that those models are being used for real decisions. I appreciate your comments.

Speaker 3: There are two important points. It's not as important to get the right natural gas price, or any other commodity. It's to account for the uncertainty in those costs in two ways. One is to have intelligent sensitivity analysis that looks at cost benefit tests under different circumstances. Second, it's to think about whether investments are sunk investments like a new combined cycle gas fired plant, or investments in energy efficiency, that would change the kind of hurdle rate that makes sense given that uncertainty. If prices continue to go up, it makes sense, but if prices go down then it may be worth waiting. That's the hurdle rate. Both kinds of analysis are critical to addressing uncertainty and scenarios.

Question: I'm concerned that we're imposing command and control on top of electricity markets. Our past experiences with price forecasts over the price of oil, other fuels, prices for qualifying facilities, or costs for Nox and Sox in environmental programs have not worked. Market mechanisms for Nox and Sox did work. What will the distortions be to the market with command and control, or a national RPS?

Second, the negative cost of abatement numbers in energy efficiency is a concern. Even though there may be a negative cost abatement the price is still going to be the price at the margin. We could potentially see $60 per ton CO2 prices even though the vast majority of those costs may be negative. One way or another, generators will incorporate the cost of CO2.

Speaker: The modeling for RGGI demonstrated that if you can reduce demand through low cost efficiency then the clearing price of energy is reduced and the pressure on carbon prices. There will be a marginal price of carbon, but that price will be lower.

Session Two.
Electricity Markets: A Transformative Moment?

Circumstances are converging in ways that may well be transformative for the electricity markets. Financial markets are in a crisis. Consumer confidence is low. The entire relationship between government and business, especially in regard to both investment and regulation, is being re-thought and reconfigured. The enormity of confronting climate change issues is now directly confronting decision makers. At the same time, national security worries are now forcing us to be far more efficient and innovative in our use of energy.

How should policy makers, regulators, and business leaders respond to the need to meet all of these challenges? Do we need what Paul Joskow has called for – an Energy Policy Act of 2009? If so, what should be in such a law? Can markets be designed or redesigned in ways that will better enable us to manage our way through all of these challenges? How might we redefine the role of government in transforming electricity markets? Will the electricity industry, with its tremendous thirst for capital, continue to be able to attract investment to meet increasing demand? In short, what will the electricity industry look like after emerging from the turbulence of the present time, and what might we do to best shape it for the future in light of all that we have to confront?

Speaker 1.

As the French say, the more things change, the more they stay the same. I will talk about the US industry but also the wider industry. There are big problems coming our way from the rest of the planet. We're in a period of massive change. There are 6.7 billion people on earth, doubled from 50 years ago, and it will soon be 9 billion. The growth will come from the developing world who will have aspirations for energy and resources. China is putting 14,000 new cars on the road every day. China is also becoming aware of its immense pollution problem. Their emission standards for new cars are set far higher than the U.S.

I've grouped the issues into structural and substantive concerns. I'll leap right in. First, we need to transform RTOs into transcos. The RTOs are doing a pretty good job but the process is fraught with politics with many players. We would be better served by a system of 6-12 regional companies – public or private – and overseen by FERC. The size and scope of these transcos would be shaped by the state commissioners, FERC, and NERC. The fewer the better because bigger markets have more players, more competition, and are more efficient.

The results of states that tried to establish marketplaces with too small or too ill-defined a market are not promising. A 21st century Federal Power Act of the type envisioned by Professor Joskow could establish these transcos. They would be authorized to lease the necessary facilities from their owners and protect existing contract commitments. State interests would be protected via a proceeding through section 209 of the Federal Power Act, which sets up federal/state joint boards.

The second structural point is to improve major facilities siting. Mostly transmission lines but also power plants. Both often affect more than one state. There is federal eminent domain for gas pipelines. Again, state interests can be addressed by joint boards or interstate compacts. Facilities of a purely intrastate nature would remain the exclusive domain of the states.

Third, transparency of prices is critical but this does not need to be said at this point. It was covered in the earlier session extensively.

Fourth concerns human infrastructure. The country spends too little money on research and engineering education. Tom Freidman's book, *Hot, Flat and Crowded*, gives an important perspective on this issue. A small levy on all electricity sold in the country could be channeled into research and pave the way to innovation. 20% should be allocated to engineering education because we're educating far too few engineers in relation to the rest of the world.

Let's switch to substantive changes needed for success. The two bad boys, coal and nuclear. We need to find a way to use coal in a way that is less injurious to the environment. This ties back to research and the need for R&D in coal. The U.S. has the equivalent of the Saudi Arabia of coal in the upper Great Plains coal fields.

Nuclear is a different story. We've begun to see some anti-nuclear activists change over to advocates. This includes Gwyneth Cravens who wrote the *Power To Save the World, the Truth About Nuclear Energy* and also Patrick Moore. Cravens had somebody from Sandia Labs go through the whole nuclear fuel cycle, look at abandoned mines, nuclear plants, all sorts of facilities around the country. She compares the relative toxicity of coal plants versus nuclear and argues that nuclear is much cleaner. However, nuclear needs one or two standard designs. Currently there are almost two dozen applications at the commission with five different designs. The commission should weed out the less promising designs and applicants. The current capital crisis may weed out some applicants of its own.

Nuclear power is useful for the U.S. and China. China is going to need a lot of coal if it doesn't do something else. Windmills alone are not going to do it because they are great for producing energy but not capacity. Coal and nuclear give us base load, capacity and energy. Gas is the transition fuel.

Energy efficiency and renewables are popular but they are probably not enough. They do provide distributed technology. Solar, thermal, or wind can make a huge contribution world wide, and is particularly useful in places without a central station grid like the U.S.

The U.S. needs to take the lead with these technologies again. Friedman tells a story of an Ohio startup in the early 90s called First Solar that could not find a market in the US because everything else was too cheap. They went to Germany. Germany saw that fossil fuels would become more expensive and renewables and efficiency would become less expensive so they enacted the feed-in law with inducements to install solar, including strong guaranteed prices for 20 years. First Solar has brought down the cost of its panels to $1.12 per watt via their first factory in Germany. They built their first factory in Germany, where the market developed. Other European countries have copied Germany's feed-in laws.

Jeffrey Immelt, CEO of General Electric, argues that utilities and big manufacturers want the president to stand up and say, by 2025 we're going to produce this much coal, natural gas, wind, solar, and nuclear. Nothing will stand in the way. There would be 30 days of whining, and then people in the energy industry would stand up and say, thank you, Mr. President, we'll do it.

Next in the substantive vein, upgrade the power grid to clear congestion but also to enable region to region transfers. For example from the Appalachian coal fields to New England, or from wind resources in the great plains to the load centers of the Midwest and the west coast. We should link the eastern, western, and Texas grids asynchronously with DC transmission. It's a wonderful complement to AC and because of its directionality DC can avoid or help restore outages in the AC system. It's cheaper to build over a long distance than AC, has less line loss, and requires less right of way. It provides added security and flexibility.

The electricity industry has been lax in promoting electric vehicles. Some think the batteries are too expensive. That does need research. If Congress bails out the auto industry they should be held to development of a reasonable fleet of EVs. So much of urban driving is 10-20 miles a day. It requires no special technology. These could be 110 volt plug-ins, hybrids, hybrid electrics, or pure electrics. It would improve balance of payments, air quality, smooth utility load factors, and add revenue for utilities.

My last point is leadership. We've needed a national energy policy for decades. The problem is that policies can be inflexible. However, wind and solar are living from year to year on production credits – there is no certainty for investors. We need to develop a sense of urgency and ramp up consciousness about the opportunities and problems in this area.

Speaker 2.

There's five major challenges for the industry. Global warming, energy efficiency, reducing dependence on fossil fuel to renewable resources, rebuilding an aging infrastructure and creating a smart grid system. It's a huge investment that's necessary and funding it is a challenge and an unknown. These challenges require more than a state by state action plan. They need unprecedented cooperation on a national level. I'll look a bit at New York to make some of my points.

Part of the panel discussion is to talk about market design and how it might change. Market design's not the fundamental issue at all. Markets are an alternative regulatory mechanism. They are probably a better regulatory mechanism. They shift risk and other positive things but in the end it's not the markets that will make or break the system. Having 50 states individually acting to develop a single comprehensive policy will not work in either a vertically integrated state or a market state. In the end the ratepayers are spending the money.

In reality the states are competing with each. They compete with each to attract a manufacturer and throw packages together for them. Different states and regions have enormous variation in the price of electricity.

It's mostly due to the resource base, environmental policies, and geography. If one examines a map with the price per kilowatt hour and the percentage of coal generation, they correlate very well, except for the Pacific Northwest where they have extensive hydro.

In West Virginia in 2007 they had 5.1 cent electricity and 98% coal. New York was 15 cents and 18% coal and New England had 0% coal. The regulatory policies have little to do with these issues. It's the basic resource base and some of the decisions that they've made along the way. In addition there's been a vacuum in federal energy policy. The states had to fill it.

EPAct addressed some of these issues but not fully. Transmission is a problem. The NIETC (National Interest Electric Transmission Corridor) provisions are still very weak. They are not a comprehensive policy to get transmission built. Similarly the renewable tax credits are determined on a yearly basis for projects that require a 3-4 year lead time. Global warming is similar. It is a global issue, but climate change efforts in the United States have been regional affairs. There's been no federal policy so the states jump started the process in California, with RGGI, and with the Midwestern regional greenhouse gas reduction amendment. Obviously some states don't have any programs so some states pay the costs, and others don't.

The clearing price in RGGI, was $3.08 in the first auction, and these costs get passed along in the market bids of generators and ratepayers will pay for this valuable program.

Energy efficiency has also been a state by state effort. Different geographies require different programs. Programs that are effective in New York City may not be the same ones that work in Montana. However, there are efficiency programs that are best done at the federal level. For instance, appliance efficiency standards. There are some states with more advanced energy efficiency initiatives. In the states that spend the money, ratepayers put money into a system benefit charge. In New York the state energy research development authority develops cost efficient energy efficiency programs, money well spent. However, the world doesn't look at energy bills, it looks at energy rates and the U.S. is not competitive.

New York has some of the smallest energy electricity bills in the nation. That is geography in part. A 250 foot studio apartment in Manhattan doesn't need much. However the bills are also the most expensive in rates, and that's because they are spending money to reduce dependence on fossil fuel, and implement renewable portfolio standards.

Many renewables at this point in time are not cost effective. When the Niagara Power Project was built in the 30s it was not cost effective compared to oil. New York paid a premium for the Niagara project. It's turned out to be a fabulous investment but there was extra cost associated with it to start. That's where we're at in renewables right now. However, again the ratepayers pick up the tab. There's enormous state variation in renewable portfolio standards, it's the same story.

Extensive investment is required for rebuilding an aging infrastructure. The Brattle Group's estimate is $1.5-2 trillion of investments. If we're really going to develop a backbone infrastructure for the transmission system the model is the interstate highway system. Otherwise, Tennessee would have a road between Nashville and Memphis and Knoxville but not to the border. The New York regional interconnect is an intrastate line in New York. 1,700 people came to the public hearings, 370 public statements, and five people were in favor of the project. That's fairly typical. Regulators, senators, Congresspersons, state Senate and Assembly are supposed to override that opposition. It's not a blueprint for success. [Laughter]

Smart grid, everybody's for it, nobody knows exactly what it means. [Laughter] The country is still operating the grid in a mode that looks like it did in 1970. If Alexander Graham Bell looked at the telecom system he wouldn't have a clue what's happening, but if Thomas Edison looked at the electric grid he'd pretty much recognize large parts of it. There are 50 to 70 pilot projects occurring around the country. States and utilities

are developing their own pilot projects. The NARUC/FERC smart grid collaborative is trying to start collecting that data instead of inaugurating 50 more pilot projects. There are different protocols being developed. If the country gets that wrong there will be parts of grids that can speak to each.

This electric system is interconnected. The eastern interconnect has been described as the largest machine in the world. 34 states, 7 provinces, 56 regulatory commissions, 13 control organizations, and hundreds of power producers, utilities, and munis. It's regulated on a state by state basis while the physics go wherever the physics flow. The problem is that 30 years ago planners were writing state master plans that look at the energy future and were calling for cleaner coal, more renewables, and a way to handle nuclear waste. The problems are still here 30 years later and we can't wait another 30 years. We truly need a new paradigm.

That being said there are some down sides of federal intervention. We really need a federal/state two way street. FERC has not yet achieved this. However, the reliability rules that have set national standards are a good approach. Further, one of the values of organized markets, not one state ISOs like New York or Texas, but New England or PJM is that they develop regional planning processes that are more effective than individual planning process would have been.

A more federal solution cannot be an unfunded mandate; mandates without dollars. If we're going to have an interstate backbone grid then where the dollars come from should not be just individual utility ratepayers. Same for a national smart grid. President Elect Obama is discussing an infusion of infrastructure that should develop energy infrastructure and move us out of this 1979 and still 2008 paradigm.

Speaker 3.

I hope to address the question of whether this is a transformational moment. Clearly all kinds of major organizations are going through a wrenching process right now. There is a perspective that while this is a tremendous challenge and crisis for the country, it's also potentially an opportunity. And boy does it make it important to improve the current system. So we're thinking about what the role of government is and how it interacts with the private sector.

The same argument applies in electricity markets. Now, the fundamentals haven't changed. The financial crisis has changed some of the context and perspective but the fundamentals in the marriage of engineering and economics, all of the problems and the jurisdictional issues remain. In Newsweek recently an article by Francis Fukuyama captured a key issue. He said, "deregulation, or the failure of regulators to keep up with fast moving markets, can become unbelievably costly, as we have seen." That captured a critical feature of the financial problem and also for the electricity sector. The question I keep asking is what regulation was removed? Please let me know what it is because I want to adopt it immediately. The common way to frame it is that regulations were removed. However many of the deregulatory actions were actually helpful, like allowing the quick incorporation of banks. Alternately, is the nature of the problem that regulators failed to keep up with fast moving markets? Something new was occurring and the fundamentals were changing. Regulators weren't keeping up with their oversight in order to deal with them. That is a very different formulation of the problem.

It's not that the country knows what to do, either keep on doing it or return to a past system. Rather, it's that the fundamentals are changing rapidly and regulators need new tools to address this. This is a better way to understand the problem. I won't deny the power of greed, that's not the point. That challenge in the financial institutions was to understand new instruments, new institutions, new relationships. They weren't keeping track. It's the same in the electricity sector, the challenge for regulators is to keep up with what needs to be done in that market.

Second, from the Energy Policy Act in 1992 the action is restructuring, not deregulation. In fact, it's a highly regulated system and new institutions like RTOs, ISOs, the reorganization of NERC, the state commissions, the FERC, and so on. The problem is not a lack of regulation, the problem is that regulation is hard. Trying to figure out what to do is the real challenge. The real challenge is to keep stepping back and look at first principles and continually bring them to bear on new challenges. It's not a question of regulating or not regulating. It's the fact that regulating has to be done intelligently.

FERC commissioner Joe Kelleher keeps reminding folks that the national policy – restructuring, relying more on competition, open access, nondiscrimination – keeps being reaffirmed over many years. It's not eliminating regulation, it's designing regulations that are compatible with the marketplace.

There is a distinction between little R regulation and big R regulation. It's similar to the distinction made this morning if there's a market failure, figure it out and fix it so it's eliminated and there's a new market design. This can include a new set of regulations along with that, defining property rights or whatever it may be, that supports the market and aligns incentives in the marketplace. Fixes need to be compatible with the larger regulatory framework and market design. Instead, we often see non-sequitur approaches where folks decide the market isn't working and therefore they socialize it and have the government decide what to do. This kind of approach is not sustainable and creates unintended consequences.

The reaction to the California energy crisis and the Enron scandals – which were clearly terrible – stopped the ability to think constructively about how to improve energy markets. Pressures keep building to have regulators make more decisions which is problematic for them and their successors.

The IEA brief [International Energy Agency], *Tackling the Investment Challenges in Power Generation in IEA countries, Energy Market Experiences*, from last year really addresses some of these concerns. They looked at experiences in many countries and tried to distill them. Their recommendations focus on reducing investment risks, reducing price caps, maintaining incentives, and focus on competitive markets. They want to reduce risks caused by government policy. You can't eliminate the risks that are inherent in the system. They emphasize the benefits of competitive markets, independent regulators and system operators, transparent market rules that are clear, coherent and fair, and efficient procedures for approval of new electricity infrastructure. There is much more detailed discussion. All of these could be implemented with current law and under the current authority of the FERC and the state commissions. For the climate change problem it will require more.

Paul Joskow, has proposed a Federal Power Act of 2009. It useful for taking climate change seriously and implementing the policies the Obama administration is talking about. I've extracted the most important suggestions. The first is to federalize the transmission rules. The second is to mandate regional transmission organizations and continue the unbundling of generation and distribution. He suggests that we rely on the states to determine retail access and allow for heterogeneity there. It's thoughtful about what needs to be done. He also suggests limiting generation subsidies to merchant investments, so there are not conflict of interest incentives under rate of return regulation. Allocate any non-auctioned CO2 allowances to electricity consumers. Finally, preserve state regulatory jurisdiction over distribution facilities.

From there I will go through my top five proposals. First, ISOs and the RTOs only cover about 75% of economic activity. That needs to be complete. Second, reform the reforms – in other words fix some of the broken markets like California's MRTU process and Texas' nodal reforms. Third, we need scarcity pricing as a general rule. Fourth, problems associated with transmission investment. Addressing lumpy transmission in a world where market based investments and cost allocation support a mixed market. The biggest concern there is to create beneficiary pays principles. Fifth, and finally, addressing climate change policy. The current

environment provides an opportunity. People are shaken to their boots. They can address the role of government is and what the private sector should be – it's harder than everyone thinks.

Speaker 4.

There is no doubt this is a transformational moment. Will we see transformational change in the electric industry and its regulation? A senior advisor at Morgan Stanley suggested one should always resist the urge to forecast. Number one, you're likely to be wrong. And number two, if you're right everybody who heard your forecast will remember it as their idea. So you're not going to get credit it anyway. Her second axiom is, if you must forecast then base it on what you know.

So in that case, yes, we're going to see transformational change of the electric industry and its regulation. All the facts show it's a pretty safe forecast. John Kotter's book, *Leading Change* is about transformational change in institutions and has eight factors.

I'm not going to give you all eight but the first one is having a sense of urgency about the change, that people feel change is necessary. The competitive realities in the markets certainly create urgency, along with the current crises/opportunities. Number two is having a guiding coalition of people who can lead the change. It has to include folks in power, including the people who probably don't want change. Third is a vision for change, what's it going to look like? Fourth, there has to be a strategy. Fifth, the vision has to be communicated. There are other interesting steps like action has to be empowered, removing obstacles, the need for short term wins, consolidating gains to get more change.

We do have urgency. In the recent election energy was a big topic in the campaign on both sides for the first time. The President Elect's campaign platform included a call for new energy in America. These include tackling climate change, promoting commercial development of renewables, moving to a digital grid, and ensuring a domestic energy supply. Kotter argues that two crises have to be addressed simultaneously; climate change and domestic energy. Within that promoting commercial development of renewables is an opportunity, moving to a digital grid is an opportunity.

The states have also shown urgency. There are 26-30 states with an RPS, 23 states with efficiency goals, several states with explicit carbon regulations, and many regions with carbon or climate initiatives. There are other perceived crises, and/or opportunities out there. The recession will be pursuing stimulus packages that will develop infrastructure, including the electricity industry. There's a simultaneous interest in creating more U.S. green collar jobs. There's also an interest in stimulating our advanced technology sector with green jobs and an investment in the grid. Overall, there are so many perceived crises and opportunities. We are clearly posed for transformation change.

On the Hill they are sorting out leadership changes. We won't see climate change legislation right off the bat but in the meantime we're seeing precursors to climate change legislation being debated. There is work on legislation to create a national renewable portfolio standard, smart grid development, and transmission expansions.

So in the White House they're creating a team, in Congress the various committees are creating teams, and independent groups will be active as well. The Center for American Progress is being used by the transition team to help see where consensus might lie on various policy issues. They have formed a team that's working with stakeholders to see what kind of consensus lies around reformation of electricity regulation to reach renewables and deploy smart grid technology. And there is a team put together by the UN Foundation called the Energy Futures Coalition which is doing similar consensus building.

Given all these activities, what's the vision of this new industry? The focus is primarily on lower carbon emissions, bringing renewables to market. Markets are implicit in the discussion,

but not explicit. For instance, the talk about reaching renewables has great interest among independent generators. They have had good success in that area.

The proposals for building more transmission to reach renewables is creating competition among transmission providers. Similar to gas pipelines, there would probably only be one transmission line in the west to a particular renewable energy zone, so who's going to do it? Generally, there is an opportunity to try to improve the markets we have.

Question: Both the journalistic and the policy world have utterly failed to distinguish that restructuring is not deregulation. Further, it's not energy independence that we need. These conventional wisdom bandwagons are completely unproductive. Are there any lessons on this, or ways to address it? [LONG PAUSE] Guess not. [Laughter]

Speaker 2: It's my experience that simple but wrong answers always beat complex but right answers. Further, there are often entrenched interests who will want to push one way or the other. It's very much a political argument a times. It's very hard for journalists to parse.

Speaker 1: Simplicity and buzzwords always win. It takes leadership, brilliance, and a communicator to lay out a more complex picture. One hopes that our new leader is such a person. Complexities need to be explained and people would actually be receptive to a real explanation.

Question: Clearly many people are arguing we need a massive investment in transmission. Is that the right public policy when analyzed on a cost benefit basis? For instance, many folks don't incorporate transmission development costs into the costs for developing wind. A speaker this morning was arguing for carbon reduction to be through the lens of cost per ton avoided. Similarly, we should do something similar with transmission development.

For instance, in PJM there was a proposal for years to build a new 230KV parallel line in Delaware through some environmentally sensitive areas. There were all kinds of congestion problems. Once the market started they saw the congestion points and prices. Over 18-24 months PJM, or the utilities, invested in a number of 69KV transmission upgrades. These were inexpensive, lasted 10 years, solved the problems, and they didn't need the 230 KV transmission line.

Speaker 1: There has been a lot of talk about electricity infrastructure and even a national grid. We should be incremental and selective. Not a grandiose plan but target a couple of opportune situations where the cost benefit ratio does make sense. It's a different situation than Eisenhower's interstate highways because of national security concerns. I presume that President Elect Obama's attention got drawn to this because of the immensity of the Midwest wind resource and the difficulty of bringing it to market. My sense is we don't need to go whole hog and should not because there are too many social problems to solve. There are too many things to do.

Speaker 3: I agree. The country does not know how much transmission investment we need and, more importantly, which transmission investments would be best. A process is needed to determine this. Many are good transmission investments if only someone else would pay for them. [Laughter] There are good systems for determining transmission line worth, and determining how stakeholders pay. The Argentinean model is very good.

The Colorado-Wyoming inter-tie is a good example of doing it right. They need a line from the wind fields of Wyoming to the customers in Colorado. They're getting wind generators to sign up in advance to pay for the transmission. They think it's a good idea and they're prepared to pay for it, and they're not going to socialize the cost. The cost socialization is a problem. Further, one needs to get scarcity pricing right. If there are no LMP data to go to then you can't fix it, like they did in Delaware. The current New York proposal on this regard really addresses this problem.

Speaker 4: This question is representative of the problem the country faces. The answer depends

on what regime is the context for the decision. These answer are dependent on whether we have climate change legislation. Is it cap and trade, a national RPS? If it's cost benefit analysis does one include economic development in that?

Question: Some general comments for everyone. First, Texas is building transmission lines. They're in a different situation than most other states.

Speaker 2: Yeah, I was talking about the United States, not Texas. [Laughter]

Question: Obviously, Texas would have a problem with their ratepayers paying for transmission in other states when they're already paying for their own transmission.

Second, the energy field is losing and experiencing a graying of engineers and skilled laborers. Students aren't interested in going into engineering or skilled labor. We need to form a connection between the energy industry and the public schools. In Texas they will need a 200% increase in the need for people in the nuclear field, and a 150% increase in the renewable field. They don't have the people. Many students aren't college or work ready. The focus of our public schools needs to be on seeing the business community as a part of their clientele.

Finally, Texas is having a little issue with implementing nodal but overall their market is working well. An earlier speaker suggested the President-elect should lay out a plan – "this much coal, this much nuclear, this much wind." However, that would be poorly received by the investment community, which is already extremely vulnerable. I look forward to comments on all these issues.

Speaker 1: Scholarships and funding for engineering education is not enough. Our public school education does not equip students to engage with the world. It does not teach them about managing money, it does not teach them about infrastructure. There should be a huge outreach program.

I didn't mean to infer an entirely prescriptive energy plan, obviously it wouldn't be. Instead, I was referring to the country's inability to develop a nuclear industry and continue it. We've had a similarly intermittent treatment for renewables. It's been short range policy and we need more consistent, long range policy.

Speaker 2: I don't advocate that we need trillions of dollars of investment in transmission. Some folks argue for a more significant backbone. The key issue is there are winners and losers. Texas is unique: it's a large, self-contained state, with 500 mile lines to get from resources. In the northeast 500 miles is four jurisdictions, and they all benefit or pay differently. It's very hard to get agreement. If we do need a backbone system then we cannot piecemeal it, especially between states.

Question: Transmission cases in Texas are the most controversial things their PUC handles. Lines go through large urban areas. Certainly the northeast is more congested than Texas but they're controversial there also.

Question: One of the planks in Paul Joskow's proposals was the further divestiture of generation from distribution. An independent generation community is critical to a strong restructured energy environment. However, the carbon proposals out there generally suggest that auction credits should go to consumers. These two things may be incompatible. It could decimate the independent power industry, especially coal. If the 2020 goals turn into the 2050 goals as discussed earlier then gas and fossil fuels will follow. The independents won't have the ability to pass through those costs to their customers. Alternately, vertically integrated utilities with generation in their portfolio will be able to pass through their costs. Unintended consequences could occur where the carbon solution is antithetical to a competitive market. How should this be addressed?

Speaker 3: Joskow argues that any free permit allocation should go to consumers, not generators. However, his preference is to auction everything. The auction revenues can get talked about. However, he also recommends that additional unbundling occur. If that happens then the utilities will have no portfolio

generation, and thus no advantage. His recommendations are internally consistent.

Question: Who is willing to be unbundled when the independents are taking the hit from the carbon regulation, particularly coal? How might we see existing coal fleets unbundled from the IOUs if they will go out of business as a result of high carbon costs?

Speaker 2: I don't agree with the premise. The RGGI process in the northeast is starting now. It's a complete auction and everyone is participating. The markets are moving to completely divest. In the northeast, natural gas sets the clearing price a large percent of the time. When it was at $12 one could argue that that created a very nice windfall for the owners of the coal facilities. It's designed that way, to encourage more low cost facilities to come in. The cost of the carbon tax compared to the extra revenues associated with the higher clearing price balances out.

Now, if gas stays at a lower price then there are different dynamics. you might have some different dynamics. Further, a gas facility at the margin can increase their bid price by their carbon cost and have it completely recovered in the market. The marginal facilities are capturing some of the carbon cost by a slightly increased clearing price.

Question: That's why I focus on coal. The $3 RGGI prices are not the example we need to look at. There are $25-30 carbon prices in the EU. In the 2050 scenarios these could be $60-100. That's a different situation.

Moderator: There are other issues in this too. If the financial crisis continues, debt costs and hurdle rates are higher. The cost of equity is substantially higher. Regulators have to worry about the replacement of critical infrastructure to insure ratepayer reliability? A company at BBB+ is looking at 8.5-9% and four months ago it was 6%. Companies with bad credit like El Paso are at 15%. This has difficult implications for markets. When does the regulator step in and say the market can't work because the money's not there?

Speaker 2: The regulators have been thinking about this for the last five years. Every merchant generator wants a long term offset or a long term contract. They want regulators to tell the utility to sign them. Now the utilities have similar problems. However the premise of markets is that it is supposed to shift risk onto the developer and away from the ratepayer. The more ratepayer guarantees are needed in order to borrow money then it puts risk back on the ratepayer.

No one knows if this is a two month phenomena or a sea change in the whole industry. We know we shouldn't make forecasts right?

Speaker 3: If the argument is that a $60 a ton carbon tax will bankrupt many plants, then good. It's not a problem as long as everyone agrees that $60 a ton is the right answer.

Question: The problem is that plants that are owned by utility companies can take that $60 cost and pass it through to their customers. The independents cannot, they are significantly disadvantaged.

Speaker 3: That's the old problem. A vertically integrated monopoly can waste a lot of money because they have a captive customer that they can force to pay for it. That's why we need restructuring and markets and unbundling.

Question: The imposition of carbon regulation tells investors the vertically integrated structure is more stable.

Speaker 3: Yes, I agree. It's much better to be a monopolist than a competitor. [Laughter] The whole point of restructuring is to stop doing that and get better signals in the marketplace. The point is to create an even playing field. In a regulated environment the risks are asymmetric.

Speaker 4: Yes, however, Joskow argues that policymakers who are designing the carbon regime need a policy that sends the correct price signal to the consumer that addresses this concern. He is concerned that consumers will not feel carbon regulation in vertically integrated regime the same way. Clearly he underscores

that it exists but it's not clear how it should be solved.

Question: There's been a failure of leadership in Congress and the Presidency over the last 30 years. We do need some sort of policy vision. Kennedy approved going to the moon though they didn't know how they were going to do it. It's not just fuel costs either. We're taking the countries money and pumping it in our gas tank and supporting terrorists, or regimes that are hostile to the United States.

So how do we go about getting a vision? We need role models in technology like John Glenn; we need to create the Mercury 7 energy people.

Speaker 2: To do better have on federal energy planning would be to do something. [Laughter] There's no vision out there. It's that simple right now. Maybe it's bring back an energy czar, bring back a plan, work with Congress, work with the states.

Speaker 1: There are a lot of kids who are waitressing and driving cabs, that are looking for careers. Making the notion of a career in energy would help.

Speaker 3: The situation is not completely hopeless. There's been success in developing RTOs, which has been substantial. It's a dramatic change. We got derailed because of California and Enron. Pat Wood was a person who had a vision and demonstrated the power of the chair of FERC. In this transformational moment the new chair of the FERC could do an enormous amount. The right kind of vision is necessary. We need to see these markets complete and support climate change policies as well.

If we go further and adopt a 2009 Energy Policy Act as Joskow says, it could have an enormous impact. There is an opportunity right now.

Question: What about policy on such things like oil?

Speaker 3: The U.S. policy there has been: "don't do something, just stand there." [Laughter]

Speaker 3: David Sandalow wrote a book on this subject recently. He's involved in the Obama transition and discusses freedom from oil. His simple, clear-cut analysis is to get off oil. It's not to get the United States off oil, it's to get the world off oil. However the list of policies that he actually suggests don't even get the United States off the oil. [Laughter] There is a disconnect between the problem of energy independence and how to address oil.

The National Petroleum Council report last year had some good insights. They suggest that we cannot be independent in the way that people are talking about. This idea is misleading. Energy independence cannot mean the elimination of oil imports. First, we can't get there politically or logistically, and it doesn't give the U.S. independence.

When Sandalow was pushed for details during the campaign, he suggested that in the next ten years we would reduce oil consumption by the amount we're currently importing from the Middle East and Venezuela. However, that is statistical noise. That's his suggestion for oil independence; he understands the landscape. Further, the climate change problem is much bigger.

Question: Several states are ratebasing new generation, in some cases re-ratebasing old generation, and competing against competitive generation. If this occurs at the state level it will affect wholesale markets, correct? Can the wholesale market adapt to that? Is it a fundamental imbalance for the risk reward profile? If so, what do we do about it?

Speaker 3: The principles of how to design the market for PJM, MISO, NY, and NEISO are not affected by this. States should not make uneconomic investments and ratebase them. However, if they do it and the market is designed correctly the costs of that investment are visited on their ratepayers, not on the others. The best thing to do is to be in a competitive market with market clearing prices, and have a state next door that's making enormous rate base investments, right? [Laughter]

Question: Is there some impact on the competitiveness and sustainability of the wholesale market?

Speaker 3: The problem is when the states or commissions who are doing this ratebasing want to change the market design to accommodate their actions and socialize the cost associated with it. That should not occur. As long as there is sensible cost allocation and market design principles then the rest of the market will be fine.

Question: The silence during the campaign from policy makers was deafening on the question of competition. What are we to make of that?

Speaker 2: That 98% of the public doesn't have a clue how electricity is made, how it's transmitted, how it gets into their house, how their light switch works and what the hell a wholesale market is. [Laughter] It is not very exciting to the average voter.

Speaker 1: It was more astonishing to hear a candidate discuss the need to upgrade the national grid. It's surprising that they did talk about that.

Speaker 4: It speaks to the nature of the industry's responsibility. Those who understand markets and competition need to make sure they are part of the debate and to ensure these questions get addressed.

Question: I like the Francis Fukuyama quote used by speaker 3. It's half right because the regulators didn't understand the new activities in the financial markets but the market participants also did not understand. There's extensive complexity in those markets, and also in the electricity context.

One answer to keep it understandable and less complex is go back to first principles. However, do these principles change as objectives change? These markets are supposed to do and accomplish a lot of different things. Do those principles change as the objectives of the markets change? When they change how do we keep it understandable, if those changes make it extremely complex?

Speaker 3: The principles are robust and can incorporate new problems. 15 years ago the questions in the design of electricity markets is did not address climate change at all. However, the cap and trade idea for SO2 was compatible with the market design that evolved. The same thing would be true with a cap and trade or a tax on CO2. New problems come up that can be a bit more complex, transmission investment being one of them. Generally, these new issues can be addressed in ways that are compatible with the broad system.

Speaker 2: In New York state they do their renewable portfolio standard a bit differently. They are trying to incorporate markets with public policy. They ask the various developers of projects, how much subsidy is needed for you to get into the market and build your renewable project? They compete against each other and the lowest bidder wins. There is an incentive to build where the LBMP [locationally based marginal price] is the highest. They've integrated the market system with the public policy goal of more renewables, and adjusted to a new objective.

Another good example is demand side management. Initially everyone thought that DSM would bid in and compete with everybody else. New York found that a price floor was needed to get program success, otherwise DSM providers could not get enough guaranteed income to get the business. The generators complained a bit. However, the public policy component wanted to encourage DSM for the other public goods it provides. These rules allowed it to operate within a market environment. You can overlay the two without causing too much disruption to the market fundamentals.

Question: We've heard that we don't have the mechanisms in place to figure out which transmission we need. However, in the public debate there's many proposals for big transmission initiatives nationally. EEI has proposed $900 billion worth of transmission. The wind industry wants everyone to build an interstate highway for wind.

Alternately, in the forward capacity markets in NEISO, PJM, and New York they are looking to socialize costs to add capacity to the system for reliability purposes. This includes DSM as a competitive bidder in the capacity market. That is a good step forward. I'd like to apply that idea to transmission. If the nation is willing to socialize transmission because it reduces congestion or addresses reliability should non-transmission alternatives be given a competitive opportunity to demonstrate that they can solve the problem at lower cost?

Second, if we're willing to socialize transmission for wind do we care if it also brings coal to market? How should that be addressed?

Speaker 3: If the presumption is that the default option is to socialize transmission then there's a serious problem. What about the other things that compete with transmission. Should they be socialized too? That's a serious problem. If we go to first principles, then to socialize transmission is a market failure. It's big and lumpy, it affects a lot of people, and the benefits are broadly dispersed. OK, so now we have a distinction. We can only socialize investments that are big and lumpy with broadly dispersed benefits.

The decision process for transmission can also work on the Argentine model of beneficiary pays. It takes a super majority of the beneficiaries to go forward. New York has modified version of this proposal. This has enormous advantages. It is a principled answer to the question of generation subsidies and demand side alternatives. They are not big and lumpy investments; they come in small increments. They should not be socialized, because they don't represent a fundamental market problem. Although DSM has broadly dispersed benefits that affect a lot of people. There needs to be smart approaches to identifying beneficiaries. The Colorado inter-tie discussed earlier is a good example of this approach. The way to parse this question is to determine the character of the market failure.

Speaker 2: Let me address the wind versus coal issue. Whatever will run will run on a transmission line. If you want to stop coal from running then use cap and trade, permits, or taxes. A transmission line cannot choose between green or black kilowatt hours. If the transmission line helps enable more renewables from a policy perspective, not a cost perspective, then fine. It might carry coal sometimes too but that should be addressed separately.

Speaker 1: I'd argue we should not build socialized transmission for wind because it is not a firm resource. Unless it's specifically for some public policy purpose.

Question: Is there a role for federal leadership in energy efficiency or is it fundamentally a local issue or should it be addressed through markets and price signals? For instance, the description of DSM bidding into capacity markets, is that the way to do it?

Speaker 2: The country misses many energy efficiency opportunities just counting on the markets. For instance, this winter there were a record number of conversions to gas furnaces that met minimum efficiency standards. For another $1,000 these could have moved up to the next level of efficiency. Over the 20 year life of the furnace, that is extremely cost effective. But there were no incentives. So that means we missed a 20 year opportunity for energy savings. It would have been cost effective to do so but it didn't get done. There are too many market barriers just to rely on the market for energy efficiency. There is a role for the federal government via codes, standards, and some places for a national policy.

Question: I want to connect two different themes. On one hand climate policy anchored by a national price based policy. Alternately markets for generation that have state or regional economic conditions for investors. These may be vertically regulated utilities with different market risks than independent power producers. Those risks depend on contractual arrangements and different rules about competitive procurements. Is it a problem if there's a national emissions market but competitors in that market have different market conditions and/or advantages? Is this a problem or a financial externality, that some market players face and others don't?

Speaker 3: A national climate policy is better than local policies .

Question: The differences are that a new nuclear plant in regulated or market environment has totally different implications. There are different risks, costs to different types of investors. It creates different opportunities; it may be largely a geographic issue. Are there any concerns about different incentives in different markets?

Speaker 3: We want a national policy for carbon. The question of different regimes – market or vertically integrated – in different states is related to the previous question. There's not a level playing field for investment in generation. It would be nice to fix that, but the wrong way to fix it would be to torque the national carbon policy to create a level playing field. The issues are mostly separable.

Speaker 2: If the regulators are doing their job in the vertically integrated areas we are better off. If they make the mistake they made 20 years ago and let the developer pass along cost overruns, do construction work in progress, it's absolutely an unfair advantage. However, many regulated states are using RFPs, third party builders, and passing risk to the developer of the project. That is a more level playing field.

Session Three.
RTO Performance: Are They Being Held Accountable/How Can They Be?

Critics of regional transmission organizations (RTOs) have alleged many flaws in their performance. These allegations include mission creep, inability or unwillingness to contain costs, ineffective countermeasures to market power, weak governance, ineffective management, and lack of appropriate incentives and regulatory oversight. Given all of the promises that accompanied initial restructuring – something RTOs have come to symbolize, it would be astonishing if there were not some dissatisfaction expressed. And given the RTO's "referee like" role as market maker and administrator, some degree of dissatisfaction is inevitable.

A recent study by the General Accounting Office suggests that improvements might be made in the regulatory oversight of RTOs by the FERC, the exercise of which might lead to more effective RTO performance. The GAO has proposed an initiative to better define RTO performance measures. It is worth considering how FERC oversight might best be carried out going forward. What performance measures and criteria should apply? What types of incentives/disincentives ought FERC put in place to signal to RTOs what is expected of them? Given that RTOs are not "for profit" entities, how might these incentives be made most meaningful? Given that the RTO exercises delegated regulatory powers, what are the appropriate boundaries between RTO management and regulatory agencies? How do we define the roles and responsibilities of RTOs?

Speaker 1.

I'm going to focus on the recent GAO study of the RTOs. The GAO serve as Congress's investigative agency. Congress asks questions, they get answers and report back. The request to look at RTOs came from Congress where Senators Collins and Lieberman were interested in understanding the RTO's role. These requests have to be specific and generally come from committee leaders. GAO may do a small portion of work on a self initiated basis. This came from the Governmental Affairs and Homeland Security Committee. They tend to be bipartisan, truly interested in understanding what's going on, not necessarily trying to use GAO to identify facts that fit their beginning framework.

In certain ways, their letter asked GAO to assess, "did restructuring work?" A tough question. Once GAO gets a request there is a scoping period where they determine, in conjunction with the requesting committee, what kind of facts they can determine, how it will

work methodologically, and when it will be finished.

GAO agreed to provide information on RTO expenses for the years specified, 2002 to 2006, how the RTOs and FERC review those expenses, and whether there's consensus about whether RTOs have provided benefits to consumers. The latter question relies on a lot of dialogue with stakeholders and the smart people in the industry. There was a lot of data; ten appendices. One of the key benefits of this work is that a lot of financial data was consolidated in a single package from the various places it resides.

The overarching goal of restructuring is to reduce prices, improve efficiency, and expand services. FERC's Order 2000 outlined an increase in the efficiency of transmission and generation planning, and improved reliability, and several other benefits. They expected benefits of $2.4 billion. GAO likes to examine cause and effect in four parts. What did one expect to happen, the condition is what actually happened, the effect is what matters that those two things are different, and the cause is getting behind why it is that they might be different. The FERC had laid out a robust set of expectations for restructuring and that was where GAO started.

People were very interested in what RTOs spend their money on. GAO operates as a kind of universal translator between specific technical policy areas and Congress and their staff. They are obviously very sharp and making key decisions but are not electricity experts. GAO's challenge is to simplify without getting overly simple.

Expenses were about $4.8 billion from '02 to '06. There was limited consistent information across the RTOs with regard to expenditures. FERC changed the "Form One" reporting for RTOs in 2006 and that will improve that problem. There were investments of $1.6 billion as of the end of 2006, mostly software for transmission and market measurement.

RTOs have unique stakeholder processes. They're all different in terms of the ways in which they interact with stakeholders, the roles that stakeholders have, and the degree to which stakeholders feel as though they have an impact on decisions. Some have a sense that they aren't being listened to in some cases. RTOs rely on stakeholders but stakeholders aren't in universal agreement that every outcome is happy for them. GAO is not saying that it always should be happy. However, these folks spend a significant time to engage in the stakeholder process and it's not clear that all stakeholders are equal.

In the budget process, stakeholders were concerned that RTOs did not focus on low consumer costs. It also appears that there is limited FERC oversight of RTO budget processes.

Stakeholder views on the benefits of RTOs varied. The GAO integrated the notion of day one and day two functions to get at this issue better. Most agreed that the integrated oversight of grid operations was valuable; being a big RTO is useful. Many agreed that the integrated dispatch offered value but folks disagreed about whether consumers were seeing that value. There was disagreement about whether RTO markets have benefited consumers. Day two operations are focused on whether benefit is occurring.

RTO-conducted evaluations find that their own operations are valuable. They self-review in different ways. Midwest ISO calls it their value proposition. However the different approaches to self-evaluation made it hard to look at these comparatively.

FERC believes that RTOs provide benefits but they don't really have a detailed level of analysis about those benefits. They have some data that catch some important points but it's not publicly available. That data would have additional value outside of FERC. Further, they haven't developed a formal process for evaluating the benefits of the RTOs, including no retrospective analysis of whether the $2.4 billion in savings materialized. There's a lack of comprehensive publicly available measures of benefits. FERC hasn't provided its own synthesis and analysis of the metrics that are made available and how they apply to their original expectations.

GAO suggests that a more structured and formalized approach to RTO oversight would be beneficial. Ten years of RTOs suggests that regulatory norms should apply and an evaluation should occur. Ten years ago FERC had a very "catch as catch can" approach; a wholesale lack of structure, despite a bunch of smart people there. Compared to ten years ago however, FERC has much more structure around their approach to markets and RTOs.

FERC's oversight of RTOs as a utility is not enough. The change in the Form One is a movement away from that, and useful. They aren't like utilities, particularly developing markets and quasi-regulatory functions like market participant behavior for market power and/or providing penalties for misbehavior. This is significantly different than a standard utility. FERC oversight of budgets and costs are not consistent. FERC has not reviewed the benefits of RTOs nor developed standardized measures to gauge their performance.

Recommendations. GAO wants more consistent reviews of expenses and budgets from FERC. FERC should work with RTOs and stakeholders to develop standard measures that track performance and report this to Congress. This would improve the uneven understanding of what RTOs are doing on the Hill. That audience needs to be convinced that RTOs are good, especially in light of Mr. Joskow's report/suggestion that RTOs be mandated.

Hopefully these ideas push FERC to play a more central role in determining the shape of oversight. Clearly more is needed. GAO didn't define specific metrics – they felt it was beyond their mandate and beyond their expertise. The industry and RTO stakeholders are more than qualified to collaboratively determine metrics. GAO didn't dictate the shape of what RTOs should look like going forward.

GAO did recommend doing a gold standard study. It would not have had a clear mandate, nor a clear value because everyone would argue over it.

FERC had specific expectations for restructuring at a high level specific for 2000. Congress and the public had implicit expectations – whether they were fair or not – for pricing, wholesale and retail. While FERC has responsibility for wholesale markets, people complain to their Congressperson about retail prices. That dynamic needs to be remembered in this context. and I think you need to be thinking about that dynamic as part of this mix. It's clear that this information needs to be set up in a simple manner. Congress and the public cannot understand the detailed kind of data that this industry uses. There have to be some easily understood, publicly palatable metrics. There's got to be a way to convey the information in a simpler. Imperfect measures right now would be better than no measures. Time matters. Sooner is better and long term measures are better. GAO would like metrics that look across RTOs and into non-RTO areas in a standardized way.

Question: You said there was consensus about benefits from regional dispatch, but disagreement about whether consumers were getting the benefits. What are the key barriers that prevent those benefits from being passed on?

Speaker 1: In the regulatory world a coal plant was paid for, and they're getting cost recovery and profits. In a market clearing world where gas sets the margin, there was a transfer that occurred in value. The same coal plant became valued at roughly a gas plant production cost. In that situation the producer gained the value transfer, not the consumer. That creates the perception, if not the actual value proposition, that consumers aren't getting the benefit of integrated dispatch.

Question: Did GAO look at fundamental metrics of RTO performance? Have RTOs improved reliability, improved asset utilization, lowered costs for consumers, or lowered the environmental footprint of the industry? Did GAO do any analysis along those lines?

Speaker 1: It was derived from the goals of restructuring. A couple of the things you mentioned are in the mix. One could look at reliability in a consistent way across RTOs. The perception might be that if RTOs are measuring reliability differently they may be gaming the

system. The perception is if there's not one way to measure it then everyone's picking their favorite way to look good. Perceptions matter in this dialogue right now.

Question: Is there any way to measure the impact of RTOs on the quality of investment decisions? That is hard to do. Things like plant location, capacity, transmission investments.

Speaker 1: GAO did not. They wanted to provide initial deference to FERC. All of these suggestions should be incorporated by FERC in consultation with the regulated and unregulated stakeholders. The recommendation doesn't explicitly say that FERC should look at RTO versus non-RTO areas. However, that would be a very useful conveyance of information to Congress. There is no reasons not to compare RTO and non-RTO areas with standardized metrics.

Speaker 2.

Many may remember a fictional character by the name of Howard Beal from the 1970s movie Network. He was the six pm newscaster on a failing TV network. It was losing ratings, losing market share, losing sponsors. One day Howard Beal does something totally outrageous. He gets on the air, throws away his script and starts ranting at the camera about everything that's wrong with America from the breakdown of the family to corrupt politicians to environmental degradation. And he works himself up in this frenzy and implores his audience, go to your windows and doors and yell out, "we're mad as hell and we're not going to take it any more." Soon the entire city is doing that.

This scene characterizes perfectly what customers thought of the electric industry back in the 1980s and 1990s. Before we pine for the good old days of yesteryear prior to organized markets. We all want bilateral contracting for example, those were the good old days. The good old days were not such good old days.

Independent transmission access was not available to generators. They had to negotiate wheeling rights. They went utility by utility and negotiated whatever they could get. Bilateral contracts occurred if one intervened in a case, preferably a merger case. They'd intervene in a merger case, make a lot of noise, and hope they got bought out. No one knew if you were really getting the best deal. There was no way to measure the price, whether you were being treated in a fair manner. Litigation took so long the legal doctrine known as refunds to a corpse would get used. By the time the commission got around to issuing refunds the company would be out of business.

Buildout costs were unreliable, they never knew what they were paying. Reliability and native load protection were code for protectionism. There was no way to verify a true reliability problem. There were strategies to bump up utility business, and dominate competitive generation. TLRs, demand ratchets, price squeezes, and others.

Retail customers were also mad as hell. Industrials were subsidizing public interest programs. There was investment technology stagnation and questions about global and state to state competitiveness.

This is to remind everyone of what the RTOs have successfully addressed. They got a whole lot more right than they take credit for. There are other problems that they need to learn from as well. However bad actions that can be fixed are probably better than a quagmire of inaction.

RTOs moved the risk allocation formula. This means there was no Enron rate case. 15 years a PUC would be dealing with utility downgrades that set the cost overruns for a utility nuclear plant out of sight, and the largest industrial customer is leaving the state. The utility would be filing an emergency rate case; a bailout in today's technology. That doesn't happen in RTO markets. The PUC is looking at public hearings of customers screaming, the possibility of a major utility failing on their watch and the governor too. When Enron tanked there was no emergency rate case filing by Enron, or Calpine, or NRG. Risk was borne by shareholders. That's significant and it gets skipped over.

When Enron failed, others stepped in very quickly, even though Enron was a significant part of the market, and substituted. In PJM, customers didn't really see a blip in their region. That's obviously different than California with regard to market manipulation. Consumers are paying higher costs but it's primarily commodity costs.

Second RTOs got the fundamentals right. The U.S. has tried regulatory, behavioral, and structural solutions. Telecom used regulatory solutions, electricity has used structural solutions. The discussions and debates amongst stakeholders compared to 15 years ago are totally different which means earlier problems have been solved.

RTOs have eliminated multiple control areas and pancaked rates. FERC championed that. Regional planning, redispatch in lieu of TLRs, maximizing use of the grid, and allowing customers to make economic decisions. There is market transparency. The first price spikes were not in California but in the Midwest in the 1990s. In Ohio, people paid outrageous amounts because there was no one place to go to verify the price of electricity. That is an enormous accomplishment.

There's a myth that RTOs are fat and happy, not accountable, without incentives to be efficient, biased to certain entities. It is incredibly difficult, just like a commission, it's equally difficult to serve and work for an RTO. At PJM, and other entities have similar programs, has pay at risk based on operational performance standards. If somebody messes up in the control room it affects their paycheck. There are customer satisfaction standards. If the munis are not happy it gets taken out of their paycheck. It's been costing some executives a lot of money.

RTO initiatives come through a stakeholder process. In PJM it's an annual plan. The states have input into that as well.

In PJM cost structure comes from a stated rate that is capped. They cannot exceed that stated rate without filing a full rate case with all the pain associated with that. Members are involved in the budget process with the finance committee; reviewing budgets and providing recommendations to the board. If they save money, it is refunded to members.

I'm unsure about consistent approaches to FERC for reviewing and approving expenditures. For instance, the stated rate works for PJM is probably not appropriate for MISO or New England. Consistency across RTOs would be good for seams and other issues but not everything.

Plus if the FERC is reviewing expenses there's always a fine line between regulating versus managing the utility. There's concern about micro management. If regulators are too involved then they end up owning the decisions of the enterprise.

To determine RTO effectiveness one has to figure out what RTOs should be when they grow up? Many argue it should be run like a business. But they also have to allocate costs, assure that rates are just and reasonable, mitigate market power, and referee disputes on transmission ownership. These are quasi-regulator functions. Further, they have to promote demand response, energy efficiency, smart grid and other initiatives. Now it's a public interest organization. So, do they do it all? If so, which are the priorities? These questions are not clear.

Cost benefit studies have been called the battle of the studies by FERC. Many of these studies look at counterfactuals; the road not taken. What plant would have been built if there was rate base in Pennsylvania instead of a free structured environment without centralized dispatch. It's enormously difficult to get a fair assessment.

What about consumer prices? The price of peaches are lower in Atlanta than St. Louis. However it is unfair to say that the food distribution system in Atlanta is more efficient than the food distribution system in St. Louis because the price of peaches is lower in Atlanta. Many factors go into consumer prices. Studies would probably overstate the benefit in lower pries and damn them during high prices.

Operational efficiency is difficult to measure as well. Is new infrastructure or resources an

appropriate measure? If customer satisfaction is a measure, who are the customers of the RTO? End users, generators, market participants customers? Is the regulator a customer of the RTO? It's probably all of those market participants. Unfortunately that means that there will be conflicts and one set of customers will be happy and the others will not. These metrics are a difficult challenge.

Issue three, what's the relevant market for comparison? There are benefits to New York by virtue of the PJM markets. PJM receives benefits from New York, a lot of New York power is coming in. PJM looks better than New York or New England on price but it's not clear if that's efficiency or simply the fact that they have more megawatt hours.

Information transparency has been improved a bit by FERC's uniform system of accounts but there's more to do. There are questions around software, the degree to which market and non-RTO participants utilize the markets.

There are some new approaches. The ISO-RTO council is looking at industry score cards with quantifiable and qualitative benefits. Forward looking benchmarks, not retroactive assessments. This would include reliability as well. The RTOs think this is the right way forward to improve things for everyone.

Question: How is pay at risk based on customer satisfaction measured?

Speaker 2: PJM hires an independent survey firm for all the market participants. It is presented with comments and scores from the different market participants. There's a separate survey for the state commissions and those go into our compensation.

Question: Just to expand on that, what level of pay, how much percentage?

Speaker 2: The higher in the organization the more pay at risk they have. The CEO is far over 50%.

Speaker 3.

I'm going to make my own independent comments but coming from the perspective of public power and load interests in the U.S. In order to accurately assess performance one has to understand the motivation of the entity whose performance you are assessing. There are motivational challenges for RTOs.

Some of the points from the previous speaker were excellent – they illustrated the conflicts between the different constituencies that RTOs serve. Non-discriminatory transportation and transmission service is the core function. They run markets for energy, ancillary services, capacity. Reliability is critical. They police market actors through market monitoring. They lead a regional transmission planning process. It is not an easy mission. They are intermediaries between generator and load interests and transmission. It's difficult to get everybody to agree. They are like a utility and a regulator. They manage assets but have no ability to order asset disposition or actual construction. They are not for profit and thinly capitalized. The main hard assets are their buildings, computers to software, and human capital.

So how do they work and figure out what their motivation is? Transmission owners can pick up their assets and go, it is a voluntary regime. We've had that in PJM with Duquesne although it looks like they're returning. Generators, in the absence of any type of contractual obligation to serve, can shut down their plants. A federal regulator can make life difficult if it disagrees with an RTO's policy position. The temptation is to just to get through the bloody thing.

Because transmission owners and generators have the hard assets, and because FERC has the jurisdiction, those are the key entities that the RTO has to keep happy. That's reality. The transmission owners and generators want substantial returns. FERC wants markets and no reliability problems.

What is missing are the interests of load. Most loads cannot leave, and must consume. That's starting to change with energy efficiency and demand response but so far it is minimal. Their

participation is not voluntary. Recently at the Pennsylvania commission there was a presentation by Alcoa saying, once the rate caps come off in this state, they will probably shut down their Lancaster facility if the prices spike. That is the ultimate demand response but it's not in the best interests of the American economy.

So load interests are subordinated to the other interests at the RTOs. I'll be more blunt than the GAO report. There's a widespread view among load interests that they are second class citizens when it comes to RTO stakeholder processes and the FERC proceedings that follow. They have fewer resources to devote to the process. One of the most interesting tables in the GAO report was the number of meetings per year open to stakeholders. One RTO exceeded 600. Many load interests cannot take part. Often they'll hire consultants but it is not the same level of impact.

Gary Newell and Ted Davis wrote a paper on regulatory capture and RTOs at Rutgers in May of 2008. They call this particular issue second generation regulatory capture. It occurs when the entity who's captured does not know they're captured, they've just adopted the world view of that set of interests. It's like the Patty Hearst syndrome. They argue that RTOs display several indicia of secondary regulatory capture. Mission interest convergence and impact concentration; the sector that has captured them has most impact and is most concentrated. The impact on consumers is higher bills but that's very diffuse. The typical end use consumer can't see that. The transmission and generator interests are more directly impacted. Migration of personnel is common to regulatory capture normally. Information costs are higher for some folks and the ones with low information cost have an advantage. There is also asymmetric distribution of expertise.

How can one revamp RTO incentives to make the performance more balanced and change the motivation? The interests of load need to get higher on the RTO screen. Several measures were made in the recent arduous FERC rulemaking on RTO wholesale markets. One is that net benefits to consumers and lower cost should be a part of an RTO's mission statement. FERC's standard is a commitment to responsiveness to stakeholders. This means the phone gets answered when load calls but that is very different from net benefits and lower costs.

Additional data transparency is clearly needed. There is more data available than there used to be. However, there are still needs for more data disclosure regarding RTO market operations. Generators argue this will facilitate collusion among them. However it will obviously demonstrate when collusion is occurring. A study by William Dunn for the APPA shows that other countries release next day bids with identities. This would address the asymmetric data issue in regulatory capture. The largest players in these markets know each other's costs, plant characteristics, and who the bidders are even if the identities are masked. They play this game every hour day in and day out. It's all the others who have an incomplete understanding.

GAO recommendations are also very good. Regular review of FERC Form One. The new Form One is much better and fits RTOs, and enables cost categories to be better quantified. However, the FERC really needs to look at them, not just post them on a website. They need to verify the data.

Standardized measures to track RTO performance are clearly necessary. These performance measures should go to Congress and the public. The mindset needs to change. One can rearrange the regulatory cost category deck chairs, have customer service satisfaction surveys but that is different from a mental dedication to providing net benefits to consumers.

Speaker 4.

I'm going to talk about issues with MISO in the context of this discussion. First, they are a 501C4, which is a non-profit that exists for the benefit of society. They take that mission seriously in terms of how they perform our functions. They have an independent board of 7 directors, elected by the membership. There are over 300 market participants but just fewer than 100 members. One can be a market participant

but not be a member. Membership is a $15,000 one time fee with an annual renewal of 1,500.

They have an advisory committee and it's appropriately labeled because it advises the board of directors and management. Unlike other RTOs they don't have a management committee that takes votes on tariff filings. There are 9 different sectors. This includes transmission owners, independent power producers, power marketers, the environmental sector, state regulatory agencies, and consumer advocates. There is lots of conflicting advice. $41 billion in transactions were settled in their marketplace over the last year.

They provide nondiscriminatory open access on a broad regional basis. There is reliability coordination to ensure the power gets delivered in the most reliable matter. Efficient market operations are in place for managing congestion on the grid. The old way of doing it was transmission load relief, TLR procedures. Now there are price signals at over 1,500 points on the grid dated every five minutes and the grid is dispatched in the most efficient manner through that information.

Regional planning coordination is enormous. Particularly in the Midwest given renewable portfolio standards, where the wind is located, and where the load centers are. The amount of this wind is a challenge. It's not dispatchable, it blows more at night than in the day, and tends to be more energy than capacity. In MISO it's a larger percent of the load so there are challenges. Finally, wholesale power markets provide a price signal which helps reduce the cost of electricity.

They are positioned because of their scale to help address national energy policy when it comes to national security, energy independence and global climate change. Infrastructure needs to be developed.

They have lots of metrics. They report on the performance of the congestion management system and the energy market. They have a monthly report by the independent market monitor that goes to the board of directors in an open stakeholder meeting. There's also an annual state of the market report for the Federal Energy Regulatory Commission. These are huge.

They discuss their operations in a monthly report to the markets committee of the board of directors in an open meeting. It's well attended by stakeholders. There are 21 metrics and with supporting details. It looks at performance for overall goals and objectives and financial performance metrics. There is stakeholder input into the development of the budget including budget versus actual reporting on a monthly basis.

MISO has a Value Proposition Study which quantified the wholesale market benefits of membership in the Midwest ISO. It did not address retail.

Let's zero in on a few metrics. Day ahead real time price convergence is an economic measure of whether the two markets are performing correctly. Load cleared in the day ahead market is an important driver. If load isn't cleared in the day ahead market it ends up causing MISO to dispatch generation and have to pay a revenue sufficiency guarantee payment. This is because the LMP may not be greater than the actual cost of putting the unit online at that time. So the higher the load cleared in the day ahead market the less commitment they have to make, the less RSG that's created.

Head room is a measure of how much reserves they have as the RTO. The more head room, the more inefficient the dispatch. Less head room can jeopardize reliability. It needs to be just right. Unit commitment efficiency how efficient they are committing units in order to produce electricity. If they over commit they destroy value, if they under commit they jeopardize reliability. It's a delicate dance but the ramp rate in the morning can be as high as 30,000 megawatts.

The value proposition is the wholesale market benefits. It compares actual performance to planned or expected results. There are five categories. The first is improved reliability; a reduction in both the probability and magnitude of small and large-scale outages.

Second is dispatch of energy. This is the unit commitment. There is centralized unit commitment on over 110,000 megawatts, and they update dispatch signals every five minutes. The bigger the power pool the more efficient use one should get from those resources. There's some controversy over measuring this because production simulation models are used.

Third is dispatch of reserves data. That will happen starting January when their market for ancillary services begins. MISO knows what utilities are carrying in the way of regulating and spending reserves. They compare that to their percent of load post-ASM. The difference between those two is a metric and they expect to have fewer reserves being held and freeing up generation to be dispatched more efficiently. They will track that monthly, actual versus planned.

They do this tracking also for the fourth category, contingency reserves. Folks hold generation reserves on a daily basis to deal with their single largest contingency. Pooling resources results in a lower amount of reserves to carry. They know exactly what the reserves were before the contingency reserve sharing group. The difference between the two of them times the price of energy gives a measurable value.

The last category is least generation investment deferral. This is similar. By pooling MISO can carry lower planning reserves. They know what utilities were carrying before and after the policy was implemented. The difference between the amount of reserves required is a reduction in generation that needs to be built or demand response.

MISO's measurement of the annualized benefit of all five categories is between 800 million and $1 billion. Their budget is 260 million. They believe they're adding value.

This captures what an RTO is doing in terms of its broad scope and scale. These are wholesale market benefits. How they flow through to retail markets is a complex equation that depends on state by state but arguably the wholesale benefits flow through in some way. They also have qualitative benefits such as price transparency and planning coordination. Many of those they would like to convert to quantitative assessments.

The value that they are outlining is a function of decreasing the risk of outages, more efficient use of existing resources, and reduced future needs. They argue that the cost per megawatt at the wholesale level is less than it would be without the RTO. There is still the problem of the counterfactual, comparing to what would have been without it. Further, RTOs are a part of the solution when it comes to global climate change response, especially integrating renewables into the grid. A transparent price signal will be even more useful when it gets to the end use consumer but the basic price signal is there.

Question: Your dashboard slide shows "virtual market profitability," could you describe what that is?

Speaker 4: It's a measure of the profit made by a virtual transaction player in the virtual market. Did they net make money or net lose? MISO aggregates all the profits and losses, and overall they tend to make a profit on their transactions. The value of participating in that market is also in price discovery for FTRs and virtual transactions. There is a benefit to having more of them participate than less. In addition to the profitability in that market, the simple existence of it provides price transparency that helps keep the overall wholesale price down.

Moderator/Question: The industry hears, particularly from APPA, that the ISOs are not consumer focused. What is necessary to address that? Alternately, critics of the markets seem to give short shrift to reliability, the fact that these markets better facilitate renewable and demand response products.

Speaker 4: MISO put out the value proposition study. Prior to that there was a drumbeat, most notably from state regulators, to help them understand whether or not MISO was creating value and helping quantify that. I'm sure they welcome any feedback on their approach.

The focus there now is now less on value, and more about concerns for renewable portfolio standards, transmission system planning, and who's going to pay. The discussion has shifted there, at least temporarily.

There is still reminders from stakeholders to produce value which flows through to end use consumers. On the margin there are some things that could be done to make it more consumer friendly or more benefits flowing through to consumers, but overall the debate has changed.

Speaker 2: What would it take to end the concerns of consumers? I'm not sure they should end. These criticisms in some ways are beyond criticism of the RTOs. They're inherent in how we view electricity, or public entitlement. There is a healthy element to this debate. I mean groups like APPA hold the RTOs feet to the fire. It could be more constructive. It'd be nice to remove the battle of the studies? And these issues don't need to be in the halls of Congress. We do need the debate on an ongoing basis.

Moderator/Question: What about giving short shrift to some of the benefits of markets?

Speaker 3: Let me comment first. There are many groups who have concerns, not just the APPA, they are not alone. That should be emphasized. Second, the concerns are coming up from the grass roots. Coops, munis, and public power members are funding the APPA's electric market reform initiative effort as an additional funding measure. They have donated more money every time so clearly the issue is live for them.

It's not short shrift to reliability or demand response. Obviously folks care about reliability very much. The concern is at what price? For instance folks in New England are very concerned about RMR [reliability must-run] issues. It's a thumb on the scale to ensure reliability at any price. There are concerns in PJM about demand forecasts that feed into the reliability pricing model and make it more expensive. Very small changes in incremental demand in outer years have impacts on the amount of capacity. Consumers there feel they have no say in how these forecasts are derived. There's a difference between a mantra of "reliability through markets" versus "reliability through markets at the lowest net price to consumers." There needs to be more of a balance.

Second, consumers strongly support demand response and their actions demonstrate that. However, in New England this has been structured with multi-year commitments. Potential consumers cannot commit that far ahead. They need it closer to the day ahead market. Again, it's an example of not listening to input from the consumer stakeholders.

Further, it's not just RTOs that are doing this. One of the regions with the highest amounts of demand response is the Florida Reliability Council. Clearly, a regulated system can provide even more demand response.

Speaker 1: RTOs do well with demand response and reliability. The GAO folks tried to avoid a dichotomy of RTOs are good or bad. They wanted consistent data across the country assess reliability, demand response, incentives for environmentally friendly generation.

In demand response there are some things missing. Generation siting in 2001 had challenges. If there isn't enough demand response in some of these markets then FERC may not want to approve market based rates. A lack of demand response can lead to prices that arguably are not just and reasonable. In part the problem is that the RTOs all measure these things differently so there's no basis for comparison. We will likely see policy changes in the industry and we need better information so that the policies will be good ones.

Question: The MISO value proposition and the $1 billion savings is focused on the power pool characteristics and the derived efficiencies there. They are not dependent on spot markets or pricing. However, the quality and location of investment is derived from markets. This is additional to the benefits from the power pool. Further, the open access and nondiscrimination supports the market operation. RTOs are the mechanism for doing it. It's this combination of

market value and power pool value that RTOs have. I'll take your comments.

Speaker: I agree. They allow for much better risk assessment and investment decisions. It helps avoid stupid investments by merchant generators and some of those costs are ultimately borne by others.

Speaker: Much of this question is bound up in the capacity markets. They are attempting to achieve these goals. They address those issues and drive investment. Other metrics could and should be developed around those markets and the investment that comes out of them. One way to do that is to get data from the investment community. Investment decisions are driven by many factors so it would be important to distinguish them. One should look at the capacity markets and determine if they're delivering smart investment.

Speaker 3: We've seen some data on this. For instance, does LMP, prior to the capacity markets, cause generation to locate in the higher cost areas or affect investment patterns. Synapse Consulting addressed that and concluded that LMP price signals were not providing investment that responded to price signals.

Further, the question is investment at what cost? When one assesses RPM it helps to ask if investment incentives are working, but also are they working cheaply and efficiently. LECG looked at the first four transitional auctions. It's clear that quite a few people think the amount of money being spent to incent generation is obscene and not efficient.

The best parts of the RTOS are the functions of power pool and nondiscriminatory transmission. How does one do that but also get better generation investment at a better price. One could incent generation via a long term forward bilateral market as the primary market.

Competition can come in a variety of ways. State run RFPs for longer term generation with safeguards to protect bidders and avoid preference to an incumbent.. Wholesale competition doesn't necessarily need a day ahead and real time centralized market. Some argue that generators will take advantage in the bilateral market the same way they do in the day ahead and real time market. However, more substantial standards for obtaining market based rate authority for long term power supply pricing, and giving states greater influence in generation and demand side portfolios could address that. Rigorous state procurement from the bottom up to help the RTO get the overall resource package right, and the resource mix would not be so short term based.

Everything now is short term investments, with lots of gas. A more balanced portfolio with demand response, energy efficiency, environmental attributes, through a reasoned, bilateral, and decentralized approach is a model that could work.

Speaker 1: Investment efficiency for transmission and generation should be better with RTOs. However , it should be measured. It's a very complicated picture to assess investment activity but people should think about how to measure it.

The financial crisis is compounding a difficult scenario for investment in the industry. Under monopoly regulation there was an environment of relatively low risk investments. Now they are perceived as a more risky investment. They'll show up in market prices. It's particularly problematic for higher capital investments, not gas, but nuclear and base load certainly.

Speaker 4: A locational marginal price has three components. The cost of the energy, the congestion, and marginal losses. RTOs look congestion on the system in their transmission planning. On a strict financial accounting cost benefit they know what the cost is. They can clearly determine if transmission investment has produced value.

That is a construct. It's easier on transmission than generation. It doesn't show if the investment was optimal, but it does show if it provided value.

The same construct applies to generation which also creates or relieves congestion depending

upon where it's sited. This is measurable with LMP. RTOs should be doing this assessment.

Question: I'm concerned with long term technology deployment. Technology doesn't deploy by itself, it needs institutions. Are RTOs going to be accelerators of smart grid deployment? We've heard two views concerning demand response – they're big players or they've done little. With the smart grid, will RTOs be a vehicle for change? How do we think about RTOs as agents of change around technology?

Speaker 2: The true promise of smart grid is in prices to devices. The defrost cycle in a refrigerator has to happen every 24 hours but it doesn't matter when. A price signal can indicate when to run that defrost cycle. RTOs can provide that foundation. The price transparency provides the foundation to make it happen.

Speaker 4: RTOs can make our wholesale platform accommodate or facilitate, but the price is the starting point. They won't be on the forefront of actually installing the technology itself. That's not independent, and not part of market operation. RTOs will be actively involved in working with state regulators, federal regulators on what is the policy and then how does one implement the policy.

Speaker 3: Folks are concerned about investing now because they don't know which way the technology is going and there are no standards. There are interim strategies. For instance, residents with wireless networks in their home to control the largest energy users: thermostat, refrigerator, etc. The initial results for reducing peak demand are encouraging.

This doesn't require a huge financial outlay. It piggybacks on technology that the customers have already installed. It's relatively easy for the customer too. The folks doing this are the Jacksonville Electric utility in Florida. Demand response and smart grid don't need RTOs in order to be implemented.

Speaker 1: The price transparency of RTOs provide a great platform for better demand response programs. However, many of the best pilot programs have been developed in the southeast by regulated utilities. Nonetheless, one would expect that better price transparency in RTOs would provide more savings.

Question: Would changing the status of RTOs from nonprofit to for-profit organizations be useful? They would have a fiduciary responsibility to shareholders. It would make them more efficient and cost effective. There are pay for performance programs at RTOs now but that' not enough.

Speaker 2: Actually PJM is for profit. It's a limited liability corporation. It just doesn't make a profit, by choice.

Speaker 4: If you introduce a for profit motive it will remove the independence from an independent system operator. That creates conflicts. A non-profit RTO has a fiduciary responsibility which is to be good stewards of the money they invest and create value. They do have a fiduciary responsibility to transmission owners. There's explicit agreements to maximize the use of the transmission.

It might provide incentives via stock options but it gives the RTO yet another objective function. Maximizing shareholder money may be at odds with the overall societal benefit of a non-profit.

Speaker 3: The transmission operator agreement, the TOA, is sometimes a contentious item. Some RTOs explicitly have a duty to the transmission owners to maximize revenues to the transmission owners. There needs to be a parallel fiduciary duty to consumers to reduce costs. That would fix things, going for-profit would not.

Question: Investment in the non-RTO regions is greater yet they face higher capital costs. There are double digit rate increases being filed in these states. Shouldn't we apply the same level of scrutiny and performance metrics to the non-RTOs as to the RTOs? This would include market mitigation, market monitoring and performance metrics with the same level of FERC review? The Federal Power Act applies nationwide, why not put everybody under the same microscope? Further, shouldn't

performance metrics for everybody include environmental impact and performance?

Speaker: I agree. The GAO report recommends the value in comparison of RTO to non-RTO areas. That being said, this kind of oversight is FERC's job and they're doing it as they deem proper.

Speaker 3: There's room for improvement everywhere. In the public power world there seem to be fewer concerns about non-RTO regions.

Speaker 2: Let me just clarify some earlier comments by speaker 3. In PJM at least, 65% of the transactions are being done bilaterally or with self supply. Spot markets are much smaller. Further, spot markets provide information and transparency. They are a good tool in the toolbox, just like Expedia and Travelocity help make better decisions when you go to buy an airline ticket.

Speaker 3: My understanding is there are bilateral transactions which actually end up being done through the spot market. For example, BGS auction obligations are considered bilateral but in fact are being purchased out of the spot market. We need more clarity on this.

Synapse analyzed the impact of spot markets on bilateral contracting. FERC gave it no attention in their recent RTO rulings. They determined that the impact of the spot market on forward contracting is substantial. If the spot market was less prominent, it would have less influence on prices in the bilateral market. The spot markets are legitimate, but they have a substantial undue importance. More bilateral contracts would also create better investment incentives.

Question: There are extensive differences in how people define the objective functions of the different RTOs. We heard about pay for performance based upon stakeholder surveys in PJM. MISO has emphasized societal value that they are measuring. These are two different models that create different conflicts for RTO officers and different political pressures. I'd like your thoughts.

Second, the new administration wants transformative change with smart grid, electric vehicle integration, renewables. How does the RTO facilitate a process to account for those objectives? How do they account for overall societal benefits and not end up in a process of many small level stakeholder meetings and immediate stakeholder concerns?

Speaker 2: PJM has several other standards and measurements of performance, several similar to MISO. There is extensive overlap in their approaches.

The question of broad top-down societal benefits is an excellent point. The answer is in the planning process, which should be a whole lot smarter than it is today. The RTOs only have one authoritative tool in the toolbox and that is transmission. Planning should be a more holistic process. They need more of a process to achieve these kind of considerations.

Speaker 3: The recent NERC report discussed the impacts of climate change on reliability, changes in generation mix. RTOs can't solve all ills. Much of this is addressed as a state function, or should be addressed through regional groups.

Speaker 4: Management and/or board can address these things on their own initiative. At MISO they have hot topic meetings where different sectors can address the board directly. They hear from majority and minority positions. This is a good place to address these broad topics.

Recently, this resulted in MISO planning folks analyzing the implications of wind in terms of the transmission system and a renewable portfolio standard at 20 to 25%. That's a very broad perspective. They came up with 7 different considerations to account for in this process.

There's also a steering committee at many RTOs that can help set broad agenda questions. So there are 3 avenues – self-directed initiatives, sector based board presentations, and steering committee initiatives.

Speaker 1: All the RTOs have pretty good stakeholder processes with lots of smart people. It's important to remember that not all the stakeholders have the same resources to attend and contribute, and RTOs should be thinking about this.

The RTO provides a way to broaden and enrich the approach to climate change. They provide price transparency, and portfolio selection processes that are sophisticated. Their large regions of control also provide extensive overview.

Question: RTOs are the focal point for frustration about restructuring which should actually be blamed on increases in input prices. They're the punching bag, along with FERC. Just a thought.

I want to address the impact of the spot market on bilateral contracts and forward markets. Spot markets are supposed to affect them, that's one of the benefits they provide. Short term transparency provides information for people to pursue bilateral. However, price caps on the short term spot markets lessen the incentives to go bilateral, and also to invest in new capacity.

Does the country wait until the price caps become so binding that they have to curtail supply? Scarcity pricing can work but people don't like that. Second is capacity markets but we heard the complaint that it's very expensive reliability. Perhaps there is a way to differentiate customers so that some can be metered differently. They have a cheaper price structure but in scarcity they can be interrupted. Those that want greater reliability can pay a higher price for it. That would be a way to address gold plating. Do consumers have a stance on this?

Speaker 3: Well, many consumers and public power folks are pursuing demand response which is slightly similar. Other folks are pursuing long term contracts or doing build their own. This includes diversified building programs; run of the river hydro to new coal to new gas to wind. In some way they are taking themselves out of the market by constructing their own resources or portfolios. This is self-help. However it is not fast enough and smaller actors don't have the resources to do these things.

So I think there's a fair amount of self help going on. The problem is it doesn't come fast enough and some of our smaller members just don't have the wherewithal to go out and construct their own units. Scarcity pricing is only good if customers can react to it.

Speaker 1: Can a market work if customers can't say no? Scarcity pricing from some perspectives looks like price manipulation. Congress members are clearly hearing form their constituents. It's hard to say just and reasonable when consumers don't see the prices but their demand can drive the prices to very high levels in very short periods of time.