

Workshop on Utility Restructuring and Nuclear Power

Managing the Atom Project/Harvard Electricity Policy Group

Doubletree Guest Suites Hotel
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MEETING SUMMARY

Topic: The impact of utility deregulation on the U.S. nuclear-power industry

Forty-six states have either already passed or are contemplating legislation requiring greater competition in electricity generation, and Congress may also act to set the terms for utility restructuring. With answers to the stranded cost question beginning to take shape, it becomes possible to look ahead at nuclear power's future in a competitive energy market. How will competition affect nuclear power in the United States? Can nuclear power plants be competitive in a deregulated market? How many may be forced to shut down before the end of their licensed lives? Should the federal government take a position on relicensing? Will competition affect the reliability or operating safety of nuclear power plants, either in actuality or in the public mind? Is the Nuclear Regulatory Commission positioned to steer the industry through deregulation, while maintaining effective oversight?

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1. Morning Session: Nuclear power in a free market

Can nuclear power compete in a deregulated energy market? Some utility executives believe that competition will lead to the shutdown of many u.s. reactors before the end of their licensed lifetimes. Should society care whether these facilities retire prematurely?

First Speaker

Introduction --Nuclear power in the long term

We are still living in a fossil-fuel-dominated world - 85 percent of the U.S. and 75 percent of the world's primary energy supply comes from fossil fuels, and they account for about two thirds of total electricity generation. Of the remainder, nuclear energy provides 17 percent of the world's electricity, and 20 percent of the United States' (including non-utility electricity generation).

How will this picture change in the future? What is going to determine the contribution of nuclear fission to electricity production? I would divide the answer into two parts.

The first part, which we are not going to talk about much today, is the issue of the contribution of nuclear fission to worldwide electricity supply in the long term, which I would define as 2025 or beyond (setting the boundary between short and long terms at roughly the nominal lifetime of a large power station). To get a substantially expanded contribution from fission, I believe four things are needed:

1. Improvements in reactor safety, both in technology and in management, such that at least ten times as many reactors experience about ten times fewer major accidents than the average over the first three decades of the nuclear enterprise. (The reason for this is that if nuclear energy is to make a big contribution worldwide, we would need ten times as many nuclear reactors as we have today, that is 3-4,000 reactors worldwide, rather than the 300 or so at present.)
2. Satisfactory solutions to at least interim, and preferably also long-term,

management of radioactive wastes.

3. Minimization of the quantities of readily bomb-useable nuclear materials in civilian fuel cycles, and immaculate protection and safeguards for the amounts that remain after this minimization has occurred.
4. Economic competitiveness, not only with electricity generated by today's systems, but with other long-run, large-scale options such as photovoltaics, fusion, and versions of fossil-fuel technologies that can sequester carbon.

The second part, which we're really here to address, is: What is the contribution of nuclear fission to U.S. electricity supply going to be in the short term, that is before 2025-30? The answer depends primarily on the prospects for license extension and for economic and safe operation in a deregulated and restructured electric-utility environment.

Second Speaker

Survey of utility executives --2if:/kWhthreshold -- Environmental impacts

In our last annual survey of utility executives in the United States and Canada, we asked:

- Will most nuclear plants continue to operate through their initial licensed term? For a number of years roughly two-thirds of respondents said yes, but last year there was a significant decline, to 49 percent.
- Will most licenses be extended? Just over half say of respondents said, no, most plants will not have their licenses extended. If you ask the same question of those who own nuclear plants - and so deal with the NRC on a regular basis - they are a bit more negative than those who don't own

plants.

- Will there be a nuclear resurgence? For a number of years we found about a third of respondents said it was possible. Between 1995 and 1996 that number dropped considerably, and it has stayed pretty low since then. Why did this happen? We think, in part, because when competition is introduced - as it was around that time - people become more short-term oriented and less committed to defending nuclear energy at all costs. The resurgence of the industry, which could mean ordering new plants 10-15 years down the road, is pretty much outside the planning horizon of most CEOs and senior executives.
- A more practical question: Would you, as an executive, order a new plant? That went from 10 percent traditionally to 2-4 percent.

A study we did last February, looking at 71 plants, showed that they fall into three categories:

- 32 are what we would call top performers. They have managed to cut their costs significantly over the last year.
- 22 sites are good performers, that is they can generate consistently at 2~/kWh, which many people think will be the price of electricity in the future.
- 17 are bad performers - over the period of time during which most plants consistently got better, this group, in general, got worse.

Our sense is that plants can compete in a price-conscious market if they get full stranded-cost recovery, if they have a fair amount of debt, if there are no significant capital costs in the future, and if the operators - either the current ones or people who are looking to buy plants - can create and sustain a committed and efficient operating environment.

A whole lot of nuclear plants are right around the 2~/kWh threshold, but others, which are on the wrong side of that line, could be vulnerable, depending on how

price sensitive the market is, and on how much they can blend nuclear with other, cheaper electricity.

When we lump all the plants together, to see who is competitive and who is not, more sites are non-competitive by a small margin, but, in terms of actual megawatt capacity, we would think of about 60,000 MW as competitive. Our sense of things is that any nuclear plant, unless it happens to be one that was terribly designed, can perform well; if it doesn't, it's largely because of poor management.

Furthermore, we aren't going to see nuclear suddenly performing much more cheaply than it does at present. Capacity factors are 85-90 percent, which is as good as you're going to get. Unless we see some major changes in the fossil-fuel business - tremendous changes in the pricing of gas, oil, or coal, for example - I don't think there'll be much cost advantage to nuclear. But the biggest single uncertainty is the market-clearing price of electricity: Most plants can probably make it if they are able to stay on the right side of the 2~/kWh line.

We think that regional impacts will be very pronounced. The Northeast, with most of the older plants and most of the people, has already seen plant closures; and in the Midwest, there are utilities which have had relatively poor performance compared to the national average. We think that there will be tremendous changes in the future, for example with the major pipeline-construction projects that are being contemplated to bring gas from Alberta into either the Midwest or the Northeast.

Finally, if there are significant nuclear shut-downs, we will see environmental consequences. For example, even though the Administration doesn't talk about nuclear power very much, its climate policy clearly depends on most nuclear plants continuing to operate. The United States is not intending to build any new nuclear plants, in fact we are expecting to have shut-downs. I don't think we will be able to comply with the Kyoto goal of a 7

percent reduction in U.S. CO₂ emissions even without shut-downs, but with them we certainly can't. (By contrast, in Japan they are planning to build 20 new nuclear plants in the next 15 years to meet their Kyoto targets.) In any case, with or without nuclear shut-downs, the United States is going to see a major increase in the use of natural gas, the lowest CO₂ emitting of the fossil fuels, but an emitting fuel nonetheless.

Nuclear also plays a very positive role in keeping SO₂ and NO_x and other traditional air pollutants at lower levels than would otherwise be the case. When we ask our utility-survey audience whether they think competition will reduce environmental performance we get a mixed response - a third say yes and close to half say no, with the rest unsure. So, there is no consensus on where we are going.

The bottom line is that, even if one takes the worst assumption, that 40 percent of capacity is vulnerable, nuclear is going to remain a very significant part of this country's energy mix. It is going to be critically important to regions; it is going to be a very big industry in terms of dollars for consultants, academics, suppliers, fuel-makers, and so on. There will be the possibility, if one can make electricity at around 2¢/kWh on a sustained basis, to keep plants in operation. We think the majority of plants can compete, although whether that is a robust majority or a bare majority, we don't know. Along with some of the very best coal-fired plants, nuclear will be the cheapest way to make electricity - and in a very price-driven market, that is the major factor.

Question: What is the 2¢/kWh threshold?

Response: That's operation, maintenance, and fuel, but not forward costs. It assumes two things: no significant capital hits, which is a very conservative assumption, and that the price of electricity stays flat. When we look at the performance of the plants, we don't think it will actually stay flat, we think it'll go down, so again that is

conservative to try to encourage the best industry profile possible.

Question: Are there any technological bright lines - e.g. design concepts separating the winners and the losers?

Response: I don't think so. We looked hard at that, and the bottom line is that any of the plants still operating in the United States ought to be able to make it from a technological viewpoint.

Question: When you were talking about the competitiveness of nuclear plants, one of the assumptions was that stranded-cost recovery would occur. For what fraction of the plants is stranded cost recovery not a factor in making them competitive?

Response: It's a factor for everybody, because when the opportunity comes to collect stranded costs, utilities find they have lots of them that they maybe hadn't noticed before, so I think that they're always there. The newer the plant, the higher the remaining capital investment, the more there are. If you can recover your stranded costs - and how one defines "stranded costs" is a big issue - and get a plant producing at 2¢/kWh, then you can make the choice: Do you want to make money (you hope) by continuing to operate, or do you want to take the opportunity to get out?

Third Speaker

Possible consequences of reducing nuclear capacity~

Can nuclear compete? Clearly, some of the relevant factors are political rather than technological. I agree with the previous speaker that relatively few plants will close in the short term, and several independent studies have concluded the same thing. Two factors really drive closure. Firstly, a design issue - if you take a look at Westinghouse reactors of the same design, no operator has been able to get those plants above a low 70 percent capacity factor on a long-term basis. Secondly, to be competitive, you've got to get nuclear units into the upper- 70 to mid-80 percent capacity-factor level. The

economics is highly sensitive to capacity factors.

I don't think there will be a precipitous closing of nuclear plants, although you will see some diminution in capacity over the next 5-7 years to something in the 90GW range; further out, 63GW may be a bit on the optimistic side. You will see decisions made to close plants where there is an inability to amortize expenditures and get the money back over the remaining plant life.

The business realities going forward are, I think, another area to focus on. Market participants' decisions are generally short-term, and so you simply aren't going to get commitments to long-range, long-lived-asset technologies. Nuclear is not the only one affected - any technology that has a very long life, meaning you recover the cost of your capital over decades and not 10-15 years, is going to have problems in a market environment.

Furthermore, unlike in other countries, there is no energy strategy in the United States today. Indeed, there's a vacuum at the federal level in acknowledging nuclear's contribution to solving environmental problems: total societal costs of electricity generation are not being addressed. And, since -- absent any significant nuclear accident -- there is little debate about all this, public opinion tends to simply drift: the energy is there right now, and it's reasonably priced, so there's no focus on what's going to happen in the future.

Should society care what happens, where power comes from in the future? Obviously increased coal production is an option. There are thousands of existing units nationwide, many of which have some degree of extra production capability. Will some new coal plants be built? Yes. Using clean coal technologies? Yes. Will they be difficult to site? You bet. In general, you're going to have them sited in areas where there is strong local-government support, a desire for industrial development, a need to expand the tax base, and proximity to coal fields and major transmission capability. Putting all

that together, there are really only a few suitable sites nationwide. Also, even with no environmental restrictions, you're still looking at 5-7 years to build a coal plant, as compared to a simple or combined-cycle gas plant, where construction times from decision to grid connection are in the 24-36 month range.

Natural gas is, of course, a realistic alternative, but there is no debate on the infrastructure impasse. To replace the 600 billion kilowatt hours of nuclear electricity production, you're looking at between four-and-a-half and five trillion cubic feet of extra gas burned per year. That's equivalent to the gas carried by 15-20 major pipelines. So, to replace the capacity of nuclear, the nation would be facing several thousand miles of extra gas pipeline construction, and the siting of roughly 100GW of operating capacity, which translates into finding about 100 sites nationwide.

Some other collateral issues that rarely get brought up include the loss of jobs (nuclear power plants directly employ almost 100,000 people in utilities, and a roughly equal number of contract employees), the impact on vendors, and the effect on the local tax base.

Also, from a national policy standpoint, if we're serious about the environment and if the contribution to climate change from greenhouse gases is real, then it seems that, way down the road, some sort of nuclear generation is inevitable. But by the time we come to that realization, the nation might have lost its technological leadership and have to buy plants from overseas.

Fourth Speaker

Environmental goals can be met without special treatment for nuclear.

I wanted to start with a couple of premises:

- . Directly specifying social objectives, such as maximum levels of pollution emission, will generally be a more efficient policy approach than being

- specific about technologies.
- Supplementary policies are appropriate when there are substantial market barriers (as in improving energy efficiency), or to assist emerging technologies (such as renewables) that are socially desirable and supported by public opinion.

Based on those two premises, I conclude that:

- A specific cap should be set on emissions of nitrogen oxides, sulfur oxides, and carbon dioxide, which will, in effect, raise the market value of any technology that has low or zero emissions, including nuclear power. The value to nuclear power of putting a cap on NOx at the levels that the EPA has proposed are probably on the order of one-and-a-half mills per kilowatt-hour relative to new gas plants, and substantially more relative to coal plants. For CO2, the advantage for nuclear, and for renewables as well, based on \$50 per ton of carbon (the kind of figure that comes out of DOE studies) would be around seven mills. In the kind of competitive market that we're talking about, those are pretty substantial amounts, and could influence the economic viability of a significant number of nuclear power plants.
- I don't see any rationale for a specific policy to support nuclear power in the current context. It's a technology that has had many decades to mature, has enjoyed the largest cumulative public investment of any energy technology over a period of many years, and, in my judgment, is not likely to be key in the future. Supporting existing nuclear power plants does not produce enabling or emerging technologies, either of which would have long-term benefits in terms of technical innovation.
- I think that regulatory certainty, knowing what the environmental requirements will be, and a policy for early reductions are all clearly desirable. The sooner we can resolve these issues and, by doing that, create a

market value for low- or zero-emission technologies, the better will be the position of all producers to plan their future investments, e.g. when considering whether shutting down or continuing to operate nuclear plants is more efficient. But I can't see any logical basis for pulling out nuclear plants and treating them in a special way.

So, to be a little provocative, my bottom line is that society should care about the level of pollution emissions; it should care about the risk of nuclear accidents; and it should care about safe management of hazardous materials, including nuclear waste. But the number of megawatt-hours generated from nuclear power plants is not, in and of itself, a social objective that should concern us.

Having arrived at that conclusion, the question is: If the market plays out so that substantial numbers of nuclear power plants do shut down over the period between now and, say, 2010, does that, as many people have asserted, make it impossible to meet the Kyoto targets? I don't believe that's the case, and I think it's quite easy to demonstrate that there are a number of scenarios where we can achieve the reduction called for in Kyoto without the level of nuclear generation that we have today.

Could we achieve the Kyoto targets with half the level of nuclear generation expected from maintaining most current reactors? I think the answer is definitely yes, although it's harder, requiring a substantial expansion beyond the Administration's proposal of 5.5 percent of total electricity production from non-hydroelectric renewables, to more like 10 percent.

A couple more things: one is that if you want to achieve the Kyoto targets, 25-30 percent of the existing coal fleet needs to be retired and replaced with alternative sources. The more zero-emission technologies you have in the fleet, the more coal you could still afford to have while getting the emission levels under the

caps.

The other thing that makes a significant difference is the emission level for coal-powered generation. Because it's a large base, even a 5 percent improvement in the average heat rates of the coal fleet - from, say, 2100 pounds of CO₂ per megawatt hour to 2000 pounds - can make quite a significant contribution to achieving the Kyoto targets.

Finally, how might allowances be allocated under a cap? The allocation decision is complicated, with a lot of factors involved, both political and economic. Proposals made so far have been to allocate on a per megawatt hour basis to fossil generators, although we're looking at other options. But regardless of how the allocation is made, just by instituting a cap you raise the market value of nuclear plants, whether or not they are explicitly allocated allowances. For example, if you auction the allowances, nuclear operators would benefit by not having to purchase any of them.

I can report that in the U.S. environmental community there is absolutely no appetite for something that would look like a non-fossil fuel obligation as an alternative to a renewable portfolio standard, for a couple of reasons:

- The rationale for supporting an emerging renewable-energy industry, which currently has a very small installed capacity, doesn't apply to the continued operation of the existing nuclear fleet.
- In such a system, the competition for existing nuclear plants is restricted only to new renewable capacity. That is a fundamentally biased competition, because nuclear generation is economic if capital costs are ignored, but a lot less competitive if they are included. In contrast, energy efficiency and natural gas can compete with existing nuclear plants under an emission cap approach.

My conclusion is that, as a matter of principle, or as a matter of the

engineering, it's quite possible to achieve the Kyoto targets with substantially less nuclear generation, although whether the economics would work out that way or not, I don't know. There will be a market clearing price for electricity, and the market should ultimately determine the mix of resources to achieve the caps.

Comment: The speaker said that nuclear had received the majority of government subsidies. I would dispute that - it's clearly had a large proportion of R&D dollars, but there are a lot of other ways to subsidize things - for example since 1992, renewables have had a penny and a half subsidy on generation. In fact, since 1976 we've spent much more on photovoltaics than we have on nuclear R&D, and we're not yet producing a lot of electricity from them. I think the thing we should look at is how the money is being spent and why it is or is not successful, as opposed to saying, "You got it then and therefore someone else should get it now." There might be lessons to be learned from the fact that, if you look at the R&D expenditures and policies regarding nuclear, you'd find that we spent altogether maybe \$50-60 billion on nuclear R&D, of which less than 10 percent went to the technology that produces a fifth of our electricity. Was the rest wasted? Probably not. Could it have been spent more effectively? Probably, yes.

Comment: A figure of 3-4¢/kWh for nuclear generation has been mentioned if you're looking at getting a reasonable return on capital. By comparison, we have the technological capability to produce advanced, variable speed, wind turbines that generate electricity at about 4¢/kWh. Without advocating utopian scenarios, it's plausible that at some point, possibly as soon as 2010, the relevant competition for nuclear generation could conceivably be from wind power. On physical constraints, I would submit that, in themselves, they are not prohibitive, although constraints on transmission facilities may become an issue. There is a tendency to make judgments based on our intuition of what may be feasible in terms

of system penetration for renewables. But that isn't necessarily a hard, physical constraint - much may come down to issues of public acceptance and of viewing the economic criteria not so much as fixed, but as expressions of public sentiment and political situations.

Question: Speaking as a competitive supplier, functioning in the retail environment at this moment, an issue we haven't really talked about is customer choice: What does the customer want? Will you find customers who don't want the nuclear option? How, as a competitive supplier, do you develop products and bring them to the market? What we've found so far, at least in the industrial market, is that it's just a question of price. So, as we begin to bring in some of these environmental products, my concern is that we are designing systems that are going to be very difficult to market.

Response: If people in California and elsewhere are interested in green power and are willing to pay 15-25 percent more for it, or whatever the going rate is, then we can introduce renewables on a much more accelerated basis. But if the price of energy generally goes up, then a lot of nuclear plants, even less efficient ones, can do just fine - the more expensive the marketplace is for everybody, the more you can afford inefficiencies. You don't necessarily enhance the transition to the future very quickly; in fact you may delay it.

Discussion

Question: Does anyone have specific suggestions for things that the government or the industry ought to do?

Response: If the concern is about having an adequate supply of electricity produced by sources of energy that are reasonably priced, then there's potentially a cost on the environmental side. On the other hand, if you're attempting not to have nuclear facilities closing before the end of their licensed-lives, then you have to step

back and look at regulation at the national level.

I think a powerful intangible is the irritation factor of NRC regulation, which has moved away from ensuring plant safety to suggesting that there can be absolutely no operation errors of any kind. The NRC should regulate to make sure public health and safety are adequately protected. Things happen at every facility, and mostly they present no threat, but the NRC treats them all the same. As the Commission moves toward performance-based regulation, we'd expect to see a change for the better in the way the regulatory process works.

Also, I'm absolutely convinced that one of the things that the government can do is to address the issue of nuclear waste disposal in a yes or no fashion, rather than continue to have it just dribble on. The uncertainty adds significant costs in terms of tens of millions of dollars in dry storage, as well as the regional and local debates as to whether or not dry storage ought to be going on at all. If the federal government does nothing about this subject it will slowly bring the nuclear industry to a halt.

Comment: If you just look at the price of electricity and at the cost of nuclear energy, maybe 40 percent of the plants would be shut down. But if you actually start shutting down some plants, and then redo the calculations, you move back up the cost curve, and the price rises. Obviously, some place in the middle there's an equilibrium, so you don't realize the more severe scenarios. Actually, when the prices start going up, a lot of the remaining plants are actually doing well. Then what you're talking about is the long-run cost of entry, not about 2~/kWh - which I think is probably not an unreasonable number for the short-run market - but something like 3.0-3.5~/kWh, which has a dramatic effect on the nuclear business.

Question: Some people have suggested that we might want to move to a world in which three or four large companies

operate all the nation's nuclear plants. We could talk about what kind of arrangement would get you there, but first, is that a world we should strive for, or try to avoid?

First Response: One of the reasons we have the kind of regulation we do is because it deals with about 45 different entities - that's why our system differs from, say, the French one. If you had larger entities that could impose a kind of standardized self-discipline, you could have a different sort of regulation.

Also, there are some personnel problems if you plan to have these plants running until the end of their lives, and then just stopping. What'll happen is that the people aren't going to stick around; they're going to leave earlier, and if they leave earlier, the plants are going to close earlier. Only larger entities can provide the kind of personnel systems, career paths, and so on that are necessary to keep the entire enterprise going.

Second Response: I think it's a world that ultimately becomes inevitable. You're starting to see the early signs: first consultative things, and then outright operational agreements between operators and owners, leading down the road to operators taking more responsibility. Ultimately there are at least some entities in the United States that have actively said they'd like to buy nuclear plants on a contrarian strategy. And I think once that starts rolling, whether it's three or four, it certainly isn't forty.

The counter argument is the evidence that the best performing plants, both from an operating and an economic standpoint, are in utilities that have a maximum of four operating units. First of all, they have some economy of scale to spread their overhead. Second, they have some comparative capability inside their own company, because all their plants aren't usually at the same level of operating performance, so they can internally benchmark off of each other and improve. Also, in large measure many of these entities have been out of the construction

end of the business for a long time.

Question: What are the barriers to consolidation?

Response: It's really the irritation factor. If you're looking for what policy initiatives are necessary, the NRC needs to have rules in place that are both certain and clear, so that companies can make business decisions. Whether I want to consolidate or not, I ought to be able to make that decision because I understand the rules. If consolidation is something that's desirable, then you have to make the process as easy as possible.

Further, because pricing and all the day-to-day economic judgments are still made in a pretty decentralized structure, where the rules vary dramatically from state to state, it makes it very difficult to run multiple units as a single business.

Question: Is the industry optimistic that that process for relicensing is moving the way it should?

First Response: We're certainly very pleased that NRC Chairman Jackson and all the commissioners have made very strong statements about their desire to make the process work effectively. They've talked about reducing the time frame for license renewal from three and a half to two years.

But maybe even more important, and where progress is less certain, is with the Commission's rules for merchant licensees. There aren't any in this country today, but they will need to be in place in the future. Relicensing by existing electric utilities is a step forward, but by the NRC's own definition, there aren't going to be any cost of service utilities in the future who are in the generating business; they'll be in the T&D business, but not in the generating business.

Second Response: On license transfer, it's not only a problem of financial responsibility, but also of the new conditions on licensees. The current practice is that you have to essentially

license at the current best possible technology. Well, that's ridiculous for a 25-year-old plant it becomes outrageously expensive to continue to operate if you transfer the license. Regulations force most licenses to stay with the original licensee, which becomes increasingly difficult if the licensee changes so much that they're no longer who we originally thought they were.

Also, if you own one of these plants in a competitive world, the first thing you'd want to do is expand them, upgrade them, build a natural gas plant next to them. All of those are very problematic in terms of meeting the licensing conditions. I can't even imagine how to actually bring a natural-gas pipeline close to a nuclear power plant, yet that would be a logical thing to do.

Will there be other revenue streams? How do you get the offsets, or the credits, or whatever for CO₂, SO_x, and NO_x reduction? The way it's structured now, it almost seems as though you have to shut the plant down for some period to prove that all that stuff goes up, and then you go back and turn it on again. Isn't there some better way of dealing with what is, in effect, another revenue stream that any business enterprise would look for?

Third Response: The whole regulatory system is designed to deal with regulated electric utilities that will accept the dictates of the NRC, which are based on a fairly general set of rules. We don't have much precision, except in a few areas, because that's the way the industry wanted it. The rules are general because it was

understood that, on safety matters, the utilities would accept the dictates of the NRC and then get the money back from their customers. When you shift over to a commercial system, it isn't clear what happens one of the NRC commissioners expressed it by saying the problem wasn't stranded assets, it was stranded responsibilities.

Let me also say something about the business of re-licensing, which is more complicated than it looks. One of the assumptions in the re-licensing process is that these plants have everything - the documents, the hardware, the procedures - all lined up, and so can get re-licensed. Well, many of the plants aren't actually in good shape on this score, that is not at the point where the NRC is going to sign off easily. I think we'll find that, when they have to start meeting the requirements in that area, it's going to be quite a drawn-out process.

Fourth Response: My concern as an economic regulator is about the entry rules. It seems like there is a large potential demand from people who want to become merchant nuclear operators, but some question about the financial standards and liability issues that are going to become constraints. What kind of fundamental rules are we going to develop? Will we allow somebody like Electricite de France to come in and start bidding on plants? What rules would they live under, since they're a foreign company? If we don't have rules laid out then you're not going to have a competitive market.

2. Afternoon Session: The impact of deregulation on operations, safety, and public accountability

The Nuclear Regulatory Commission (NRC) has expressed concern about whether: (a) utilities facing price competition will be able to provide the financial assurances necessary for decommissioning; (b) a competitive marketplace will put pressure on utilities to cut back on expenses, with a resulting effect on safety. Are these fears well founded? Is the NRC itself organized to manage the transition to competition, and what key issues will it face? What impact will the new environment have on public input into decision-making processes, and on the availability of information?

First Speaker

Electricity price benchmark -- Debt-equity ratios -- Convergence of economic efficiency and safety -- Roles for the NRC

I'm going to start with an overview of some assumptions about the nuclear industry in a more competitive marketplace.

First: Wholesale electricity prices are likely to remain relatively low, with marginal pricing in many regions of the country determined by low-cost, coal-fired capacity and, increasingly, by combined-cycle, gas-fired capacity.

Environmental requirements for coal will escalate, but I believe existing coal plants will remain very cost competitive. For example, I just finished debt financing for a 30 year old coal plant located in the Midwest, which will be refurbished over the next couple of years, will operate with a power-purchase agreement for 15 years, and, after that, with a merchant component for 10 years. In 2015, the second year of the merchant-component period, that plant is expected to generate power at a cost of 1.8¢/kWh (in 1988 dollars), versus the estimated market price in that region of about 2.7¢/kWh. These estimates include some fairly conservative assumptions about increasing environmental requirements over time, so they give a benchmark for the competition that nuclear plants may face over the next 10-20 years.

Very efficient combined-cycle gas plants are also likely to be medium-term competitors for nuclear, with costs of

about 3¢/kWh, although there may be some over-capacity, which could lead to facilities selling power more cheaply.

To be competitive, nuclear units are going to have to perform consistently at the levels being achieved by the plants that fall in the top-quarter of current industry performance - that is, with capacity factors on the order of 80 percent, and fuel, operating, and maintenance expenses of 1.6-1.7¢/kWh.

Second: In the future, the regulatory and safety performance of nuclear units will have to be consistent with the levels being achieved today by the better plants in the industry. In a competitive market, I don't think the funds are going to be there to finance an extended corrective action program over a 2-3 year period. Plants that find themselves in regulatory difficulties are much more likely to be shut down.

Finally, in my view, nuclear-power generating companies can be viable entities, but the financial requirements are likely to be more conservative than for non-nuclear generating companies, or for companies that blend nuclear and non-nuclear capacity. Consider the average U.S. investor-owned utility today with single-A credit and a capital structure that is roughly 50 percent debt and 50 percent equity. If you look at the transmission and distribution components of that business, the rating agencies will tolerate more debt and lower interest coverage - say, 60 percent debt and 40 percent equity - to retain a single-A rating. That

reflects the rating agencies' perceptions that, in a competitive marketplace, transmission and distribution is likely to be a more stable, lower-risk enterprise than generation, which is likely to be more of a commodity business, with volatile cash flows and pricing. The agencies have signaled that generation will require a more conservative capital structure - on the order of 40 percent debt and 60 percent equity - to maintain that single-A benchmark.

We have also talked to the rating agencies about their views on a nuclear generating company, and their perception is that nuclear either works well, or it doesn't. If it works, it generates power at a relatively low variable cost; if it doesn't, plants are shut down. Given that perception, you could get investments for a nuclear generating company, but you'd need a stronger financial profile than for either a blended company or a predominantly non-nuclear generating company. Probably the most leverage you could impose is on the order of about 25 percent debt and 75 percent equity, and you are going to need cash flow from operations to cover about five times the interest expenses. Finally, the agencies have signaled that they are going to want to make sure that decommissioning costs are taken care of.

Those are the operating assumptions that I tend to use as I've looked at some of the issues posed for us. Let me turn to some of those issues now.

First, where are we today in terms of the ability of the plants to meet the economic and operating requirements necessary in a more competitive marketplace? Overall, we've seen a clear trend toward improved operating performance within the industry, in terms of regulatory performance, safety performance, economic performance, and reliability performance. My sense is that at least half of the plants in the industry are within the broad range of what will be necessary to remain competitive in the marketplace, but that the rest clearly have some work to do to reach performance

levels at which they would remain viable over the longer term. There is, however, a convergence of interests, with well-run plants tending to be both economic plants and safe plants that do quite well in terms of their regulatory performance.

A second topic I wanted to touch on is this: Can competitive pressures lead to reduced spending, which could compromise safety? The answer to that is yes, there is no question that the competitive pressures could lead to that kind of result. I think you can point to at least one or two instances within the industry where there have been some mistaken signals in terms of what competition means and how plants react to it in terms of reduced spending levels. Also there is another component - namely a diversion of management focus away from the operation of nuclear plants, and of domestic power plants in general, toward other areas of activity, such as re-configuring companies and diversifying businesses. I tend to believe, however, that the challenge of competition is likely to provide the right kinds of incentives to monitor performance, and a recognition of what is really necessary to survive in the longer term. My judgment is that, for the most part, the positive incentives outweigh the negative ones. The practical effect of market forces and of industry reconfiguration will be that the folks who don't get the message will not be long-term players in the business.

Third, how well is the NRC coping with the changes that are taking place in the industry due to competition, and what do they need to do? In general, the NRC is trying to cope effectively, although it doesn't have a strong internal capability to understand or evaluate the kinds of changes that are taking place. Also, the NRC has been able to operate on the premise that they could rely on economic regulation of the industry and, as long as they were dealing with licensees who were regulated utilities, they did not need to worry very much about things like financial qualifications, or the ability to meet economic requirements. That world

is clearly changing, and I think the NRC should focus on a few core issues, such as recovery of decommissioning costs, liability, changes that might be needed in the financial qualifications for licensees who are not traditional utilities, and coping with license-transfer requirements.

Decommissioning costs first: I tend to look at decommissioning costs as predominantly a pre-existing health and safety requirement that needs to be satisfied whether or not existing plants continue to operate. Those liabilities and expenses were properly incurred as part of a regulated business, and the approach in most states is to ultimately provide for recovery of decommissioning costs from customers. That's a reasonable and appropriate approach, and it ought to be one with which the NRC is comfortable. It provides a mechanism for avoiding what might otherwise be some fairly onerous requirements, in terms of substantial pre-funding of decommissioning liability for owners or operators of nuclear plants who are not traditional, regulated utilities.

What does the NRC need to do on financial qualifications? This is an area where I don't think the Commission has strong capabilities. My own view is that there are probably limits to what the NRC can do to define the financial requirements for licensees. The marketplace is going to require a conservative approach as to how companies with a large nuclear-generating component are structured and managed, and I suspect that the NRC can do what it needs to by focusing on their traditional mission, which is the health and safety regulation of plants. At this stage I'm not a big fan of substantial NRC involvement on the financial qualification side, other than to ensure that companies are viable and have the capability to meet normal operating and maintenance expenses.

The one area where the NRC is likely to have some difficulty, and where there is the biggest challenge in accommodating the needs of a more competitive industry, is looking at future ownership arrangements for plants. I think

ownership arrangements are going to have to change significantly, either within the holding company structures of existing utilities, or ultimately with independent companies. If the regulatory flexibility isn't there to accommodate those ownership arrangements, then the number of nuclear plants that operate over extended periods of time may be lower than might otherwise be the case.

Second Speaker

Operating costs -- Decommissioning

I'll address the impact of deregulation on operations. Often we only talk about maintenance and fuel as the costs of operating the plant, which is not the case. There is incremental capital, there are the property taxes, and so on. In particular, one important financial variable that nobody's mentioned is the big IRS tax benefit that often arises from shutting down a plant. All of these costs should be discussed as part of economic viability, because they all have to be recovered from the marketplace.

Even if you are competitive, is it worth the trouble? There is maybe a 10 year net present benefit of \$70 million on the operation of a 1,000 MW plant. That's not very much money for all the trouble of running a nuclear power plant for 10 years. Also, the capacity factor is a very big driver in terms of the earnings you can get out of these plants.

What is the impact of deregulation on safety? The airline business is an analog in some respects - there are economic incentives to run a safe airline, but we wouldn't be content if the only thing keeping airlines safe was the possibility that they would lose money if their planes crashed more often. Attention has to be given to the question of what requirements are needed: the premises for regulation today are much different from those in the past.

On decommissioning, there seems to be a consensus that it is an important safety issue. I would assert that some liability was

incurred at a time when the utilities had an obligation to serve. I don't hear obligation to serve mentioned very often, but it is important. We no longer have an obligation to serve with regard to generation: you shut down plants and the price goes up or the lights go out - since I have no utility revenue coming into my business unit, I have no obligation to operate.

The NRC, as the principal regulator, needs to make sure that there is decommissioning funding, regardless of whether the plant is operating or not. I hear talk about plants having to operate in order to get the money needed to decommission them, which I don't really understand. The plants should operate because it makes sense to do so on an on going basis - the plant license was granted on the basis of cost of service. That does not mean that going forward costs need to be recovered on a cost-of-service basis, but it does mean that the health and safety issues associated with the existence of that license need to be protected by some assured recovery of the cost needed to deal with them.

Third Speaker

Maintenance Rule -- Effects of downsizing -- Public accountability

I want to talk to you today about some of the impacts of deregulation on operations, safety, and public accountability. To give you a flavor of what restructuring could do:

- . In operations, the budget-cutting efforts can lead to fewer inspections being conducted at facilities, and larger backlogs of items being deferred.
- Some facilities are downsizing' in staggered layoffs, where 50 to 100 people get laid off every six months, and the survivors end up working longer hours. It's not been good for morale, and I think the implications of low morale at a nuclear plant don't need to be explained.
- Downsizing means that experience leaves with the people, although we've

noticed that the impacts of this vary.

- As restructuring occurs, electric-grid reliability may be reduced, which means that nuclear power plants may suffer the lights going out, just like consumers, and there are some implications of that.
- The way we define public accountability is as public involvement. The good news is that it's at such a low level now that there is no real chance of it being compromised under restructuring.

I said there would be fewer inspections due to spending limits. Things that are now being done on a monthly basis, the move is to do them quarterly; things that are being done quarterly, the move is to do annually, and so on. The driving force behind this is the availability of data on equipment failure rates (how often a valve fails, how long you can operate between failures, and so on), which was not there when these plants were built, is leading to justifiable shifts in frequency. Unfortunately other things found during these tests where a person mispositioned a valve, or made some other mistake - will not be identified as often in the future, due to the reduced inspection frequency. That could certainly have safety implications.

Furthermore, a lot of lower priority items are being deferred to save money. What we are concerned about is that nobody looks at the aggregate: an analogy is that I can tolerate a single bee sting, but perhaps not a thousand stings. We're not sure that the deferral process is accounting for the aggregate of the items that are being deferred.

However, there's some good news. In 1991, the NRC enacted the Maintenance Rule, which came into effect in July 1996, and which requires every plant to keep a score card on its important safety systems. If rigorously enforced, this rule will help detect any failures due either to larger backlogs or to lack of inspections. I think this is an example where restructuring poses some risks, but where there are

mechanisms in place to deal with them.

Staying with operations, plants are going from one year to two year operating cycles, which raises capacity factors. In the old days, maintenance and testing was done when the plant came down for outage, but now a lot of that is being done online. It isn't that companies aren't doing the same amount of work in order to get these short outages, they are just doing it over the course of the entire cycle, instead of only at refueling. By supporting the same amount of work over a longer period, they are able to do it with much greater management oversight, without compromising the safety margin. There are some risks, but they can be dealt with.

Turning to downsizing: most of the schemes used to encourage people to leave are based on years of service, so you tend to see an exodus of more experienced people, lowering the corporate experience level. At newer plants with computerized data documentation systems, plant drawings, and so on - the impact of that experience drop is relatively minor, because the less experienced people have the tools to compensate. It is at the older plants, without these management tools and processes, where experienced people leaving could cause some problems.

At some plants, the way that downsizing is done has caused some morale problems. The survivors aren't sure that they are going to have a job in a year or two's time, and at some point they might just give up, and go through the motions, which is not a good attitude. I think if there was an instrument to measure morale at some of these plants it would be low right now. The former president of Yankee Atomic put out a paper on the right way to do downsizing. What he stresses is that you've got to improve how you do business before downsizing, otherwise you are just using fewer people for the same inefficient processes, and the problems get worse instead of better.

Turning to electric grid reliability, right now there is infrastructure, with backup

equipment, maintenance and so on, that provides pretty good reliability of the transmission and distribution system. Because that infrastructure costs money, it may not be as reliable in the future as it is today. If there is a grid outage now, nuclear-power plants generally get top priority for restoration. That may not be true in the future when they're competing with everybody else to get their power back. Regarding safety, the concern is that loss of power to a nuclear plant is a significant contributor toward damage frequency - at some plants it is on the order of 10 percent as an initiator of a core damage event if the loss of power lasts 4-8 hours, although it varies depending on plant configuration.

The last impact on safety is in the area of emergency planning and response. A lot of utilities centralize emergency planning and response functions, sending corporate folks out to a plant affected by an accident. In the last few years there has been an effort to make the plants do everything themselves. At the same time, they're downsizing, and so may not have the financial or, more importantly, the personnel resources to handle emergency planning and response in the event of an accident.

Shifting to public accountability, in the mid-1990s the NRC changed its rules to virtually eliminate public involvement in the license-renewal process. They basically narrowed the scope on which you could contend a license-renewal process, virtually eliminating any meaningful public involvement. Last year, the NRC revised the decommissioning rules along the same lines, again virtually eliminating public involvement. After almost everything has been done, you can request and possibly be granted a public hearing, but by then it is, at best, a legal exercise. The NRC rules still allow the public to pay for nuclear power, but not to have any substantive role in decision-making. Because public involvement is limited to cameo appearances, the chances of restructuring affecting it in any meaningful way are very low.

Discussion

Question: What are the potential safety risks if environmental standards cause nuclear plants to operate for longer than they might otherwise be able to under restructuring?

Response: The dynamics could change in a more competitive marketplace simply because of the cost of going through corrective programs in the troubled cases. There's a risk that, if there is financial compensation, you will operate underperforming plants, but as long as the new regulatory system is operating effectively, that probably won't happen. I'm not sure that you would run into a situation where a plant that is really way out of line in terms of safety performance continues to be artificially propped up. Also, it's not just plants that are doing poorly on safety that may get weeded out - you might have a small plant that is run pretty well, but just has a high cost structure in a relatively low-cost market - perhaps providing a financial incentive for benefit may allow some of those operations to continue for a longer period.

Question: The British moved eight of their nuclear plants out of government ownership into private hands. How are they doing in the market, and what does that experience tell us about transfers of ownership for U.S. plants?

First Response: I haven't spent a lot of time looking at how the stock has performed since the public issuance, but it is one model to consider in terms of how to go about trying to move nuclear to a more competitive framework. It has, not been an overnight process - a number of protections and subsidies are being eased off, providing a gradual transition to a company that will be a stand-alone competitor in the marketplace. But you can also make the argument that the United Kingdom does not have a very open market for generation, because there is a very limited number of competitors, and a lot of artificial constraints

Second Response: The British energy experience was a privatization of a government enterprise, and therefore it is very hard to see how it maps onto the deregulation of the already existing - albeit regulated - private enterprises in this country. Let me make one point though: looking at the plants in Britain and the United States, capacity factors were always going to go up. A number of plants came on line in the early 1980s, and they were going to improve their performance no matter what. In the United Kingdom, there were specific reasons why their performance was poor, partly due to the fact that they were a government entity, so nobody had any great incentive to improve performance. But more important than privatization is the fact that they solved a lot of operating problems. The result was that performance improved, just as it has in this country, but not due to the occurrence of some big paradigm shift.

Third Response: To get directly to the question, in Britain the share price is up about 50 percent over the flotation price, and they are selling electricity into a market where the annual average price is about 5.5¢/kWh, although their cost structure is not that much different from here in terms of fuel, operation, maintenance, taxes, and so on. So they're making a good margin now because the government kept all the other debts behind, and committed to funding the decommissioning account before they were privatized. But the point is that they are doing well, their cash flow is up, and they are making quite a bit of money.

Question: There is some cause for concern in the emerging division between nuclear operation and ownership. The operating contracts are likely to give incentives to run plants at maximum levels, whereas most of the liability for things going wrong remains with the owners. Should the NRC be scrutinizing that split in incentives?

Response: This IS an area of serious

concern, and I have spent a good deal of time trying to figure out how to draw up a contract aligning the interests of the owner and the operator. It's very difficult, because there is an inherent inability to write a contract that will put the service provider exactly in the shoes of the owner and, unless you do that, there's going to be some gap to deal with. Insofar as the NRC might be able to regulate these operators, they haven't shown any inclination to do that; on the contrary, they have been looking for ways not to do it. But it is an active issue that is being discussed between the industry and the NRC, and it's not clear where they're going to draw the line.

Question: On decommissioning, the picture isn't quite as clear as the consensus that seems to have emerged. On one hand, decommissioning costs aren't much driven by future nuclear consumption, and therefore the case for charging per kilowatt hour and putting it as part of the operating cost to be recovered in the market is not strong. On the other hand, there are future decisions regarding the decommissioning process - such as the decommissioning methodology - that will affect its cost. Is it likely that regulators will want to install some kind of an incentive to keep those costs down?

Response: I agree with you in terms of the future commitments, that you can make future business decisions that can add to decommissioning liabilities. Maybe the California formulation, where those incremental costs get allocated to the future business risk via an automatic pass-through, makes sense. Also, there is a potential concern about managing the decommissioning process effectively, so that you pursue a reasonable cost alternative. Perhaps there is an argument for some scrutiny of decommissioning costs, but I don't think it changes the fundamental premise that the costs incurred to date ought to be passed through. You ought to be able to address the concerns about not writing a blank check for decommissioning by providing some ongoing monitoring of the process

and of the funding arrangements. My bet is that regardless of the pass-through ability there's still going to be a reasonable incentive on the part of operators to try to control those costs to some degree.

Question: I've heard three different positions here and I would like you to tell me which one is right. The first is that nuclear safety regulation has been, and is, too strong, resulting in overspending on safety. In a competitive world, you do not need to be as careful about safety - operators will have a large incentive to operate plants reliably and safely because if they don't, they will no longer get operating contracts. The second one seems to be that the NRC's safety regulations are going to have to get tougher in a competitive world because companies will have too much of an incentive to cut costs, to keep their prices low; the public perception of restructuring will be shaped by the failures, i.e., the worst 10-20 percent of the nuclear plants, and therefore we've got to make sure that we minimize the chances of these failures, meaning tougher regulation. Also, in a competitive world, nuclear will be even more vulnerable to the public backlash from an accident, regardless of where in the world that accident happens, perhaps in Russia or one of the Eastern European countries. And then a third philosophy is that NRC regulation is just about right, and we don't really need to tinker with it, as they're doing a pretty good job. Which one of those should I believe?

First Response: I would like to throw a fourth one out: Regulations are too tough today and they need to be consistently enforced. Some of the regulations we have are onerous and provide no measure of safety, they just drive costs up - those need to go away. The ones that do have some impact on safety need to be consistently enforced - right now we they aren't.

Second Response: I'm not sure your choices are mutually exclusive, because there is some truth to each of them. Is nuclear safety regulation too strong? It is

a very prescriptive system, and you can use a very literal interpretation of how you to apply and enforce that prescriptive system. If you do that, I think you can take actions that are not terribly beneficial to safety, but that do have a detrimental effect in terms of operating performance and competitiveness. How you provide flexibility, and how you interpret and apply regulations is really the key thing. What we have seen, I think, is that the NRC has gone back and forth at various times. Since Millstone, there has been a period where we have seen a very literal, very direct, fairly prescriptive enforcement approach. I would argue in some cases, that doesn't produce the right result in terms of the overall safety benefit that you get for the cost incurred.

Question: It wouldn't be unusual to discover that one has underestimated decommissioning costs. But if you have transferred the plant to someone else by the time you discover that, it may be more difficult to come back to a regulator and argue that it should be added back in as a wires charge or whatever. How does one get around that particular problem?

First Response: The NRC's requirements do not establish a sufficient fund to ensure you have enough money for decommissioning. More fundamentally, with existing plants we know where the liability rests, and attempting to transfer that liability elsewhere would be a mistake. What that means is that a utility, even if it divests the generating plant, will not divest the environmental liability. Additional decommissioning costs will be incurred under an NRC license, and as a condition for getting that license, the licensee will have to accept, the responsibility for any incremental costs that arise.

Second Response: It wouldn't be unusual to find decommissioning costs increasing over time, although we have a much better fix on them now than we've had historically. Decommissioning liability is going to have to be dealt with when the NRC looks at a license transfer; they are

going to have to be comfortable that there is a way to recover those costs via some reliable and predictable means. As long as there is an ongoing review of the expected costs of decommissioning, some practical experience with decommissioning in terms of what the real costs are, and the possibility of making adjustments in the pass-through mechanism, I think the NRC should be comfortable. You should be able to minimize the risk of ending up with a substantial, unfunded decommissioning liability. So I would argue there's probably not too big a risk, but it's precisely what the NRC should look hard at when they consider a license transfer.

Question: The spent-fuel problem is still an issue, because you have spent fuel from the regulated period, and you will have spent fuel from the deregulated period. Ultimately, who bears the responsibility to put it in dry casks, or to get it off-site? If there is a problem in the spent-fuel pool or in the dry casks, or in something else, where are those liabilities allocated?

Response: Insofar as on-site spent fuel goes, you're right. Those sites are not going to be able to go to green-field, no matter what people say. Somebody is going to have to take care of the spent fuel for a long period of time. But I don't see that as a problem because right now it's clearly the responsibility of the licensees, and it will stay that way unless a transfer occurs under the provisions of the regulations. The responsibility to manage the storage of spent fuel will rest with the T&D utility that produced it, and any that's produced subsequently with whoever the licensee is then.

Question: On the financial responsibility issue, we have talked in terms of the impact it makes on the finances of the company, but what are the opportunities for some kind of insurance - such as a surety bond or business risk insurance - to be a substitute for what is, in effect, self-insurance, that is the company having to payout from its own revenues? There are lots of industries that face disastrous risks, but have them covered in some way.

Response: Insurance is certainly going to be an element, just as for any business. But it depends on what costs you are trying to insure against - if you are trying to insure against some increase in decommissioning costs in the future, I don't think that's insurable. But if you want to insure against other kinds of costs that you are liable for, and that are risks based on the performance of the plant, then that'll be insurable, and there will be instruments available.

Comment: The concern here is a reduction in expenditures and a threat to safety. Well, if you look at the plants today, our most efficient ones are clearly also our safest. Generally, what you see today is that efficiency and safety go hand-in-hand, and I would expect to see that continue. I think the real challenge right now is to get the NRC to focus on those things that are important for safety, and not divert resources to those things that aren't. Other things that would be very important are for the regulators to be credible with the public - which I am not sure they are right now - and also to talk about how safe the plants are, so they are not only in the news when there is a problem.

First Response: I am very concerned that the NRC is trying to adopt an economic indicator for plant performance, which has more chances of failing than of succeeding. Also, I don't think that the problems at Millstone and Maine Yankee were associated with restructuring. It is a convenient excuse, but that's not the real reason for the problems at those plants.

Second Response: If you look at all of the watch-listed plants today, the problems' are neither new nor unique. They're the same things that have been going on at plants that have been on the watch list ever since the list was first instituted; these are frequently not money problems or resource allocation problems. The right thing is to look at best practices at individual plants, take advantage of that knowledge, and apply it throughout the

industry. There are plants doing particular tasks very efficiently, and that information from them should be taken, disseminated, and utilized.

Third Response: You mentioned the watch list. Just to give a perspective on that, if you look at the plants on the list now, you find that - by NRC's own standards - those same plants would have been in the top quartile when the list started, ten years ago. Now, you can make numbers say almost anything, but clearly, just from the standpoint of performance indicators, there has been a raising of the bar. There is no question that the range of performance within the industry has narrowed, and the overall level of performance has increased dramatically.

Fourth Response: Going back to the impact of deregulation on safety, whereas decommissioning and spent fuel may loom large politically, from a safety point they're not all that significant. For one thing, the NRC will let you avoid decommissioning a plant for 60 years, just leave it sitting around, and spent fuel can sit in casks more or less indefinitely. The really important thing is protecting against accidents. And here people ask, is this plant safe? Or, is it going to be safer? Safety is a subtle thing - there's no easy way to quantify it - but it ultimately depends on the skill and dedication of the operating staff, and how the management motivates that operating staff. Now, if we're going to put more commercial pressures on these people, is the whole system going to be going closer to the line? Remember, we have a wide spectrum of performers, very good ones and some less good. If it looks like some of them are close to that line, the NRC is going to have to be more intrusive; you are going to need more "real-time regulation," with people checking things that aren't being checked at the moment.

Question: In this industry, a lot of the safety depends on sharing information. Will sharing continue when that information is valuable in itself, because it can get you to a better level of

performance, so that you can outdo your competitors?

First Response: I think utilities are going to continue to share information, because they realize that if there is one troubled plant, then a lot of other plants will also get some additional inspection, and there are costs associated with that. I think they'd want to avoid those costs, so they are going to continue to share information. What we've seen is that, instead of just giving away information on a process, they're trading it. They want something back, because they realize it has value. That may actually improve performance, because there will be more sharing, or more return for what you gave away. There can be some barriers but there can also be some bridges.

Second Response: I'm involved in one plant, and I know that there's been a pretty consistent message that competition doesn't mean not sharing safety and regulatory information. People do understand the potential negatives from

having a problem and not having the information are larger as you move toward more competition.

Question: What is the status of the Price Anderson Act?

First Response: Price Anderson is up for renewal in 2002, but existing plants are grandfathered - that is, if Price Anderson was not renewed, they would continue to be covered forever anyway. The expectation right now is that Price Anderson will be renewed.

Second Response: Last time Price-Anderson was redone was probably the peak moment when it might have had opposition, and not been renewed, but that did not happen. It may not have come out the way the industry would have liked, but it did get through Congress because, in the end, there was no stomach to risk undoing the whole system. So, unless we see some significant problems, I doubt that there'll be any fundamental change.