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NUCLEAR REGULATORY COMMISSION'S LICENSING AND RELICENSING PROCESS FOR NUCLEAR PLANTS

HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

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C O N T E N T S

NUCLEAR REGULATORY COMMISSION'S LICENSING AND RELICENSING PROCESSES FOR NUCLEAR PLANTS

Wednesday, July 16, 2008

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
Washington, DC.

The subcommittee met, pursuant to notice, at 10 a.m. in room 406 Dirksen Senate Building, Hon. Thomas R. Carper (chairman of the committee) presiding.

Present: Senators Carper, Voinovich, Inhofe, Lautenberg, Cardin, Sanders, Isakson, Craig

STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR ROM THE STATE OF DELAWARE

Senator CARPER. The Subcommittee will come to order.

Senator Voinovich and I are pleased to welcome all of you this morning, particularly our first panel of witnesses. Thank you for joining us.

Today's hearing provides oversight on the Nuclear Regulatory Commission's licensing and relicensing processes for nuclear plants. Senators are going to have roughly 5 minutes for opening statements, then we will recognize the Chairman of the Nuclear Regulatory Commission and each of our commissioners to offer their statements to our Committee.

Chairman Klein is prepared to give us a statement about 5 minutes in duration, and our commissioners, Commissioner Jaczko, Commissioner Lyons and Commissioner Svinicki will each have about 2 minutes to offer any additional thoughts that you might have.

Following the commissioners' statements, we will have two rounds of questions, and then we will ask our second panel of witnesses to come forward and present and respond to our questions as well.

A number of you, at least three of our witnesses on this first panel, Senator Voinovich, Senator Craig, have been before us any number of times. One of them looks, I don't recall seeing one of the commissioners on the other side of this table before, but I know that she is somebody that you have worked with for a long, long time, and we welcome you and thank you for joining us today.

As Americans face tough issues like global warming, like air pollution, a sluggish economy and high energy costs, I believe our

hearing today on nuclear energy is more than timely. By creating a strong nuclear industry we can help reduce our growing reliance on foreign oil and unchain our economy from the whims of hostile governments. We can also reduce air pollution that damages our environment, harms our health and contributes to global warming.

Nuclear power provides reliable power, and provides it cleanly. Unlike fossil fuel power plants, nuclear power plants do not emit sulfur dioxide, do not emit nitrogen oxide, do not emit mercury, nor do they emit carbon dioxide. Over the past 12 years, the current nuclear fleet has prevented emissions into our air something like 8.7 metric tons of carbon dioxide, 47.2 million tons of sulfur dioxide, and 18.9 million tons of nitrogen oxide. These air pollution reductions equal lives saved.

A recent statement by the U.S. Department of Energy says that by the year 2030, America's demand for electricity will grow by some 25 percent. Nuclear energy is a viable, carbon-free option to help meet our growing electricity needs. In these times of increasing unemployment, it is important to remember that the nuclear industry provides good jobs for a highly skilled American work force.

A recent Clean and Safe Energy report projected that a nuclear renaissance would create about 38,000 nuclear manufacturing jobs in the United States. These will be good-paying jobs that could be filled by our soldiers coming back home from Iraq and from Afghanistan, or by Americans who have been recently laid off in our auto industry. In short, our Country needs nuclear power. And luckily, new nuclear power is on the way.

Over the past few years, my colleague and friend from Ohio, Senator Voinovich—who just celebrated a birthday yesterday—Senator Voinovich and I have worked closely, and he doesn't look any the worse for wear, I would say.

[Laughter.]

Senator CARPER. We have worked closely together in this Subcommittee to make the nuclear renaissance a reality, and a lot of other people worked with us. I believe we have made significant progress. Every day, we are getting closer to seeing a new generation of nuclear power in America.

The Nuclear Regulatory Commission, or the NRC, is now to receive nine license applications for the first reactors to be built in this Country, I believe in more than 30 years. And the Commission expects several more this year. It is expected that 34 new nuclear units may be built in the next 10 to 15 years.

In addition to these facilities, the current nuclear fleet has increased its capacity and is extending its lifetime through the Commission's renewable license process. Out of the 104 nuclear facilities currently in operation, the NRC has granted roughly half of them an operating extension of 20 years. The other half are expected to request similar extensions.

However, for the nuclear industry to be truly successful, one word is key. I know the commissioners can tell us what that word is, and that word is safety. Without a safe nuclear industry, there will be no nuclear industry. There will not be the reductions in SOx, NOx and mercury and CO2 that I talked about. There will not be the 38,000 plus manufacturing jobs that I talked about.

There will not be the reduction in our dependence on foreign oil that we discussed, or other fossil fuels.

We are only as strong as our weakest link. That is why today's examination of the Nuclear Regulatory Commission is so important.

We called this hearing to discuss the NRC's licensing and relicensing processes for both old and new nuclear power plants. We want to make certain that the NRC has the resources as well as the right tools and structures in place to continue to ensure nuclear safety. This includes making certain the NRC does not focus on one process and forget the other. Getting these processes right is crucial for the nuclear industry to move forward.

Having said that, I look forward to working with my colleagues, certainly Senator Voinovich, who helps to lead this Subcommittee and has for some time, and one of our previous leaders in the Subcommittee for many years, Senator Inhofe, who has joined us, and Senator Boxer and many others, to continue to ensure the safety of the nuclear industry.

Senator Voinovich.

[The prepared statement of Senator Carper follows:]

STATEMENT OF HON. THOMAS CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

At a time when Americans are facing high food and fuel prices, I believe today's hearing on the Renewable Fuel Standard is an especially timely topic. As many of you know, the Renewable Fuel Standard is within the Clean Air Act—and therefore under the jurisdiction of this Subcommittee. Although this is the first hearing in the Subcommittee on this issue—I assure you, it will not be the last.

First implemented in the 2005 Energy Policy Act and enhanced in the 2007 Energy Independence and Security Act, the Renewable Fuel Standard is intended to promote energy independence and protect the environment. The EPA must implement the Renewable Fuel Standard to meet both these objectives.

Of course, there are several other critical issues that must be carefully weighed when considering the effectiveness of the Renewable Fuel Standard. Increasing energy prices are already placing a strain on families across this Nation. In light of growing gas prices, there are a number of things I believe can be done that will reduce financial burdens as well as provide energy security:

1. I believe that oil and gas companies should drill for oil on the 68 million acres of land that Federal Government has provided. In addition, Congress has approved opening a 1.5 million acre section off the Gulf of Mexico to new drilling.
2. The lion's share of oil produced in the United States should stay in the United States. Most of our oil should be sold to Americans and consumed here, not shipped overseas.
3. Our nation must make a stronger commitment to reducing our energy demands through conservation and investments in renewable energy alternatives. I also believe we must develop advanced biofuels that reduce greenhouse gas emissions and do not divert crops from the food stream.

Increasing food prices have been blamed on biofuel mandates. From leaked reports to published studies, the impact of biofuel mandates and subsidies on rising commodity prices ranges from 3 percent to 75 percent. In truth, we don't know the exact impact on food costs. But we do know that technology is coming online that will enable us to produce the biofuels needed to support energy independence and reduce greenhouse gas emissions without impacting food prices.

We must evaluate any unintended consequences of the renewable fuel provisions. As academia, government and industry continue to research these effects, this subcommittee will maintain strong oversight.

Today, however, we will begin to review the methods the EPA will use to evaluate the greenhouse gas emissions of biofuels compared to traditional fuels. In addition, we will hear testimony about advancements in next generation biofuels. It is important that we take a close look at the State of new biofuels, which will be based on feed stocks of waste materials that are not competing with food sources.

I am excited about the investments and advancements DuPont is making in renewable fuels. And look forward to hearing about the results of the company's current pilot programs. We need to ensure that facilities to manufacture new biofuels and the infrastructure needed to deliver the products to the public will be in place to meet the established target of 20 billion gallons of advanced biofuels by 2022. The Renewable Fuel Standard makes these new biofuels technologies a viable choice for business.

Ultimately, the Renewable Fuel Standard must be implemented in a way that positively impacts the environment and economy. I believe this subcommittee must work together to make sure this happens.

I am grateful to all the witnesses here to today, and look forward to hearing your testimony.

STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR ROM THE STATE OF OHIO

Senator VOINOVICH. Thank you, Mr. Chairman. I really enjoyed working with you and Senator Inhofe on oversight of the Nuclear Regulatory Commission, and really appreciate the cooperation that we've received from the Chairman and members of the Commission. We dearly care about what you're doing and the impact it is having on our Country.

Mr. Chairman, I was back in Ohio over the Fourth of July weekend and talked with folks about high gas prices. They were very frustrated at the high cost of gasoline and angry that Congress does not seem to be doing anything about it. They told me about how the price of gasoline is seriously affecting their lives, from their ability to affordably commute to work, to take vacations with their family. And because energy prices are a form of regressive tax, it is affecting people who live on the financial edge the most. Our standard of living in many parts is going down in this Country because of the high cost of energy.

A recent report by the FBR Research estimates that Ohioans could spend 13.5 percent of their disposable personal income on gasoline, electricity and home heating during the next 12 months. Ohioans are contacting me daily with a clear message: increase our supply of oil and develop a comprehensive energy strategy. Our constituents want us to lead this Country out of this crisis. As a Nation, we must work to achieve energy independence, but we must do so in a way that balances our environmental objectives.

What we need is a rational attempt to create a bridge to a carbon-constrained world that will give us the time we need to develop technologies that will lead us to a cleaner, energy-independent future without destroying jobs and ruining our competitiveness during the transition. In this context, there is a growing realization that nuclear power must play an increasing role in our Country's energy mix. In his recent book, The Age of Turbulence, Adventures in a New World, Alan Greenspan writes that nuclear power is a major means to combat global warming, and its use should be avoided only if it constitutes a threat to life expectancy that outweighs the gains it could give us. By that criterion, he believes that we have significantly under-used nuclear power. I think that I don't have to remind folks that we do have 104 nuclear power plants operating today. They represent over 70 percent of the Nation's emission-free generation portfolio, avoiding annually 680 million tons of carbon dioxide, compared with 13 million tons for wind

and a half million tons for solar. That is a big, big reduction in carbon dioxide.

To be sure, we must have a greater efficiency, more demand side management and more renewable energy, all of which play a role in reducing the amount of carbon we emit. But renewable energy sources like solar and wind are intermittent and unreliable. The fact of the matter is that most of us know that we have to do a much better job in terms of increasing nuclear power in this Country.

It is interesting that the Lieberman-Warner bill, when EPA looked at it, said that in order to get the reductions that it anticipated, we would have to have a 150 percent increase in nuclear power by 2050. We are talking 150 new nuclear power plants. So what we are talking about here today is the license renewal process, and also the new licensing that is going to go on, it is so very, very important. I was very pleased to learn that our Committee's efforts have helped the NRC to attract and hire over 1,000 new employees since 2005, with a net gain of over 500 employees after attrition, mostly due to retirement. So you have looked forward to the human capital crisis that we have and are compensating for it.

While the NRC's new licensing process will be a significant improvement over the old process, a level of health and skepticism remains by virtue of the fact that the new process has not yet been tested. We want to find out how you folks think that you are doing.

Since 2003, we have had eight NRC oversight hearings and over a dozen meetings in my office with the NRC Chairman, and now Dale Klein. Senator Carper and I are continuing with these meetings since he took over the chairmanship of the Subcommittee. So I think all of you know this, that the two of us are dead serious about oversight. We care about what you are doing, every aspect of it. We had a nice meeting recently with Chairman Klein and laid out two or three things that the two of us working together can do to help you do your job better. So we are with you and we are anxious to hear from you.

Senator CARPER. Senator Voinovich, thank you very much.

We are going to bounce over to the Democratic side here, Senator Lautenberg, followed by Senator Craig. Senator Lautenberg, you are recognized at this time. Welcome.

STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR ROM THE STATE OF NEW JERSEY

Senator LAUTENBERG. Thanks very much, Mr. Chairman. Thank you for enabling me to participate in this Subcommittee hearing, even though I am not an official member. I am an official interested party, I can tell you.

First, it is critical to understand how essential nuclear power is to my State. In fact, about half the energy coming into New Jersey's homes and businesses is nuclear. I can't help but think about a time not too many years ago when nuclear was a dirty word. Now we face up to the reality of need and understand that nuclear certainly has a place and a position that will help us in other areas of energy resource.

But everyone understands, though nuclear is so important in supply in my State, safety is the largest factor. One can't help but

think back to a time when a couple of nuclear plants were built with billions of dollars invested and then abandoned because safety couldn't be guaranteed. We don't want that to happen.

So we will not trade safety for the sake of meeting our energy demands. And that is a, I think, in all candor, that we believe that these two requirements are available and should be pursued in the name of safety. We need to focus on the licensing and especially the relicensing process to make sure that we are not putting any plants back online that could put any communities in danger. The NRC, or the Nuclear Regulatory Commission, is tasked with overseeing this industry. Communities rely on the NRC to strictly enforce the rules, make sure that the plants are safe.

However, the NRC is currently not doing enough to follow the rules designed to protect the communities nearby nuclear power plants. Last year, the Nuclear Regulatory Commission's own Inspector General concluded that the Commission was not performing due diligence when it came to license renewals. In particular, the IG could not tell whether the NRC actually did its job to audit, review and verify the safety applications it received from the companies. In fact, I quote the Assistant Inspector General, he said that "The safety analysis was probably done, it is just that we don't have sufficient evidence to know whether it was or it wasn't done."

Mr. Chairman, probably is not good enough. The communities surrounding the Oyster Creek facility in New Jersey, the oldest operating nuclear plant in the United States, cannot rely on probabilities. The NRC must do better, the NRC has an obligation to conduct real oversight of the Nation's nuclear plants.

We also need the Commission to be more responsive to the needs and views of the public. New Jersey's residents have been forced to fight just to submit their views on the relicensing of Oyster Creek. And no one should have to fight that hard to make themselves heard when there is a nuclear facility in their back yard.

Mr. Chairman, energy is on everybody's minds these days. People are concerned about how they are going to pay for everything, from gas for their cars to electric bills for their homes. But we can't be rushed; we can't be hasty. We need for the NRC to do its job, put safety ahead of speed when it comes to licensing nuclear power plants. And we believe that the NRC has the capability to do that and urge it to do just that.

Thank you, Mr. Chairman.

Senator CARPER. Thank you, Senator Lautenberg.

Under the early bird rule, Senator Craig, you are next. Senator Inhofe has asked you to go ahead and speak next, and then we will go back to Senator Sanders and then to Senator Inhofe.

Senator Craig.

STATEMENT OF HON. LARRY E. CRAIG, U.S. SENATOR ROM THE STATE OF IDAHO

Senator CRAIG. Mr. Chairman, again, thank you for holding this hearing and allowing me to participate in it.

I appreciate the commissioners being with us. It is the first time as a commissioner that Kristine Svinicki is with us. She was with me a good number of years, working on these very issues. So she

brings to the Commission a variety of talents that I think you commissioners are finding are a great asset to your deliberations.

Mr. Chairman, I just returned from France and a week with the nuclear industry of France, in which a country now receives over 80 percent of its energy from nuclear. I went to a reprocessing plant, I watched a new reactor coming up out of the ground, literally, by construction. I went to a new fuel enrichment plant that is being built, a footprint of one of a kind that may be built in Idaho.

While I looked at the physicalness of all around me, most of my questions were about public confidence. Because in France today there is a high level of public confidence in their nuclear industry and in their generating capacity. They not only have a clean fuel, they are able to sell a clean fuel to many other countries in Western Europe.

Now, I have said that to the Chairman, I turned to the Commission. While I have heard the Chairman say and while I have heard Senator Lautenberg talk about safety, I see that as only one of three key ingredients to the success of a nuclear renaissance in this Country. Because a renaissance speaks about growth and revitalization, when in fact, our Country almost killed the nuclear industry. It was a near wipe out, prior to the Energy Policy Act of 2005, when we began to put in place procedure again that would allow the NRC to do certain things. And for our Country to realize, in a time when we wanted clean energy, that there was in fact a clean energy source out there, if we could do a variety of things to bring it back.

In fact, in this very room, we have debated climate change, and much of that debate was based on the ability to switch to a clean energy source, until the Committee found out, and members of the Committee found out that clean energy source might not be available or as readily available in a timely fashion in the way that we expected it to be.

Gee, we were going to build 10 or 15 plants just in the next few years. Not so, Mr. Chairman, not so at all. There are several factors if that is to happen in the next 20 years. And most of it, in part, rests right here with this Commission and these commissioners. Not only is safety a factor, but so is confidence. Confidence in the market, confidence in the financial community that what this Commission does, they do well, that safety is forefront. But it is also confidence that they can proceed in a timely fashion and deliver these plans to the street and these licenses to the street in a way that the marketplace can anticipate them with confidence.

The other side of it is a utility having certainty, certainty that the design that they are going to proceed with has the confidence of the market and the safety of public acceptance. So it isn't just one factor, Mr. Chairman, in my opinion. It is a multiple of at least three. It is confidence, it is certainty and it is safety.

How do you get confidence? Well, a major utility recently tried to site a new greenfield operation in Idaho. Mr. Chairman, a greenfield means it is not being sited near an existing reactor. It is a new site, a new reactor. And in my State of Idaho, there is reasonable confidence in the nuclear industry. It is probably a pretty good place to site.

They spent millions of dollars, location, water and walked away. The reason they walked away, because of the time line they were being told it would take to bring them to license.

Now, I understand where we are headed, and I understand the time it takes to re-gear, to employ, to build the confidence to do the right things. And I look at this chart, Mr. Chairman, and I see these time lines, way out to 2012 and 2013. And I think this represents maybe four reactor designs.

What I hope this Committee can achieve, Mr. Chairman, because I am not going to be here next year, or any year thereafter, but I hope you work very closely with this Commission and you work with them not just once a year but maybe twice a year, that you achieve a process and a procedure that has the public safety in mind, but the confidence of the market and the certainty for the utility industry that they have brought about at least three or four designs that are there on the shelves. They have been basically licensed as a design. And the responsibility beyond that then is the siting. It is the site of integrity: is it geologically sound? Does it meet the criteria? Does it satisfy the public? And this should all be done in a very open public process. Transparency is absolutely critical.

Senator Lautenberg said it, confidence, certainty, safety. All is a product of transparency and openness. That was the key thing I heard in France. When there was a question, they were open, they were public about all that they do over there. As a result, over the 20 years since we left the industry and they picked it up and took our technologies and moved them forward to where they are today, they have gained that level that we are now attempting to rebuild.

It is worth doing, Mr. Chairman. It is a great source of energy for our Country as baseload. We are going to build a lot of new energies. But this is the one that will fuel the plants, this is the one that will turn the lights on of industry. The rest will simply supplement.

So thank you for holding this hearing. I probably took a little too long. But I think for this Commission to understand our urgency, but our willingness to be duly diligent, as they will be in the future development of a "renaissance" industry, you have to get it right this time, and you can, and we know how to do it.

Thank you.

Senator CARPER. Thank you.

When I was, I think, a junior in high school, I took a driver's education course. Most of us in the room have taken a driver's education course. I was in Roanoke, Virginia. And we were coming back from our first day out with our driver's ed teacher, and it was one of those cars, I don't know what it was like for you, but my instructor sat to my right hand side, having a steering wheel and actually had an accelerator and brakes on his side of the car.

We were coming back in, pulling back into the lane of my high school, the drive-up lane. It was a new high school and the driveway was just being constructed. It was in gravel. As we turned in, I was probably going a little faster than I should have for my first time out. And I meant to put my foot on the brake and instead, as I made the turn onto the gravel drive, I depressed the accelerator, and sheer terror for the other students in the back seat.

Fortunately, my instructor had the brake, and immediately began applying the brake as I applied the accelerator.

I think as we look ahead to this licensing, new licensing process, we have probably one foot on the accelerator but one foot on the brake. And we may need both of them. But we need in the end to get this right, so if we are going to have the kind of confidence that you alluded to, we will be able to move forward.

Senator Bernie Sanders. Welcome, Senator Sanders, you are recognized.

STATEMENT OF HON. BERNARD SANDERS, U.S. SENATOR ROM THE STATE OF VERMONT

Senator SANDERS. Thank you, Mr. Chairman.

Perhaps I want to pick up on the issue of confidence, Senator Craig was talking about it, and maybe expressed it in a little bit different light. It is clear that public safety must be job No. 1 when it comes to nuclear power. But I must express serious concerns about the aging fleet of 104 nuclear power plants in this Country which, in my view, need much more oversight than they are currently getting before we talk about more nuclear power plants. In other words, we have to get it right today.

In fact, I would be willing to bet that most people in our Country would be disturbed to learn that the Federal oversight role of nuclear power plants in our Country is currently quite limited in scope. And they would be equally upset to learn that Federal regulators rely so heavily on information that they get from nuclear power plant operators as part of the whole deregulation effort that we have seen since Ronald Reagan. And some of the implications that we are seeing in some of our financial markets today I think apply to nuclear power as well.

I think that many people just don't know what is going on, and in my view, it is not what should be going on. But let me use, in my State, we have one nuclear power plant located in the southern part of the State, in Vernon. Let me use that just as an example to illustrate what I consider to be a failure of the NRC when it comes to oversight.

On August 21st, 2007, one of the cells of the cooling tower collapsed. I think we have a photograph of that somewhere, there it is. An interesting point is, and I don't want to alarm people, this was not a safety issue. This was not radioactive waste streaming out into a river. But that is the reality of what happened on August 21st, 2007.

Question: given that reality, was Energy fined? Did they pay any penalty for this glaring mistake, which was on the front pages of papers all over the State? How much did they pay? To the best of my knowledge, the answer is, they did not pay one nickel in a fine for that mishap. In fact, as I understand it, a "non-cited" violation was issued, which is the lowest level of citation.

Then on August 30th, 2007, a week later, there was an emergency shutdown involving stuck valves. And then just last Friday, just last Friday, on July 11th, there was another problem with the cooling towers. This time it is leaking pipes. I think we have another photograph here.

Again, I don't want to suggest to people that this was somehow a safety emergency. It is not. But this is again what took place in my State just last week. And the end result of that is, Senator Craig talks about confidence. Do you know what, Senator Craig? When people see this, and they find out that a company like Energy gets zero fine, confidence is not terribly high. Because common suggests that what we understand in this room, and I had the privilege yesterday of talking to both Commissioner Chairman Klein and Commissioner Jaczko, who made the point, and I understand it, these are not safety issues. I understand that. But you tell that to people that when this is going on, that a quarter of a mile away, you have extremely toxic waste, you know what? Peoples' confidence in the ability of that company to run that plant is not particularly high. You can spend the rest of your life saying, hey, don't worry about it, this is not a safety issue and people have concerns. And you know what? I share those concerns. It seems to me inexplicable that there are no fines attached to this lack of oversight.

As I mentioned last October, I happen to strongly believe that the NRC should broaden its oversight programs, whether it be by supplementing the reactor oversight process with independent assessments when called for by a State, similar to what I have called for in legislation S. 1008, or by some other means, so that we can assure the American public that the nuclear power plants that we have aren't being guarded by the foxes.

You want confidence? Then these guys are going to have to have the power to assure the American people that these plants are absolutely safe. What my legislation would allow is a Governor or public utility commission to request an independent safety assessment if they have a nuclear power plant in their State. If a State is in the emergency planning zone for a nuclear plant in the State next door, they certainly have an interest in these issues as well. That is why my legislation will allow them to make the same request.

Critical times at nuclear plants call for special inspections, both to ensure the public safety but also to boost public confidence. When a facility is seeing a power up-rate, as was recently approved for Vermont Yankee and other plants around the Country, that is a critical time. When a nuclear plant is seeking to get 20 more years of life in an aging facility, that is also a critical time. Or when a nuclear plant has had a history of safety problems, that is also a critical time.

These are the circumstances under which my legislation would allow for an independent safety assessment. So getting back to Senator Craig's point, you want confidence? Those are some of the things. This does not provoke confidence.

Let me just move on a little bit. Some of my friends talk about nuclear renaissance. I don't know, I don't know if anybody in this room does know what the future of nuclear power in this Country may or may not be. But I do know that we are grossly underestimating the significance of energy efficiency and renewable energy as we attempt to deal with the energy crisis that we currently face.

I could tell you that in my State, when I was mayor, we installed in my city of Burlington energy efficiency. And today, in Burlington, 20 years later, we are not using any more electricity than we did back then. And frankly, we can go a lot further. That is more or less true throughout the State of Vermont. So despite economic growth, if we are serious about energy efficiency, we can cut back a great deal on the use of electricity.

In terms of sustainable energy, I think the potential is just extraordinary. Just last week, I was out in Nevada looking at a thermal solar plant out there.

Senator CARPER. I am going to have to ask the Senator to wrap up. Go ahead and complete your thought.

Senator SANDERS. I would just suggest that there are people out there who think that within 15 years, 20 percent of the electricity can come from solar thermal plants alone, excluding photovoltaics, which also have tremendous potential.

Thank you, Mr. Chairman.

Senator CARPER. Senator Sanders, thank you very much for those thoughts.

Senator Inhofe, and then we have been joined by Senator Isakson.

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR ROM THE STATE OF OKLAHOMA

Senator INHOFE. Thank you, Mr. Chairman. Everyone always starts off by thanking you for having this hearing, but this time, I really mean it.

Senator CARPER. You mean you didn't mean it all those other times you said it?

[Laughter.]

Senator INHOFE. To hear you talk about the needs and the reality of where we are today and what we are going to have to do, I associate myself with all of your remarks and those of the Ranking Member, Senator Voinovich. I didn't realize until I heard your opening remarks reminding me that it was over 10 years ago that I became chairman of this Committee. I remember at that time we actually had Senator Voinovich, who was then Governor Voinovich, come down and testify. So a lot of time has gone by, and fortunately, some things are happening now.

But at that time, we had not had an oversight hearing of the NRC in over 10 years. And I suggest to you that you can't let any group, any entity in Government, any bureaucracy, go that period of time without having oversight. That is what we are supposed to be doing. So immediately after that, we started setting deadlines and good things started happening.

And by the way, you would think there would be a pushback from the bureaucracy. There wasn't. The chairman and every member said, we have been wanting to have oversight for a long period of time. Well, that time is here now.

So anyway, the U.S. electricity demand is projected to grow by 30 percent by 2030. And within the next 4 years, according to the North American Electric Reliability Council, six regions of our Country may not have adequate electricity supplies to ensure reliability. We need to have adequate, reliable and diverse energy sup-

ply to power this great Nation of ours. As has been said by everyone talking so far, all but one, anyway, nuclear is going to have to fill a great part of that.

It was one of you who mentioned that the 104 nuclear plants that we have that provide, it was Senator Voinovich, I guess, that provide 70 percent of the emission-free, as far as CO2 is concerned. But that is still only 20 percent of the whole mix. And now with the new president of France, I can say nice things about him, France has 80 percent. So I think a lot of good things are happening. We are moving in the right direction.

Last September, the NRC began to review licenses for new nuclear plants. This is a function the Commission has not performed since the 1970's, with a revised rule that has never been used before. The nature of the situation makes strong leadership by the Commission extremely important. I am concerned that the Commission is not providing the policy and schedule guidance necessary for this process to proceed smoothly.

In 2004, the hearing notice for the LES National Enrichment Facility included a detailed schedule with deadlines for staff to complete various task, and for completion of the hearing itself. The notice also directed the hearing boards to exclude certain issues from their consideration, issues that the Commission would address directly. Accordingly, the license was issued in 31 months, nearly exactly the amount of time that was expected in the original schedule, which was 30 months, despite never having previously issued a license for a uranium enrichment facility. With the LES review as an example of efficient decisionmaking, it begs the question of why the same approach is not being used for new plant licensing.

Hearing notices issued for the current license applications are generic and provide no such guidance or schedule. The NRC staff vaguely indicates 1 year for having the hearing process, but readily admits uncertainty about the time in the future. Certainty is something we have been talking about in these opening statements. Why the Commission is reluctant to ensure schedule discipline for including specific milestones in a hearing notice, I don't know.

Let me just say this. I really think streamlining is necessary. We can do a better job than we are doing now, but we are headed in the right direction. The other day we had what I thought was a rather thoughtful news conference by T. Boone Pickens, a person that I have been honored to know for a long period of time. He talks about, you have to keep in mind when we talk about energy, we are talking about two almost unassociated, but they are associated, problems. One is the energy crisis in America. We are going to have to have energy to operate this machine called America. The other is the No. 1 issue with Americans, the price of gas at the pump.

What he was doing was saying, by diverting, although I think that perhaps I would choose nuclear over the source he was talking about, that would free up natural gas. And with the technology we have right now, with liquified natural gas, with compressed natural gas, and the price varies from State to State, but the price in Oklahoma for liquified natural gas to run your car is 99 cents a gallon. So he is talking about the idea of freeing it up.

So it just seemed to me that this is the opportunity we have in using nuclear to free up some of the other sources until some of these really good things we look for in the future, the renewables and other opportunities become a reality, we can still bring the price down and do our job here in running this machine that we call America.

So I am just glad that this Committee is going to stay hitched on a bipartisan basis and make sure this gets done, Mr. Chairman.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE U.S. SENATOR FROM THE STATE OF OKLAHOMA

I commend Senators Carper and Voinovich for holding this hearing today, continuing the tradition of rigorous oversight that I started when I assumed the Chairmanship of this Subcommittee over 10 years ago. Back then, the nuclear industry was preparing to extend existing plant licenses and was very concerned about significant uncertainty in the process, particularly the time involved and the requirements necessary to receive the extension. Since then, as a result of strong oversight by this Subcommittee, almost half the fleet has been approved for an additional 20 years of operation. It is our job to ensure that the Commission is an efficient regulator, true to its mission of protecting public health and safety, but also able to issue sound decisions in a timely fashion.

U.S. electricity demand is projected to grow 30 percent by 2030. Within the next 4 years, according to the North American Electric Reliability Council, 6 regions of our country may not have adequate electricity supplies to ensure reliability. We need an adequate, reliable, and diverse energy supply to power this great nation of ours and nuclear energy is a vital component. New nuclear plants can't be built within the next 4 years, but we need to ensure that new plants are being developed promptly and safely, to meet our growing needs.

Last September, the NRC began to review licenses for new nuclear plants. This is a function the Commission has not performed since the 70's with a revised rule that has never been used before. The nature of this situation makes strong leadership by the Commission extremely important. I am concerned that the Commission is not providing the policy and schedule guidance necessary for this process to proceed smoothly.

In 2004, the hearing notice for the LES National Enrichment Facility included a detailed schedule with deadlines for staff to complete various tasks and for completion of the hearing itself. The notice also directed the hearing boards to exclude certain issues from their consideration, issues that the Commission would address directly. Accordingly, the license was issued in 31 months, nearly achieving the Commission's original schedule of 30 months, despite never having previously issued a license for a uranium enrichment facility. With the LES review as an example of efficient decisionmaking, it begs the question of why the same approach is not being used for new plant licensing.

Hearing notices issued for the current license applications are generic and provide no such guidance or schedule. NRC staff vaguely indicates 1 year for the hearing process but readily admits uncertainty about the timeframe. Why is the Commission reluctant to ensure schedule discipline by including specific milestones in hearing notices?

Furthermore, key policy questions remain. Will the Commission defer to State agencies on determinations of the need for power? Will the Commission require licensees to analyze alternative sites if they have chosen to add a new reactor to an existing site?

The lack of clear schedules and resolution of key issues will compound the growing pains that the Commission and the industry must wrestle with as we end our 30-year construction hiatus. These are complications we simply can't afford. The Commission's review of licenses for new nuclear plants must be as efficient as possible WITHOUT compromising safety. Keeping the lights on is fundamental to our nation's energy security and the NRC will undoubtedly play a critical role.

Senator CARPER. Thank you, Senator Inhofe.

Senator Isakson, welcome.

STATEMENT OF HON. JOHNNY ISAKSON, U.S. SENATOR ROM THE STATE OF GEORGIA

Senator ISAKSON. Thank you very much, Senator Carper. I echo what Senator Inhofe said, thank you very much, this is a very important and timely hearing.

I will be very brief in the interest of hearing from the commissioners, except to make one statement and pose one question I hope you will give us a response to in your allotted time.

I am one of those that subscribes to the belief that the solution to America's energy problem lies in a myriad of products, one of which is nuclear. Others are solar, others are wind, others are synthetic, others are clean coal. You can't just pick one favorite and say it is the magic bullet.

But there is no question in my mind that without a robust nuclear energy program for electric energy, we can never get to where we need to get in terms of reducing carbon and having reliable energy at an affordable rate for the people of the United States of America. To that end, the Nuclear Regulatory Commission is in the cross-hairs at an interesting time and a propitious time. You have received and are getting ready to receive a number of applications. The nuclear renaissance that hopefully will happen in the United States is going to be triggered by your actions in terms of the processing time and the byproduct of that processing.

It is critical that you have the resources. So in your remarks, I hope you will address this question. First question, do you have the resources to meet the demands of these two processes that we see in front of us, of the pending and soon to come applications for licensing, No. 1 and No. 2, can you do it in a timely but reliable and absolutely committed to safety process? The questions that Senator Sanders raised with regard to safety are appropriate questions. And the Nuclear Regulatory Commission is the key to ensuring that the confidence of the public is absolutely 100 percent in this process, so we can really have a nuclear renaissance in this Country that makes a meaningful difference in our current energy dilemma. I will appreciate your addressing that in your remarks when you get a chance.

Thank you, Mr. Chairman.

Senator CARPER. Thank you. And Senator Voinovich wanted to add a comment. Please proceed.

Senator VOINOVICH. I would just like to comment in terms of the issue of safety. We had a real problem at Davis-Besse in the State of Ohio. We had several hearings on that. There were lessons learned for the industry and there were lessons learned for the Nuclear Regulatory Commission. And we have continued to followup on that to make sure that those lessons really were learned.

I would also like to point out that the Nuclear Energy Institute, NEI, really is concerned about safety. Because they know if something happens that it is a reflection on the entire industry, particularly at a time when we are talking about more nuclear power facilities. And last but not least, the Institute of Nuclear Power Operations, INPO, an industry organization itself, from what I understand, they put each of these management operations through the grinder to make sure they are doing the job that should be done.

So the public should know that we are spending a lot of time on oversight, and that some of these independent organizations really do care about safety and the reputation of the nuclear industry. Thank you.

And I would like to introduce, if you wouldn't mind, a paper that was published in Nuclear News, from the American Nuclear Society. It is one that I put together called Making the Nuclear Renaissance a Reality, which gets into all the various things we have to do if we expect to be successful when launching it.

Thank you, Mr. Chairman.

Senator CARPER. Thank you. Without objection, it will be entered into the record.

[The referenced information follows:]

Perspective

As seen in the March 2008 issue of **Nuclear News**
A publication of the American Nuclear Society

Making the nuclear renaissance a reality

BY GEORGE V. VOINOVICH

Ohio's senior senator elaborates on support from Capitol Hill for nuclear power's growth.

IN SEPTEMBER, FOR the first time in over 30 years, a license application to build a new nuclear power plant was filed with the Nuclear Regulatory Commission. Three more applications soon followed. The NRC expects to receive 18 more applications within the next two years for a total of more than 30 new reactors. Although no applicant has yet made a firm commitment to build, a number of them have made significant investments, such as ordering long-lead construction items. Internationally, the resurgence seems to be moving at a faster pace. According to the International Atomic Energy Agency, there are 34 reactors in various stages of construction in 14 countries.

The underlying political climate for nuclear power has changed over the past several years, influenced by a confluence of factors: the growing demand for electricity, sharp increases in the prices of natural gas and oil, and the increased emphasis on clean energy. Recent government policies, such as the Energy Policy Act of 2005, have certainly helped in stimulating private sector investment for new nuclear as part of a portfolio of "environmentally clean" energy projects. At the state level, legislation has passed or is being considered in Georgia, Iowa, Wisconsin, Florida, Virginia, Kansas, South Carolina, and Texas recognizing the value of a diverse energy portfolio that includes new nuclear plants. These factors have created an environment in which nuclear has once again emerged as a viable (perhaps one of only a few) energy source for baseload generating capacity.

Currently, 50 percent of our electricity comes from coal, 19 percent from nuclear, 19 percent from natural gas, 9 percent from renewable sources such as hydro, solar, and wind, and 3 percent from oil. Of these, coal and nuclear (with average capacity factor of about 90 percent) have been the backbone of baseload generating capacity, since they are capable of providing a steady flow of power to the grid at low cost and high efficiency. Solar and wind power plants produce electricity only when conditions are right; when the sun sets or the wind calms, their output drops, regardless of the demand for electricity. Natural gas power plants are too expensive to run as baseload plants due to volatility in natural gas prices.

According to the Energy Information Agency, U.S. electricity consumption is projected to grow from 3821 billion kilowatt-hours in 2005 to 5478 billion kilowatt-hours by 2030, an increase of more than 43 percent. To be sure, we must have greater efficiency, more demand-side management, and more renewable energy, but we must also have clean coal and nuclear generating capacity to sustain our $11-trillion-a-year economy. With increasing environmental constraints, particularly the desire for caps on carbon emissions, expanding nuclear's share of baseload seems logical. The 104 nuclear power plants operating today represent over 70 percent of the nation's emission-free generation portfolio, avoiding 681 million metric tons of CO_2, compared with 13.1 million tons for wind and 0.5 million tons for solar.

George V. Voinovich (R., Ohio) was elected to the U.S. Senate in 1998 and is now Ohio's senior senator. He was chairman of the Senate Subcommittee on Clean Air and Nuclear Safety from 2003 to 2006, and is now the ranking member. Before his election to the Senate, he served as governor of Ohio from 1990 to 1998, and as mayor of Cleveland from 1979 to 1988.

So it is no accident that there is a growing realization among environmentalists, scientists, the media, think tanks, and policymakers that nuclear power must play an important role in harmonizing the country's need for energy independence, economic competitiveness, and a healthy environment. Sen. Barbara Boxer (D., Calif.), chairwoman of the Environment and Public Works Committee, recently stated: "I am a pragmatist. The vast majority of the members on my committee support nuclear power, and so do the majority in the Senate. . . . I don't think there is any question that we are going to be seeing new plants." Patrick Moore, one of the founders of Greenpeace, also caused a stir last year when he declared that "nuclear energy is the only large-scale, cost-effective energy source that can reduce emissions while continuing to satisfy a growing demand for power . . . and these days it can do so safely." They have come to a similar conclusion: If we are to meet the growing electricity needs in this country and also address global climate change, nuclear power has a crucial role to play.

Despite these positive developments, a number of formidable challenges to realizing a nuclear renaissance remain, particularly in the areas of regulatory uncertainty, financing, availability of human capital, expansion of the domestic supply chain infrastructure, and nuclear waste management. I intend to take steps, together with other stakeholders, to turn these challenges into opportunities. My hope is that these steps will serve as a road map to making the nuclear renaissance a reality.

Regulatory uncertainty

Processing 22 or more new plant license applications concurrently on schedule in a thorough manner will be a monumental challenge for the NRC, which has not seen this type of major licensing action in the past 25 years or so. That is why as chairman of the Senate Environment and Public Works Committee's Subcommittee on Clean Air and Nuclear Safety between 2003 and 2006, and now as ranking member, I have focused a great deal of time and effort on making sure that the NRC is gearing up to meet this challenge and avoid a bottleneck. My management philosophy since my days as mayor of Cleveland and governor of Ohio hasn't changed: Place the right people to run the agencies and departments, provide them with the resources and tools necessary to do their jobs effectively and efficiently, and then hold them accountable for results.

Together with Sen. Tom Carper (D., Del.) and Sen. Jim Inhofe (R., Okla.), I introduced a number of bills—the Nuclear Fees Reauthorization Act of 2005 (S. 858), the Nuclear Safety and Security Act of 2005 (S. 864), and the Price-Anderson Amendments Act of 2005 (S. 865)—to provide the NRC with what it needs in terms of legislative reforms, human capital, and other resources

to do its job effectively and efficiently. These pieces of legislation were enacted into law as part of the Energy Policy Act of 2005. Among other things, these bills authorized the NRC to take innovative steps to attract both young talent and retired experts to address the agency's anticipated shortages in technical capabilities.

The NRC's licensing process has been completely overhauled. All regulatory approvals are now received up front based on a completed plant design, before construction starts and significant capital is placed at risk. Under the old process, repeated construction delays and massive cost overruns were common as applicants struggled to stay ahead of evolving regulatory requirements and design changes. The old process required two separate permits—one to begin construction of the plant, and one to operate it—allowing multiple opportunities for delay. Some multibillion-dollar facilities stood idle for years while licensing proceedings ground slowly to completion. The new process requires only a single combined construction and operating license (COL) for both functions. There are opportunities for public participation in the new process, but most of those occur before construction begins, when such participation is most productive.

While the new licensing process is a significant improvement over the old process, a level of healthy skepticism remains by virtue of the fact that the new process has not yet been tested. Given the complexities involved, it is perfectly reasonable to expect some wrinkles during the NRC's review of the first few applications under the new process. In my view, the level of success and certainty in the process will depend in large part on the discipline with which the process is implemented by both the NRC and the applicants.

Finally, and perhaps most important, the composition and the stability of the commission will be more critical than ever before. Senator Carper and I will work with the administration and the Senate leadership to ensure that future appointees have a balanced and objective view regarding nuclear power and its role in harmonizing the country's need for energy independence, economic competitiveness, and a healthy environment.

Financing

The nuclear industry's major financing challenge is the cost of new baseload nuclear power plants relative to the size of the companies that must make those investments. Unregulated generating companies and regulated integrated utilities represent different business models, and those differences influence how these companies approach nuclear plant financing. Regulated companies expect to finance nuclear plants in the same way they finance all major capital projects, with state regulatory approval and reasonable assurance of investment recovery through approved rate charges. These companies must know—before construction begins—that their investment in a new nuclear plant is judged prudent and can be recovered. Unregulated companies rely on debt financing with a highly leveraged capital structure. Since the estimated cost of a new nuclear plant ($5 billion to $6 billion) is a significant fraction of the company's assets, it is in effect a bet-the-company decision.

To help overcome these obstacles, the Energy Policy Act of 2005 provides key incentives for investments in new nuclear plants: a production tax credit of $18 per megawatt-hour for the first 6000 megawatts of new nuclear capacity; regulatory risk insurance against delays in commercial operation caused by licensing or litigation for up to $500 million for the first two plants and $250 million for the next four; and loan guarantees up to 80 percent of the cost of projects, such as nuclear plants, that reduce emissions. While the production tax credit certainly improves the financial attractiveness of a project during its commercial operation, and regulatory risk insurance provides a safety net in case of regulatory delays, it is the loan guarantee provision that makes the difference for unregulated companies in deciding whether or not to build. Properly implemented, this loan guarantee program allows unregulated companies building nuclear plants to employ a more leveraged capital structure at reduced financing costs, which then benefits consumers through lower rates for the price of electricity.

I have worked hard to make the loan guarantee program perform as Congress intended in the Energy Policy Act of 2005—that is, to attract sufficient private capital at low cost. In addition to meeting with key administration officials, including then Office of Management and Budget Director Rob Portman and Energy Secretary Sam Bodman, in 2007 I introduced the Voinovich-Carper-Inhofe Amendment (SA-1575) to the Energy Bill (H.R. 6) to allow loan guarantees of 100 percent of the loan amount for capital-intensive projects such as nuclear and clean coal, provided that the borrower pays for the loan subsidy costs. Although this amendment did not make it into the final version of the Energy Bill, the administration recently issued a final rule that in effect adopts the intent of the Voinovich-Carper-Inhofe amendment.

I have also been working with the Senate appropriators to increase the fiscal year 2008 cap on the aggregated value of the guaranteed loans. On June 15, together with Senators Carper and Inhofe, I sent a letter to the appropriators urging them to increase the cap from $9 billion (as called for in the president's budget) to an amount sufficient to cover all qualified and worthy energy projects, including new nuclear, clean coal, renewable energy, and energy efficiency projects. The appropriators responded by increasing the cap to $38.5 billion, with $18.5 billion for new nuclear, $6 billion for clean coal–based power generation and gasification plants that incorporate carbon capture and sequestration, $2 billion for advanced coal gasification, $10 billion for renewable energy, and $2 billion for a uranium enrichment facility.

Another critical factor for the successful implementation of the loan guarantee program is a transparent methodology for calculating the credit subsidy cost to be paid by project sponsors. Such costs should be reasonable and commercially viable. I will continue to work with my Senate colleagues and the administration to make sure the loan guarantee program is working the way it is intended to work. The need for government-sponsored investment incentives should be only temporary. Once it is shown that new plants can be built to schedule and budget, the sector will take care of itself. I don't want to create a ward of the state, but rather to overcome initial hurdles and nurture a sector that makes economic and policy sense on its own.

Human capital and job opportunities

Senator Carper and I recently held a nuclear energy roundtable with representatives from organized labor, industry, academia, professional societies, and government agencies. The roundtable was very productive as it raised an awareness of the impending shortage of the skilled workers needed to support the nuclear renaissance. Government, industry, and labor efforts in the development of a skilled workforce must be coordinated in order to align with anticipated investment in new plants. Each new nuclear plant will require 1400–1800 workers during construction, with peak employment of as many as 2300 workers. Skilled tradesmen in welding, pipefitting, masonry, carpentry, sheet metal, and heavy equipment operations—among others—all stand to benefit. If the industry were to construct the 30 reactors that are currently projected, 43 400 to 55 800 workers would be required during construction, with peak employment of up to 71 300 workers. Everyone at the roundtable agreed that the construction of more than 30 new reactors over the next 15 to 20 years could present an enormous challenge for the nuclear industry.

The roundtable resulted in a number of recommendations to turn this challenge into an opportunity, including the following: (1) use recent retirees as instructors, mentors, and advisors; (2) provide more flexibility to a younger generation of workers; (3) invest in building a pipeline of future workers by front-loading recruitment

and training—the philosophy of "just-in-time" inventory does not work with human capital; (4) identify all existing public and private-sector training programs, and then leverage and fund those that are successful (e.g., Helmets to Hardhats and the Building Construction Trade Department's training program); and (5) provide adequate and consistent funding in science and technology for universities and colleges.

Successful follow-through on these suggestions requires a collaborative effort from the federal and state governments, industry, organized labor, and academia. Congress has demonstrated leadership in addressing some of these workforce challenges. The recently enacted America Competes Act establishes a solid policy framework for addressing the science, technology, engineering, and math workforce challenges identified in the National Academies' report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Sen. Jeff Bingaman (D., N.M.) and I fought to restore federal funding to support nuclear science and engineering programs at universities across the country in FY 2007 and FY 2008.

Senator Carper and I are planning a follow-up roundtable in mid-2008 to align investment and workforce development initiatives to ensure the collaboration and coordination of government, industry, and labor efforts in developing the energy-related skilled work force, and to solicit input on legislative support.

Expanding the domestic manufacturing base

In the three decades since the last nuclear plant was ordered and the two decades since the bulk of the nuclear plant construction was completed in the United States, the nuclear design, manufacturing, and construction industry has significantly declined. The leading U.S. firms have either ceased operation, consolidated, or become subsidiaries of non-U.S. parent companies. The companies that remain have survived by retrofitting and maintaining existing U.S. plants.

Initially, it will not be possible to manufacture all of the major plant components required of new nuclear plants in the United States. Successfully bringing the planned 30 or more new nuclear reactors on line, however, requires the reestablishment of the construction and component supply industries, as well as the supplier network needed to support those industries—from the steam generators and reactor vessel heads to the thousands of valves, pumps, heat exchangers, and other parts used in a nuclear plant. The potential for growth in the manufacturing sector and manufacturing jobs to support the construction of 30 new nuclear plants is staggering.

I am a strong advocate for government policies that encourage private-sector investment in the manufacturing of various components and pieces of equipment for the energy sector. This includes the nuclear industry, as well as other energy technologies the nation will need, such as carbon capture and sequestration. The United States has long been a leader in innovation and advanced manufacturing. We need to promote policies that take advantage of the growth of our energy sector and of American ingenuity, productivity, and entrepreneurship by encouraging the manufacturing industries that will support future energy development to produce their products in the United States.

I introduced the Voinovich-Carper-Inhofe Amendment (SA-1683) to the Energy Bill (H.R. 6) to make American-manufactured nuclear components, parts, and service-related jobs available to foreign markets. The support of our House colleagues—Chairman John Dingell (D., Mich.) and Ranking Member Joe Barton (R., Tex.) of the House Energy and Commerce Committee—was instrumental in getting this piece of legislation passed and signed into law. This legislation is anticipated to spur growth in U.S. manufacturing for new international commercial nuclear power plants, create highly skilled jobs across the United States, and provide

American companies and workers access to foreign markets that have long been dominated by foreign competitors.

Managing nuclear waste

The U.S. high-level radioactive waste management program under the Department of Energy has faced several challenges for many years. First, a redirection of the program has occurred with every change in administration. Second, a majority of the Nuclear Waste Fund revenues are consistently applied to support congressional budgetary priorities rather than their intended purposes. Third, the annual appropriations process provides for ongoing opportunities for those opposed to the direction of the program to interfere with its success.

At the time the Nuclear Waste Policy Act was signed into law in 1982, the direct disposal of spent fuel as a national policy was established on the premise that the existing fleet of nuclear plants would operate only through their initial 40-year license and then be retired, with no new plants being built. This was during the post–Three Mile Island accident era, when nearly 100 planned nuclear plants were canceled. Today, the story is vastly different, with most nuclear plants likely to extend their operating lives to at least 60 years. Also, there may be as many as 30 new nuclear power plants planned in the next 15 to 20 years.

I held a subcommittee hearing in September 2006 to examine both short- and long-term options for the nuclear waste issue. One of the options discussed was a program to determine whether the reprocessing of spent nuclear fuel should be adopted in some form, rather than the current policy of direct disposal. Through reprocessing, uranium and plutonium recovered from spent fuel can be recycled into new fuel. Reprocessing also serves to significantly reduce the volume of material requiring geologic disposal. Reprocessing technology has been used on a commercial scale for many years in a number of countries. The renewed interest in an expanded role for nuclear power in the climate change debate further emphasizes the importance of reexamining U.S. policies related to the nuclear fuel cycle. I believe we should not remain solely fixated on a waste solution that was designed for a different day.

Another idea presented at the hearing involves long-term interim storage perhaps complementing a spent fuel recycling program. While permanent disposal at Yucca Mountain or a similar facility remains a long-term imperative, the combination of short-term on-site storage and longer-term interim storage of spent fuel gives us time to complete the technology development needed to safely and securely recycle spent nuclear fuel.

Senator Carper and I plan to hold a roundtable to solicit input from various stakeholders to help us develop a legislative proposal with the following objectives in mind: (1) implement an accountable and sustainable governance structure to execute the federal government's responsibilities under the Nuclear Waste Policy Act; (2) enable the investigation of recycling spent nuclear fuel with appropriate consideration of safety, nuclear proliferation, environmental, energy supply, and economic factors; and (3) ensure that the fees paid into the Nuclear Waste Fund are applied for their intended purpose—i.e., the disposal of radioactive wastes produced by the generation of electricity from nuclear power—in a manner insulated from political influences.

I believe that the safe and secure growth of nuclear energy is essential if we are to harmonize the country's need for energy independence, economic competitiveness, and a healthy environment. Nuclear power is growing in the world, and our own energy needs can serve as a springboard to rebuild U.S. technology and manufacturing capabilities to something approaching the leadership the nation once enjoyed, contributing to foreign markets as well as supporting our own. I intend to work with my colleagues in the Senate to build bipartisan support and leadership for making the nuclear renaissance a reality. NN

Senator CARPER. We said our piece, and we will have some questions here in a few minutes. Chairman Klein, you are recognized for 5 minutes, each of your colleagues for 2 minutes. Try to stick roughly within those time constraints.

So far, no votes have been ordered, so it looks like for this panel we have clear sailing. Chairman Klein, you are recognized, please proceed. Your entire statement will be made part of the record, as you know, and you are welcome to summarize. Thank you.

STATEMENT OF HON. DALE E. KLEIN, CHAIRMAN, NUCLEAR REGULATORY COMMISSION

Mr. KLEIN. Good morning, Chairman Carper and Senator Voinovich and distinguished members of the Subcommittee. We thank you for inviting us here today to talk about the activities that we have underway on the new reactor licensing and the license renewal process.

As indicated previously, I would certainly like to acknowledge Commissioner Svinicki as a new member of our Commission. We certainly welcome not only her technical expertise but also her knowledge of the Senate in terms of how it conducts its business will help our communication as well.

I would like to thank you for your continuing support for the NRC's activities. Because of your leadership and support, the NRC has successfully made the transition from preparing for new reactor technical reviews to actually doing them. At the same time, we remain focused on our top priority, and that is the safety and security of our existing licensees.

Let me begin with a few words about the power uprates and license renewals. As of June 2008, the NRC has approved 119 power uprates which have added the generating capacity of about 5 new nuclear units. In addition, over half of the current fleet of operating reactors have received or are in the process of applying for license renewals.

As you know, a plant's initial 40-year license can be renewed for an additional 20 years if technical and safety requirements are met. An NRC Office of the Inspector General report issued last September examined the effectiveness of the NRC's license renewal safety reviews. While it was generally positive, the OIG identified a number of areas for improvement, and we are responding to those suggestions. Let me assure you, the continued safety and security of all the operating reactors in the U.S. is of utmost concern to the NRC.

Now let me turn to the case of the new reactors. The Congress has provided the NRC with the resources needed to successfully complete significant new reactor licensing activities. To date, we are on schedule. However, significant challenges remain. One involves the streamlined licensing process that was established under the so-called Part 52 rule. This assumes that applicants will be referencing NRC-certified designs in their applications and that the NRC will receive complete and high quality COL applications.

To date, we have received 9 COL applications for 15 units. But only one of these five designs currently being referenced is a certified design, and it is only referenced in one COL application. This

is for the Advanced Boiling Water Reactor at the South Texas project.

In addition, the design certification applications and some COL applications initially lacked information that the staff needs to complete its review, while others are modifying their applications. The result is that the early COL applications are unlikely to achieve the complete benefits that the Part 52 process had intended.

We are of course working with our stakeholders to overcome these challenges, and we hope that the streamlining that was envisioned in Part 52 can be realized as we complete the initial COLs and we finalize the design certifications of these reactors.

Based on the energy information that is submitted by the industry, we expect to receive 11 more applications for 16 more units by the end of 2009. But while there are challenges, I want to emphasize that the NRC is strategically positioned to be ready for these new reactor licensings and the associated workload. We created the Office of New Reactors, or NRO, to handle the agency's activities. The office was aggressively staffed, and as Senator Voinovich indicated, we have hired a significant number of individuals. The New Reactor Office has over 425 individuals.

With NRO in the lead, the NRC has taken great strides to prepare for the new reactor licensing challenges. In my written testimony, there is more detail given on these activities.

Let me conclude by touching on two points. First, it has been suggested that there is not enough opportunity for public participation, both in the COL application and the license renewal process. We have provided you some handouts and we have provided charts that also show in fact, that there are significant opportunities for public participation, and we encourage that public participation. Not only does this occur at the COL stage, but it also occurs at the early site permit and the design certification stages, and it is also true in the entire license renewal process.

Second, the GAO recently did an audit of the NRC's readiness to conduct the reviews of the COL applications. It was generally positive. It acknowledges our existing preparation and the quality of our plans. As I noted in a letter to you, Senator Carper, on December 31st, the GAO identified four recommendations and we are addressing those concerns and issues as well.

While we are satisfied that we have in place a stable, efficient regulatory process, the Commission is always looking for ways it can improve. As we have heard Senator Carper say a few times, if it isn't perfect, make it better.

I ask that my written testimony be entered into the record, and we look forward to the opportunity to have questions, keeping in mind that my general counsel is sitting behind me, and she reminds me that there are certain renewal activities that we will not be permitted to go into great detail, because the commissioners will be in an adjudicatory role.

Thank you very much.

[The prepared statement of Mr. Klein follows:]

STATEMENT
BY DALE E. KLEIN, CHAIRMAN
UNITED STATES NUCLEAR REGULATORY COMMISSION
TO THE
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
ON
NEW REACTOR LICENSING AND LICENSE RENEWAL

July 16, 2008

Good morning Chairman Carper, Senator Voinovich, and distinguished members of the Subcommittee. I want to thank you for inviting Commissioner Jaczko, Commissioner Lyons, Commissioner Svinicki and me to appear before you today to discuss license renewals and new reactor licensing. I would also like to take a moment to thank you, Mr. Chairman, Senator Voinovich, and the other members of the Subcommittee, for your continuing support of the NRC's activities. Because of your leadership and support, the NRC stands ready today to handle the emerging new reactor workload. I am pleased to report to you that NRC has successfully made the transition from preparing to actual performance of new reactor technical reviews. More importantly, your help has assisted us in making this transition while maintaining our focus on the agency's top priority – ensuring the safety and security of our existing licensees.

Let me begin with the subject of power uprates and license renewals.

U.S. utilities have applied for power uprates since the 1970s as a way to generate more electricity from their nuclear plants. As of June 2008, the NRC has approved 119 power uprates, resulting in a gain of approximately 5,430 MWe at existing plants. Collectively, these uprates have added generating capacity at existing plants that is equivalent to about five new nuclear power plants. Applicants for uprates totaling more than 2,500 MWe are under review or expected in the near future.

In the eight years since the first license was renewed for Calvert Cliffs, over half (65 of 104) of the current fleet of operating reactors have received or are in the process of applying for

license renewals. The Atomic Energy Act limits the initial term of a nuclear reactor operating license to 40 years. However, because the initial term was based on economic and antitrust considerations, not technical limitations, the regulations allow a license to be renewed for an additional 20 years if technical and safety requirements are met. Through technical research and analysis, NRC has concluded that licensees can and have implemented effective aging management programs and therefore this provides reasonable assurance that plants will continue to operate in accordance with their current licensing basis for the period of extended operations.

An NRC Office of the Inspector General (OIG) report issued in September of 2007 examined the effectiveness of NRC's license renewal safety reviews. The OIG concluded that the NRC has developed a comprehensive review process to evaluate applications for renewed licenses. The OIG, however, identified a number of areas for improvement. In response, the NRC staff is updating report-writing guidance, enhancing the report review process, and otherwise establishing additional guidance and management controls on the conduct and depth of the reviews.

In a May 2008 memorandum following the September report, the OIG examined the review process as applied to four license renewal applications and two aging management programs for each of those facilities. The results of this additional OIG review indicate that the NRC staff's license renewal reviews are, in fact, quite extensive. The OIG observed that the NRC safety review process included technical reviews in NRC headquarters and the use of on-site audits of supporting documentation, the results of which are incorporated in the NRC staff's safety evaluation reports. Although the OIG found that the staff does not obtain copies of all applicant documents reviewed during on-site audits and reviewers typically do not retain their "working papers," the audit reports indicated that the staff reviewed approximately 280 applicant documents on average during each audit. OIG's analysis of work hour data indicated that the staff spent approximately 10,582 hours per reactor unit review.

Pending before the Commission are petitions to suspend four license renewal adjudicatory proceedings on the basis of the September OIG report and the May follow-up memorandum. The Commission is currently deliberating on these petitions. The Commission will issue its decision in a memorandum and order for these four adjudicatory dockets. Therefore, I am limited in what I may say about these issues and in particular the arguments presented in those petitions.

Let me assure you that the continued safety and security of all of the operating reactors in the U.S. is of utmost importance to the NRC regardless of the age of the reactor. This focus on safety and security holds true in the NRC's license renewal program. Plants that are approved to operate for an additional 20 years beyond their original 40 year license will be required to maintain the same level of safe and secure operation throughout the extended license period.

Now let me address the subject of new reactors.

The Congress has provided the NRC with the resources needed to meet the growing interest in additional nuclear energy in our country. These resources have enabled the NRC to successfully complete significant new reactor licensing activities, to date, on schedule; however, significant challenges remain.

The new licensing process (as detailed in 10 CFR Part 52) was designed to enable an effective and predictable licensing process. In establishing Part 52, the NRC provided for a detailed technical review of safety and environmental issues before authorizing construction. In addition, the licensing process provides for timely and meaningful public participation. The NRC created this process to provide both applicants and the public with the opportunity to resolve site and design issues before construction.

The potential benefits from the Part 52 process are predicated on two important assumptions: 1) applicants will be referencing NRC-certified designs in their Combined License (COL) applications, and 2) the NRC will receive complete and high quality COL applications for

review. Both are necessary to maximize the benefits of the new licensing process and enable an effective and predictable licensing process to be implemented. The Part 52 requirements are designed to provide a predictable licensing process, and resolve safety and environmental issues before authorizing construction; are structured to encourage standardization of nuclear plant designs; and are intended to reduce financial risk to nuclear plant licensees, allow limited work to be authorized before COL issuance, and optimize public participation. However, so far, only one of the five designs currently being referenced in the COL applications -- the Advanced Boiling Water Reactor -- is a certified design and is only referenced in one COL application. In addition, the design certification applications and some COL applications received to date initially lacked information that the staff needs to complete its review. Our reviews have been further complicated because some applicants are revising submission dates and submitting modifications to their applications, often with late notice to the staff, which is disruptive to the work planning process. The result of these problems is that the early COL applications are unlikely to achieve the full benefits of the Part 52 process. We are, of course, working with stakeholders to overcome these challenges. As this process matures, we seek continued support of Congress and this Subcommittee to support and sustain the continued successful execution of the NRC's mission.

I would like to focus my comments briefly on where we are today, and what we expect down the road in new reactor licensing.

The NRC has strategically positioned itself to be ready to respond to new reactor licensing workload. To meet the growing need, the Commission created the Office of New Reactors, or NRO, to lead the agency effort to establish the regulatory and organizational foundation necessary to safely meet the new reactor licensing demand. The office was aggressively staffed, and today has over 425 employees. To ensure our readiness to handle the new reactor workload, we have developed a qualification program for all technical and

project management staff. Each staff member is required to achieve the certification for their position by meeting the requirements of the associated qualification program.

With NRO in the lead, the NRC has taken great strides to prepare for the new reactor licensing challenge:

- We published a revised 10 CFR Part 52 (titled, "Licenses, Certifications, and Approvals for Nuclear Power Plants") last August to clarify the applicability of various requirements to each of the licensing processes and to enhance regulatory effectiveness and efficiency in implementing the licensing and approval processes. We also incorporated lessons learned from our reviews of the first design certification and early site permit applications.
- Similarly, we published a final rule on Limited Work Authorizations, or LWAs, which supplements the final rule on 10 CFR Part 52. This rule revised the regulations applicable to LWAs, which allow certain pre-construction activities on production and utilization facilities to commence before a construction permit or combined license is issued. The final rule specifies the scope of construction activities that may be performed under an LWA, as well as specifying those activities that no longer require NRC approval, and changes the review and approval process for LWA requests. Like the Part 52 revision, these changes were adopted to enhance the efficiency of the licensing and approval process and to more clearly reflect NRC's authority with no compromise to safety.
- In March 2007, we completed the first comprehensive update to the NRC's Standard Review Plan (SRP), which provides guidance to the staff on how to perform technical reviews. The update brought the SRP into conformance with the Part 52 revision, and extends the applicability of the SRP to the Part 52 licensing process.

- We issued guidance for applicants and NRC staff. For instance, we issued a new regulatory guide, RG 1.206 (titled, "Combined License Applications for Nuclear Power Plants"), which provides guidance to potential applicants on standard format and content of new reactor combined license applications. We also recently issued draft guidance for applicants on complying with the LWA rule.
- We've implemented an Enterprise Project Management Solution, a server based software which significantly enhances NRO's ability to plan and schedule work.
- In 2004, we promulgated substantially revised rules of practice intended to streamline and make more effective our hearing process.
- We promulgated an electronic filing rule that should further increase the efficiency of our hearing process.
- We created a new reactor construction inspection office in our Region II Office in Atlanta, Georgia. The new construction staff has performed inspections and observed new construction activities in China, Finland, France, Japan, Korea, and at Browns Ferry Unit 1 and Watts Bar Unit 2 in the United States.
- And finally, we are working on a "lean six sigma" project to streamline the design certification rulemaking process to increase its efficiency.

With these activities, I think that the NRC has established the regulatory foundation necessary to review new reactor license applications, and has positioned itself to respond to the incoming new reactor workload.

I should also mention that consistent with its lead responsibility for offsite nuclear emergency planning and response, the Federal Emergency Management Agency (FEMA) continues to support the NRC's ongoing application reviews by providing timely input to ensure that the offsite emergency plans will be an effective element of licensees' overall defense-in-depth strategy.

In addition to our preparations for the incoming workload that I just described, we have already made significant progress in our new reactor licensing activities. Just to mention a few highlights, we have completed the review of three early site permit applications, and we are proceeding with the review of the fourth application for Southern Nuclear's Vogtle site.

For design certifications, we are continuing our review of General Electric's Economic Simplified Boiling Water Reactor, commonly referred to as the ESBWR. We are currently evaluating schedule impacts of supplemental information recently submitted by the applicant. We have also recently completed acceptance reviews for three additional designs (Areva Nuclear Power's U.S. Evolutionary Power Reactor, or U.S. EPR; Mitsubishi's U.S. Advanced Pressurized Water Reactor, or US-APWR; and an amendment to Westinghouse's AP1000 design certification) and have begun detailed technical reviews of these applications.

With regard to COLs, we have received 9 applications for 15 units. As I noted earlier, however, we are experiencing some significant challenges in this area.

For the Next-Generation Nuclear Plant, or NGNP, the NRC and DOE are currently on target to deliver the licensing strategy to the Congress by August 2008, as required by the Energy Policy Act of 2005. To implement this strategy, however, the NRC will require additional resources beginning in Fiscal Year 2009 and continuing through Fiscal Year 2017.

I should mention that in addition to our new reactor activities, the NRC also completed extensive licensing efforts and authorized the restart of Tennessee Valley Authority's (TVA's) Browns Ferry Unit 1 nuclear power plant on May 15, 2007. This 1065 MWe unit – shutdown in 1985 to address performance and management issues – resumed commercial operation and began generating power to the grid on June 2, 2007. This authorization required substantial effort and review by NRC licensing and inspection staff.

While we have accomplished a great deal so far, the toughest part is yet to come. Based on industry information submitted to the NRC, we are expecting to receive 11 more applications for 16 more units by the end of 2009. This will bring our projected total workload for

new reactors to 20 COL applications for 31 units by the end of 2009. In addition, I should note that the TVA has recently decided to complete construction of Watts Bar Unit 2 using the original 10 CFR Part 50 licensing process. When you consider the COL workload combined with the three design certifications, the design certification amendment for the AP1000, the Watts Bar Unit 2 construction, and the Vogtle Early Site Permit currently under review by the staff, you can see that we have a significant challenge over the next several years in the area of new reactors. Additionally, many of the early applications will be entering the most substantial and resource intensive portions of their review – and adjudication – during this period.

I would like to touch briefly on the GAO's recent audit of the NRC's readiness to conduct reviews of COL applications. In general, the GAO's findings were positive assessments, acknowledging our extensive preparations and the quality of our plans. The NRC continues to believe that the GAO assessments provide useful insights to the agency's management. As I noted in my letter to you, Senator Carper, on December 31, 2007, the GAO identified four recommendations. I am pleased to report to you that the NRC has completed its work in response to these recommendations.

We are building upon our experience, including lessons learned during the construction of the current operating fleet. There are numerous historical lessons that have provided insights related to quality and oversight problems during the previous period of construction in the United States, as well as current insights from our international partners. The most important of these is that regardless of the licensing process and the type of construction, a commitment to quality, instilled early in a nuclear construction project, is important to ensure that the facility is constructed and will operate in conformance with its license and the NRC's regulations. We are working with the industry to ensure that a strong commitment to quality is part of the foundation of every new reactor project.

We are also working with our international partners through the Multi-national Design Evaluation Program (MDEP) to leverage their experience in licensing and constructing two EPR

plants in Europe to assist the NRC in its review of the US EPR. We are also working towards establishing agreements with international partners on cooperation on licensing reviews of proposed AP1000 reactors in the U.S. and abroad.

Our preparations for licensing new reactors include the development and implementation of a new Construction and Vendor Inspection Program. The program is utilizing enhanced international cooperation to assist the NRC's oversight of component manufacturing. NRC inspectors are visiting vendor facilities in many other countries, as I mentioned earlier. Quality assurance (QA) inspections of engineering and site activities are contributing to our ability to conduct effective reviews of design certifications, COLs and early site permit applications. We have endeavored to obtain a wide range of stakeholder involvement, and to make construction and vendor inspection a timely, accurate and transparent process.

While we are satisfied that we have in place a stable, efficient regulatory process, the Commission is always looking for ways to improve. Further enhancements could take place with the enactment of legislation. The Commission recently submitted to Congress proposed legislation which would eliminate the requirement for the Commission to conduct uncontested hearings. Under current law the Commission is required to hold a hearing on each application for a construction permit or a combined construction permit and operating license for a reactor, even if no person has requested a hearing or been granted intervention. The Commission has concluded that there is very little added value in holding uncontested hearings and that the Commission's resources could be better utilized. Just as industry can become more efficient, the NRC is working to improve its efficiency with no compromise in safety. We are implementing a variety of measures, including Lean Six Sigma management principles.

Once again, I would like to thank the members of this Subcommittee for their support. With your help, the NRC worked to prepare for the new reactor review activities in a timely and effective manner. As I noted earlier, increased resources are needed in the future (Fiscal Year 2009 and beyond) to support the Next Generation Nuclear Plant program. If DOE and other

parties demonstrate a strong interest in advanced non-light water reactors, we will work closely with this subcommittee and the Congress to address the resource needs for those efforts.

Responses by Dale M. Klein to Additional Questions
from Senator Boxer

QUESTION 1. The NRC Inspector General (IG) mentioned in his written testimony that NRC teams are prohibited by their management from removing licensee documents from the licensee's site, which makes it difficult for license review staff to write their reports. Why does the NRC prohibit license reviewers from temporarily taking documents from a facility? I understand NRC regional inspectors are allowed to remove documents from a facility during a license renewal inspection, why not the license renewal staff?

ANSWER:

The Inspector General found that when the teams go out to audit the information they have reviewed in the application to confirm that the programs and information are accurate, they do not necessarily bring back copies of the information with them, but may refer to their notes.

The license renewal staff is working with the inspection program staff and the Office of the General Counsel to develop consistent guidance for removal of licensee documents from the licensee's site and has committed to update the guidance by September 30, 2008.

QUESTION 2. According to the IG report, NRC does not, as standard practice, require staff to preserve copies of all licensee documents reviewed onsite or their own working papers and inspector notes as a permanent record. Why doesn't NRC require inspectors to keep records?

ANSWER.

All NRC Staff are subject to the agency's document retention guidelines set forth in Management Directive 3.53, "NRC Records and Document Management Program," which in turn conforms to the requirements described in regulations promulgated by the National Archives and Records Administration, found at 36 C.F.R. pt. Part 1222. As observed by the Inspector General in his report, the management directive describes situations where disposal of certain working papers used by individual staff reviewers is permissible, as well as situations where working papers are considered "agency records" that must be retained. For example, licensee documents that contain substantive information necessary to understand an agency decision, beyond that which is documented in an official agency report or other document, should be retained as an official agency record.

The Inspector General report did not find that staff reviewers failed to comply with the applicable management directive in disposing of notes at the conclusion of their review of the license renewal application.

QUESTION 3. One of the witnesses on the second panel mentioned in his written testimony that the NRC does not require a public hearing for plant license renewal unless a contention is fillied and admitted by the NRC's Atomic Safety and Licensing Board. If you feel it is important to have mandatory public hearings for new plant licenses, why not for license renewals?

ANSWER.

The NRC conducts mandatory, uncontested hearings for new plant licenses because Section 189 of the Atomic Energy Act requires such hearings for construction permits. But the Act does not require such hearings for any other reactor licensing action, including operating licenses and license renewals.

The NRC, in a letter dated June 9, 2008, proposed draft bill language to Congress that would remove the requirement for mandatory, uncontested hearings on construction permits from the Act, because the purposes of such hearings are being met in other ways, both legally mandated and voluntarily undertaken.

Fifty years ago, the unusual practice of adjudicatory hearings in which no issues were being contested was thought to contribute to open government and public confidence because the Atomic Energy Commission, which regulated nuclear power before the NRC was issuing construction permits without prior notice to the public and was basing construction permit decisions on reactor safety evaluations that were likewise not public. Furthermore, none of the current federal openness statutes – the Freedom of Information Act (FOIA), the Government in the Sunshine Act (GSA), and the Federal Advisory Committee Act (FACA) – had become law, there was not yet any public process as the National Environmental Policy Act provides for

analyzing environmental impacts, and there was no Web-based access to the NRC's voluminous documentation of its standards and actions. Perhaps most important, the Atomic Energy Commission was both regulator and promoter of nuclear power.

In light of the present circumstances, the Commission believes that it is no longer necessary to have adjudicatory hearings in which no issues are being contested. In the absence of such uncontested hearings, the agency staff would continue to prepare a safety analysis report and an environmental statement on each license application, the Advisory Committee on Reactor Safeguards would continue to provide an independent assessment of each power reactor application, and persons whose interests were affected could petition to have a hearing on specific matters.

QUESTION 4. What is the NRC doing to ensure that its technical review of license applications are consistent, thorough, and that reviewers maintain the supporting documentation that led to the agency's decision?

ANSWER.

The NRC has a comprehensive review process for evaluating license renewal applications. In response to the Inspector General's report identifying areas where improvements are needed, the NRC staff is updating its report-writing guidance, quality assurance procedures for reports, establishing management controls to standardize conduct and depth of the reviews with respect to licensee operating experience, revising its post-license renewal inspection procedures, and clarifying the guidance for removal of relevant licensee documents from licensee's facilities.

QUESTION 5A. During license renewal, why doesn't the NRC look at terrorist threats or other issues which would not have been considered when a plant was first constructed?

ANSWER.

This question relates to ongoing litigation in which the NRC is involved. In the United States Court of Appeals for the Third Circuit, the NRC is defending an adjudicatory decision not to consider the environmental consequences of a terrorist attack when renewing reactor licenses (*New Jersey Dept of Environmental Protection v. NRC*, No. 07-2271). In the United States Court of Appeals for the Second Circuit, the NRC is defending its denial of a rulemaking petition asking the agency to expand the scope of license renewal to include ongoing operational safety issues, such as emergency planning, and not confine its review to "aging" issues (*Spano v. NRC*, No. 07-0324).

These matters involve complex legal arguments that are set forth in the NRC's briefs. The cases remain before the courts and have not yet been orally argued or decided. It is thus not appropriate in this response to discuss the contested issues in detail. I will say however that I remain convinced that the best use of limited NRC resources is to focus on monitoring and controlling aging of safety-important plant components through the license extension period and to devote our remaining resources to ensuring that day-to-day operations of the nuclear facilities are safe and secure. Restated, problems affecting the safety and security of the operating reactors, including terrorism, are addressed in real time and do not await license renewal review for resolution.

QUESTION 5.(B). Shouldn't the NRC evaluate whether or not the safety and security of a particular plant could be substantially improved, bringing it up at least to the standards set for new plants?

ANSWER.

The Commission engages in a large number of regulatory activities, including research, inspections, investigations, evaluations of operating experience, and regulatory actions to resolve identified issues. The Commission's activities may result in changes to the licensing basis if the requirements of the Backfit Rule (10 CFR 50.109) are met. In this way, the Commission's consideration of new information provides ongoing assurance that the licensing basis for all nuclear power plants provides an acceptable level of safety. This regulatory process continues through the term of a renewed license and ensures that licensees maintain an acceptable level of safety. Once the NRC issues a renewed license, the licensee is required for the period of extended operation to maintain the level of safe and secure operations required under the renewed license.

The NRC has reviewed current requirements for physical protection and determined that they provide adequate assurance that public health and safety will be maintained. This same level of protection will be maintained during the renewal term. The NRC requirements regarding the physical protection of plants and materials is continually reviewed and updated to incorporate new information, as necessary. Further, the NRC continually inspects, conducts force-on-force exercises, and reviews licensee actions to ensure that all licensees maintain the physical protection of the plant in a manner that protects public health and safety.

QUESTION 6. When we see cooling towers collapsing and leaking at Vermont Yankee, and security guards asleep at Peach Bottom, it raises concerns about the safety and security of our nuclear plants. What is the NRC doing to ensure they are not renewing licenses for plants that are not meeting current safety or security standards?

ANSWER.

The license renewal process focuses on managing the adverse effects of aging of safety-important plant components and a review of the potential impacts to the environment. Day to day safety and security issues are addressed on an ongoing basis under the active operating license and are part of the ongoing regulatory oversight program known as the Reactor Oversight Process (ROP).

The NRC continuously oversees and assesses plant performance under the ROP, which is a flexible process that focuses inspections on those activities or areas that are risk significant (i.e., important to plant safety based on each plant's unique design). The ROP has a built-in protocol that increases the level of scrutiny to focus on elements of a licensee's performance that appear to be declining commensurate with the significance of the performance issues. This process focuses on three key strategic performance areas: reactor safety, radiation safety, and safeguards, which for the purposes of answering your question can be equated to security standards. Satisfactory licensee performance in these areas provides reasonable assurance that the facility is being operated in a safe and secure manner.

Response by Dale M. Klein to an Additional Question
from Senator Carper

QUESTION 1. What plan is the NRC implementing to ensure the relicensing process is transparent?

ANSWER.

Public participation is an important part of the license renewal process. There are a number of opportunities for members of the public to question how equipment aging will be managed during the period of extended operation. Information provided by the licensee and NRC documents are made available to the public in a variety of ways. Licensee and NRC documents are available to the public in the NRC's Public Document Room and in its Agencywide Documents Access and Management System. The licensee's application and the NRC's safety evaluation report and supplemental environmental impact statement are also available on the NRC license renewal website (www.nrc.gov/NRC/REACTOR/LR/index.html). The NRC places a copy of the licensee's application in local libraries to ensure the public in the vicinity of a power plant has access to it. The NRC publishes evaluations, findings, and recommendations when they are completed.

The NRC holds many public meetings as part of the license renewal process. Shortly after the NRC receives a renewal application, a public meeting is normally held near the nuclear power plant to provide the public information about the license renewal process and opportunities for public involvement, and to solicit input on the scope of NRC's environmental review. Additional public meetings are held by the NRC during the review of the renewal application. In addition, the licensee's application and the staff's safety evaluation report are reviewed by the Advisory Committee on Reactor Safeguards (ACRS), an independent group of technical experts, and their review is discussed during public meetings. All public meetings are posted on NRC's Web site, with key ones being announced in press releases and in the *Federal Register*.

Concerns may be litigated in an adjudicatory hearing if any party that would be adversely affected requests a hearing. In addition, members of the public may petition the Commission during the period of extended operation of the plant for consideration of issues other than the management of the effects of aging.

The NRC has issued generic guidance documents for the use of the NRC staff and other stakeholders related to the review of applications for license renewal. These guidance documents are publicly available. The principal purpose of the generic guidance documents is to assure quality and uniformity of staff reviews and to present a well-defined base from which to evaluate applicant programs and activities for the period of extended operation. These documents also provide the public with an understanding of how the NRC staff reviews license renewal applications.

Responses by Dale M. Klein to Additional Questions
from Senator Inhofe

QUESTION 1. In GAO's September 2007 report on the NRC's new reactor licensing process, one of the recommendations was the development and implementation of criteria for setting priorities to allocate resources. In an NRC letter to this Committee dated March 28, 2008, the Commission indicated that it considers this recommendation closed. In the hearing, Chairman Klein testified that a Continuing Resolution, if in effect until February, would impact license renewals, power uprates, and new reactor reviews. Does the Commission have a clear, objective set of criteria for prioritizing resources, or is this matter left to the discretion of the Resource Management Board? If the agency has such criteria, please provide a copy.

ANSWER.

In order for the Commission to prioritize the workload under a potential Continuing Resolution (CR), it uses an established process to evaluate the impact of not providing a full year's funding for specific NRC programs, e.g., work that is mission critical, work that may be delayed without significant impacts, and internal and external factors which may influence the workload.

For new reactor reviews, the Office of New Reactors established an internal Resource Management Board which monitors resources and workloads. In the event there are insufficient resources to conduct new reactor reviews, including the impacts of a Continuing Resolution, the Resource Management Board would make recommendations on the prioritization of the work in accordance with Commission's process and direction to the NRC staff.

With respect to objective criteria established to enable resource allocation for new reactor reviews, the Commission issued Staff Requirements memorandum "Staff Requirements –

SECY-06-0187, Semiannual Update of the Status of New Reactor Licensing Activities and Future Planning for New Reactors" which delineated criteria the staff should consider when making resource allocations and schedule decisions. A copy of that memorandum is attached.

QUESTION 2. In the hearing, Commissioner Jaczko testified that the NRC may not be able to docket new applications while operating under a Continuing Resolution since agencies are generally prohibited from engaging in new activities during the time that the Continuing Resolution is in effect. Since the NRC signs contracts with applicants for the review of license applications, would these contracts constitute "new activities" that would be prohibited under a Continuing Resolution? Does the NRC have any precedence for this situation?

ANSWER.

Recent Continuing Resolutions have prohibited spending funds on new "projects or activities" or "new programs." This would include the utilization of staff, obligation of contractual support, or incurrence of travel expenses to support such programs, projects or activities. For example, the FY 2008 Continuing Resolution stated that appropriations shall not "be used to initiate or resume any project or activity for which appropriations, funds, or other authority were not available during fiscal year 2007".

The prohibition on new spending generally does not apply when the program was something the agency during the previous year had spent money on or was authorized to spend money on. Congress for several years has appropriated funds for NRC's program of reviewing new reactor license applications. Therefore, while certain particular contracts or work orders to support new reactor review activity may not occur until the next fiscal year, the agency's program and activity of preparing for new reactor application reviews has been well under way prior to the new fiscal year, and the agency has already spent appropriated funds on this activity. Therefore, NRC may obligate funds during a FY 2009 CR to start work on a new Combined License (COL)

application. The new COL application would be a continuation of NRC's existing new reactor licensing activity.

Additional examples where the agency could initiate specific new work under a CR are new reactor design certifications and the Next Generation Nuclear Plant (NGNP). The NRC has existing authority to review and certify new reactor designs. This authority is not linked to a particular specific design and the NRC would be authorized to begin design certification review work for a new design while operating under a CR. NRC has been performing NGNP activities, as described in Section 644 of the Energy Policy Act of 2005, since the effective date of that statute. Therefore, NRC may continue to perform NGNP activities during a CR.

It should be noted that the NRC does not sign contracts with applicants for the review of new reactor license applications. However, the agency does enter into contracts to support the licensing reviews. These contracts do not constitute "new activities" that would be prohibited under a CR.

QUESTION 3. In the hearing, Commissioner Lyons indicated that the potential funding shortfall for the review of DOE's repository license application would severely impact the NRC's ability to meet its statutory review schedule. If the NRC receives only $37.3 million for FY 2009, what impacts will that have on the review?

ANSWER.

The NRC projects that a budget of $37.3 million for FY 2009, will not allow the Commission to meet the timeline of 3 to 4 years for deciding whether to issue a construction authorization as specified in the Nuclear Waste Policy Act (NWPA), as amended. It is estimated that this funding level will impact the Commission's ability to meet this deadline, delaying this decision by at least three years. Impacts to the review will be decreased if Congress appropriates sufficient additional funding in FY 2009 for the program. The impact of the lower funding level will depend on the level of resources and how soon resources are appropriated for the program. Assuming increased funding in FY 2010 and beyond, the NRC might be able to make a construction authorization decision at the end of FY 2014 (6 years from receipt of the license application); depending on the quality and completeness of the application, the DOE's ability to address NRC staff's questions in a timely manner and, of course, the technical soundness of the application.

A Continuing Resolution in FY 2009 will further exacerbate the potential delay in the review schedule. If a Continuing Resolution remains in effect throughout the year, the program will have to reduce its resources by an additional 20 percent in FY 2009.

QUESTION 4. Please provide a list of all potential federal permits outside the NRC's jurisdiction that may be required for construction of a new nuclear plant. Please indicate which ones may require development of an EIS.

ANSWER

Because of dissimilarities in features and issues each site may differ in terms of specific required permits. As outlined in NRC regulatory guidance, each applicant for a Combined License (COL) is expected to provide, in its Environmental Report, a complete list of all the authorizations, permits, and certifications that will be needed. Specific examples are publicly available in COL applications on the NRC's new reactor webpages. The federal permits and consultations may include the following:

- In most cases, COL applicants will need permits from the U.S. Army Corps of Engineers under the Federal Water Pollution Control Act (Clean Water Act) and the Rivers and Harbors Act. The Corps and Council on Environmental Quality have determined that these permits require an Environmental Impact Statement (EIS).

- COL applicants need permits under the Federal Clean Water Act and the Clean Air Act. The U.S. Environmental Protection Agency (EPA) has delegated the authority for these permits to all but a few States.

- Except for unusual circumstances, the NRC staff does not believe permits or authorizations will be needed from other Federal agencies. Nevertheless, NRC consults with other Federal and State agencies as appropriate including the following:

- The NRC consults with Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) on any threatened and endangered (T&E) species under the Endangered Species Act

- Implementation of the National Historic Preservation Act is overseen by the American Council on Historic Preservation; however, the NRC consultation process is conducted with the State or Tribal Historic Preservation Office (SHPO or THPO) (State or Tribal officials) as part of the National Environmental Policy Act (NEPA) process.

- In addition to Clean Water and Clean Air Act delegations to States, certification under the Coastal Zone Management Act has been delegated to State governments.

- Consultation with the Federal Energy Regulatory Commission (FERC) may be necessary because of the routing of transmission lines across state lines or the presence of a FERC-regulated hydropower facility on the same water resource that would be used by a nuclear power plant.

- Consultation with the National Park Service may be necessary because transmission line routing could traverse a National Park or activities or structures could affect the public's enjoyment of the Park.

- Consultation with the Department of Homeland Security concerning security of new reactor sites as required by EPAct 2005

QUESTION 4A. Does the NRC's EIS process develop the information necessary to support issuance of these federal permits?

ANSWER.

Where it is appropriate to do so, the NRC plans to work with other Federal agencies to include information in the NRC's EIS that either will or can be used by other agencies if they also have permitting authority. For some Federal actions, the NRC does not have the authority to grant approval for an activity (for example, dredging), but may account for the indirect or cumulative environmental impacts because the activity is related to the overall project. For those projects where the NRC and one or more sister Federal agencies cooperate on a single EIS, the information necessary to support each agency's action (e.g., issuance of a permit) will be included in the EIS.

QUESTION 4B: Does the NRC have Memoranda of Understanding developed with each of the relevant agencies?

ANSWER.

The NRC has a 1975 Memorandum of Understanding (MOU) with the Army Corps of Engineers (ACE). NRC and ACE staffs are meeting to coordinate Federal activities on COL applications and are developing a revised MOU. This updated MOU will provide a framework for the ACE to be a cooperating agency with the NRC as the lead Federal agency on specific COL applications to support issuing required ACE permits. The NRC staff believes that the update to the MOU and the cooperative agreement can (1) provide the necessary documentation to support NRC licensing decisions as well as ACE permitting decisions and (2) facilitate the construction schedules for COL applicants by allowing the ACE to issue permits soon after the final EIS is issued by the NRC. Without cooperation on a single EIS, the ACE may need to take additional time to develop the necessary documentation to issue its permits.

NRC also has a 1975 MOU with EPA. The NRC staff has met with EPA headquarters and regional staffs to discuss interactions in the review of COL applications and the EPA's Section 309 review of NRC EISs. Neither NRC nor EPA has determined that the MOU needs to be updated at this time. The NRC also routinely consults with FWS, NMFS, and SHPO and other federal and state agencies as appropriate. The NRC does not plan to pursue additional MOUs with these Federal and State agencies at this time.

QUESTION 5. Is a Construction and Operating License (COL) application required to reference a certified design or design certification application?

ANSWER.

No. As allowed by NRC regulations, applicants can submit a combined license (COL) application that does not reference a certified design or a design certification (DC) application. The design certification process supports the Commission's desire for increased plant standardization since it provides safety advantages while maximizing regulatory review efficiency. The NRC has encouraged, but does not require, the use of the design certification process.

QUESTION 5 (A). If a COL review is essentially complete but references a design whose certification rulemaking is pending, wouldn't mechanisms such as license conditions or a custom design allow the NRC to issue the COL prior to finalization of the design certification rule?

ANSWER.

A license condition would not be a viable mechanism in this circumstance. In order to issue a COL, all safety and environmental findings related to the specific application must be resolved. A license condition may not be used to defer completion of the staff's safety or environmental review to a later date. Because the safety findings related to the standard design are resolved through the design certification rulemaking, which in this case would occur at some future date, the COL could not be issued with a license condition that allowed these findings to be made after the COL was issued.

It would be possible, although probably not practicable, for a COL applicant to revise its application from referencing a pending certification rulemaking to change to a custom COL review. In this case the applicant would need to revise its existing application by providing all design information necessary to grant a COL. A supplemental notice of hearing would have to be issued. This would allow the full scope of the design to be subject to hearing, eliminating one of the key benefits of Part 52; - finality of the standard design information achieved through a design certification rulemaking. Although such an approach is possible, it is probably not practicable as the time required for the applicant to revise its application, for the NRC staff to conduct the necessary review, and for the potentially expanded scope of the hearing will likely exceed the time necessary to conclude the pending design certification rulemaking.

QUESTION 5 (B). If not, wouldn't such a situation be inconsistent with the Congressional goal of avoiding unnecessary regulatory delays as evidenced by the Standby Support provision in the Energy Policy Act of 2005?

ANSWER.

The NRC is currently conducting reviews of four reactor designs and expects to complete them in time to support the associated combined license applications assuming that all required information needed to support the reviews is received in a timely manner. A COL applicant may decide to reference a design which has not yet been certified, but they must also accept any business risk associated with making this decision.

In fact, NRC's regulations specifically state that, "An applicant for a construction permit or a combined license may, at its own risk, reference in its application a design for which a design certification application has been docketed but not granted." 10 CFR 52.55(a)

QUESTION 6 (A). Of the eight complete COL applications that have been filed, only half appear to have been docketed within 60 days of submittal to the NRC. Is 60 days inadequate for the staff to conduct a docketing review?

ANSWER.

Sixty days is adequate for the staff to conduct its acceptance review. An additional two weeks is provided in our scheduling process to complete the docketing process. Several challenges outside of the staff's control perturbed the acceptance of the first few applications. These included difficulty in loading the application into the NRC's Agencywide Documents Access and Management System (ADAMS) computer system and allowing applicants additional time to supplement their application with required information such that the staff would not have to reject the application if the 60-day limit were rigidly enforced.

Except for the first few applications, the staff has completed its acceptance reviews and communicated its decision to the applicant within 60 days.

QUESTION 6 (B). When was the regulatory guide for the docketing process issued?

ANSWER.

Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)", which provides guidance to applicants in preparing the COL application was issued in June 2007. The staff also issued an office instruction (OI), NRO-REG-100, "Acceptance Review Process for Design Certification and Combined License Applications," which provides staff guidance on conducting reviews based on lessons learned from the South Texas Project acceptance review. In addition, the OI provides guidance to the staff in conducting acceptance reviews for design certifications, combined license applications referencing a design certification being reviewed in parallel, and subsequent combined license applications.

QUESTION 6 (C). Did any of the applicants revise their submission date and, if so, how much advance notice did the NRC receive?

ANSWER.

Yes, applicants have revised their submission dates. Advance notice periods from applicants have ranged from greater than 180 days to significantly less than the 90 days the staff requested in Regulatory Information Summary (RIS) 2008-01, "Process for Scheduling Acceptance Reviews Based on Notification of Applicant Submission Dates for Early Site Permits, Combined Licenses, and Design Certifications and Process for Determining Budget Needs for Fiscal Year 2010." RIS 2008-01 states that the NRC's expectation is that applicants will declare in writing their expected submission date no later than 90 days ahead of its arrival. This expectation is consistent with what the staff has communicated to the Design Centered Working Groups throughout 2007.

QUESTION 7. Why hasn't the Commission included policy guidance in its COL hearing notices similar to the LES hearing order? Is the Commission confident that resolution of generic policy issues will not become a critical path for any applicants?

ANSWER.

The Commission does not believe that additional policy guidance is needed. The regulatory infrastructure for nuclear power plant licensing is well developed. In 2007, in anticipation of receiving multiple combined license applications, the NRC completed a large scale revision of its regulations and associated guidance documents to clarify and streamline regulatory requirements and review guidance. This revision included changes to safety and security regulations, and environmental requirements. Earlier, in 2004, there were major changes to hearing procedures. Currently, there are additional ongoing rulemakings regarding security plan and design requirements. With these revisions to the NRC's regulatory requirements and review guidance, the Commission believes that the NRC's regulatory process for COLS is well defined. In addition, in April 2008, after considering public comment on a draft policy statement, the Commission issued its Final Policy Statement on the Conduct of New Reactor Licensing Proceedings, which announced the Commission's policy for applying the existing agency Rules of Practice to new reactor licensing proceedings.

Furthermore, the Commission directed the NRC staff to evaluate whether there were any generic policy issues that could best be addressed through rulemaking. The NRC staff informed the Commission that it found no issues that could be more efficiently and timely addressed through rulemaking at this time, but that the staff would continue to evaluate generic policy issues based on experience gained with the first COL applications.

QUESTION 7(A). To what extent will the Commission defer "need for power" determinations to state regulatory bodies and regional transmission organizations?

ANSWER.

Whenever possible the NRC staff will defer the need for power analyses to a state regulatory body or regional transmission organization, independent of the applicant. The analysis needs to be systematic, comprehensive, subject to confirmation, and responsive to forecasting uncertainty (NUREG-1555, Environmental Standard Review Plan Sections 8.2.1 and 8.2.2). However, based on discussions with combined license applicants and States, NRC found that in some cases neither the State nor any other organization will be performing such an independent evaluation. In addition, in some cases in which an independent evaluation will be performed, the evaluation may not be available because it will not be performed until some time after the NRC EIS is completed. In cases such as these, the NRC will address the need for power.

QUESTION 7(B). For applications to construct new reactors at sites with existing units, does the NRC plan to require consideration of alternate sites under NEPA absent an indication of new and significant information that calls into question the NRC's prior determination that the site was acceptable?

ANSWER.

The National Environmental Policy Act (NEPA) requires consideration and evaluation of alternative sites. The NRC staff plans to consider information from previous or ongoing environmental reviews, however, alternative site analyses for the current operating plants were conducted over 30 years ago. As evidenced with the COL applications tendered, much has changed with respect to the designs contemplated, the environmental settings at the proposed and potential alternative sites, and the influence of human activities on the environment during the intervening decades. The NRC staff does not believe that attempting to use a review process based solely on the identification of new and significant information would be useful for combined license applications; however, NRC staff will consider information from the original analyses to the extent practicable.

QUESTION 7(C). For applications to construct new reactors at sites with existing units, does the NRC intend to limit consideration of emergency planning issues to those issues uniquely resulting from the addition of the new unit?

ANSWER.

In general, if an application is for an additional reactor at an operating reactor site, and the application proposes to incorporate and extend elements of the existing emergency planning program to the new reactor (including by reference), those existing elements should be considered acceptable and adequate. The review will focus on the extension of the existing program to the new reactor, and will determine whether the incorporated emergency planning program information from the existing reactor site (1) is applicable to the proposed reactor, (2) is up-to-date when the application is submitted, and (3) reflects use of the site for construction of a new reactor (or reactors) and appropriately incorporates the new reactor(s) into the existing plan.

QUESTION 7.(D). How does the Commission plan to address contentions that challenge the cost of building a new plant based on the basis of historical cost overruns?

ANSWER.

Regardless of the subject matter of a contention, to meet the admissibility standards in the NRC rules of procedure, a potential intervenor must identify a specific issue concerning a deficiency in the application that is material to the findings that the NRC must make to grant the license, and must identify actual facts or expert opinion to support the intervenor's position. Applying these standards, the presiding officer will rule on the admissibility of any proposed contention. The parties, including the applicant and the NRC staff, will subsequently address admitted contentions in the proceeding and the Atomic Safety and Licensing Board will render a decision (subject to appeal to the Commission) based on the record made in the proceeding.

QUESTION 7.(E). How does the Commission plan to address contentions that challenge the safety of new units based on historical events such as Three Mile Island or Chernobyl?

ANSWER.

As stated in response to the prior question: Regardless of the subject matter of a contention, to meet the admissibility standards in the NRC rules of procedure, a potential intervenor must identify a specific issue concerning a deficiency in the application that is material to the findings that the NRC must make to grant the license, and must identify actual facts or expert opinion to support the intervenor's position. Applying these standards, the presiding officer will rule on the admissibility of any proposed contention. The parties, including the applicant and the NRC staff, will subsequently address admitted contentions in the proceeding and the Atomic Safety and Licensing Board will render a decision (subject to appeal to the Commission) based on the record made in the proceeding.

QUESTION 8. Once the NRC staff establishes its review schedule after docketing the application, why has the Commission chosen not to include that schedule and the hearing schedule in the hearing notice?

ANSWER.

The Commission does not include the staff's review schedule in the hearing notice because the purpose of the notice is to invite members of the public to file petitions to intervene and request a hearing. The staff's review schedule is posted on the agency's website after the application is docketed and the applicant has provided sufficient additional information if necessary, for the staff to establish a review schedule.

As discussed in further detail below, the Commission does not include hearing schedules in the hearing notice because model milestones have been established by regulation.

QUESTION 8.(A). Does the Commission believe there is a benefit to ensuring schedule discipline by ensuring that both the application review and hearing schedules are given the authority of a Commission order?

ANSWER.

The NRC staff does establish review schedules, and does all it can to maintain these schedules. A current challenge is that many applicants have filed combined license applications that reference design certification applications or amendments to design certifications that are still under review. The Nuclear Regulatory Commission is required to make certain safety and environmental findings regarding each of these interdependent applications, and the staff must take the time that is necessary to resolve all issues. The staff is taking all feasible measures to establish and maintain effective and efficient review schedules.

With regard to hearing schedules, the Commission has adopted regulations directing the presiding officer to establish a hearing schedule based upon the model milestones in Part 2. The NRC published in its Part 2 regulations a model milestones schedule that will guide the presiding officer in establishing hearing schedules for the review of new plant license applications, obviating the need to address schedules in notices of hearing. In its Final Policy Statement on the Conduct of New Reactor Licensing Proceedings, the Commission also gave further guidance on the Commission's policy for applying the existing Rules of Practice to new reactor licensing proceedings. As stated in this Policy Statement, the Commission will closely monitor each combined license proceeding and the presiding officer's management of the hearing, and will step in as necessary to ensure the timely and fair conduct of the hearing.

QUESTION 8.(B). Do the model milestones listed in the appendix to Part 2 (L) carry the weight of a Commission Order?

ANSWER.

The model milestones were adopted by rulemaking, which has the same regulatory force as an order. After careful consideration of alternatives for governing the pace and timing of adjudicatory proceedings, the Commission decided that model milestones would best achieve the goals of the Commission for effective and timely adjudicatory processes in a manner which fully recognizes the rights of all parties to a fair hearing process. The milestones, in conjunction with other rules of procedure, give effective guidance to the presiding officer regarding the conduct of adjudicatory proceedings, while accounting for case-specific issues and circumstances which allow presiding officers to have the flexibility to handle cases on an individual basis without requiring Commission approval for each proposed alteration to the case schedule.

QUESTION 8.(C). Why does the staff estimate a year for COL hearings when the model milestones in the Part 2 (L) appendix indicate 295 days?

ANSWER.

The NRC staff uses one year as a rough estimate of the amount of time to conduct both the contested and the uncontested portions of the COL hearings because the actual hearing time may be affected by case specific facts and occurrences.

QUESTION 8.(D). Why are the model milestones significantly longer than the 240-day schedule listed in the hearing order for the LES application which followed a more complex hearing process with several admitted contentions?

ANSWER.

The model milestones for Subpart L proceedings were developed on a generic basis, and apply to a broad range of Subpart L proceedings, including initial materials licensing, initial production and utilization facility licensing, and license amendments for both materials and production and utilization facilities. The model milestones are a starting point for the presiding officer to establish a specific hearing schedule. The presiding officer is expected to make appropriate modifications to the milestones in setting detailed schedules (e.g., for filings) based upon all relevant information, including the number of contentions admitted, the complexity of the issues, the NRC staff's schedule for completion of its safety and environmental evaluations, and any other relevant consideration. Upon consideration of all factors and relevant information, the presiding officer may adopt a hearing schedule in a contested combined license proceeding with shorter dates than those set forth in the model milestones.

QUESTION 9. Does the NRC's time estimate of 42 months for a COL review include the time required for the docketing review? Does it include the time required for Commission action? What is the estimated time for Commission action on a staff recommendation to issue a COL?

ANSWER.

Yes, the NRC's original estimate of a nominal 42 months for a COL review included time for the acceptance review, docketing, technical review, and hearing. The original estimate did not include the time required for Commission action.

The nominal 42 month review schedule was based on a high quality COL application that referenced a certified design. The review schedule takes into consideration benefits that result from the design centered review approach. To date, no application has met all of these conditions. The staff uses its acceptance review process to determine project risks and associated schedule impacts to develop the review schedules.

At this time, the Commission does not have an estimate of the time for Commission action on a staff recommendation to issue a COL. At the time that the staff makes its recommendation, it is likely that the Commission will also have to consider and rule on petitions for stay of licensing board decisions, assess the significance for license issuance of matters certified to the Commission by the licensing board that have not yet been dispositioned, and, possibly assess the significance for license issuance of other matters raised in the licensing board's decisions that may need to be modified or clarified. The number and complexity of issues that the Commission may have to address in a particular case is unknown at this time and the Commission currently has no experience with actual COL issuance that would lend itself to formulating a meaningful estimate.

QUESTION 10. The scope of an EIS for a COL application that references an Early Site Permit is limited to review of new and significant issues. Why is it that the EIS processes for the two COL applications that reference a recent ESP and an ESP application currently under review are estimated to take 23 months (North Anna) and 20 months (Vogtle) when full scope EIS's are estimated to take 23-26 months?

ANSWER.

The scope of an EIS for a COL application that references an early site permit (ESP) is not necessarily limited to a review of new and significant issues. The scope also includes analyses of environmental issues, energy alternatives, economic, technical, and other benefits and costs of the proposed action not resolved in the proceeding on the ESP. Also, issues that the ESP applicant elected to defer until the COL need to be analyzed in the COL EIS.

The initial estimates for COL reviews reflected the uncertainties before the NRC staff had the opportunity to review the results of the applicant's processes to identify new and significant information. The NRC considered its previous experience gained from other programs to establish its initial planning assumptions to conduct its environmental reviews. The staff must evaluate the process used by the applicant to identify and evaluate new information, and how well it was implemented. The NRC has yet to complete its review of any COL application; consequently, there may be a spectrum of savings in cost and schedule. However, design choices and issues that were deferred to the COL application must be considered. Moreover, the process for developing an EIS must be followed (e.g., consultations with appropriate resource agencies, public comment opportunities). Some of these activities have been completed and the staff is forecasting that there will likely be additional cost and schedule reductions from the initial estimates.

QUESTION 10(A). Why does it take the NRC nearly a year to finalize an EIS following publication of a draft EIS?

ANSWER.

Based on experience from the early site permit reviews, the NRC staff expects a large number of individuals and organizations offering comments on the draft EIS, including Federal, State and local officials and resource agencies, Tribal Nations, and other interested parties. The NRC is obliged to consider each comment received. Comments received may require follow up by the staff to determine the influence on the scope, breadth and depth of the issue. Compilation of the final EIS is subject to technical, management and legal reviews to ensure that it is prepared to be issued as well as be presented as evidence in the adjudicatory proceeding. In some circumstances the NRC staff may be able to reduce the time needed to produce its final EIS below the one-year target. The different circumstances on each project will determine the actual schedule for completion of the final EIS.

QUESTION 10(B). Does the NRC have adequate resources and processes to resolve public comments in a timely fashion?

ANSWER.

The NRC believes that it has adequate resources and processes in place to resolve public comments in a timely fashion. Subsequent to the NRC receiving over 10,000 comments on a draft ESP EIS, the NRC staff developed an electronic routing process and a comment response data base to help it identify and resolve public comments in a timely and consistent manner. The NRC has created a special comment identification and resolution team that includes environmental experts who have considerable experience in responding to comments on NRC EISs to help address the more substantive comments. Senior NRC environmental staff members provide technical oversight and participate in the disposition of comments on complex issues.

QUESTION 11. For the design certification, ESP, and COL applications currently under review, how many Requests for Addition Information (RAI) have been issued to each applicant?

ANSWER.

The estimated number of RAIs issued for Design Certification, ESP, and COL applications that are currently under review are provided in the following table. Please note that we have provided the number of RAIs issued for both the safety and environmental reviews for the COL and ESP applications. These numbers are estimates and do not represent the total number of RAIs, as we are still early in the review process for the majority of the applications. Also included is the estimated percentage of RAI responses received within the deadline. It should also be noted that the percentage of responses received do not represent the quality of the responses.

Application	Number of RAIs Issued (Safety and Environmental)	Percentage of RAI Responses Received within 30-45 Days
ESBWR DC	5249	30%*
AP1000 DC Amendment	1140	68%
EPR DC	468	80%
US-APWR DC	45	100%
Vogtle ESP/LWA	Safety - 251 / Environmental - 163	99%
Calvert Cliffs COL	Safety - 41 / Environmental - 349	87%
STP COL	Safety - 268 / Environmental - 177	72%
Bellefonte COL	Safety - 323 / Environmental - 86	98%
North Anna COL	Safety - 275 / Environmental - 8	100%
Lee COL	Safety - 4 / Environmental - 132	N/A***
Harris COL	Safety - 4 / Environmental - N/A**	N/A***
Grand Gulf COL	N/A**	N/A***

*This percentage is based on RAI responses received prior to January 2008. As of July 7, 2008, agreement was made between the staff and GE-Hitachi that responses to RAIs for the ESBWR DC would be submitted within 90 days.
**RAIs are currently being developed and will be issued according to established schedules.
***RAIs were recently issued; responses have not yet been received.

QUESTION 11 (A). What is the deadline for applicants to respond?

ANSWER.

The deadline for applicants to respond varies based on when the RAI is issued and the complexity of the question. Typically, the NRC has requested that applicants respond to RAIs within 30-45 days after receipt of the RAIs. However, agreements have been made between the applicant and staff for up to 90 days to respond to selected issues.

QUESTION 11 (B). What percentage of each applicant's responses has met that deadline?

ANSWER.

As shown in the previous table, applicant responsiveness varies.

QUESTION 12. Why is it unnecessary to review existing emergency and security plans when reviewing license extension applications?

ANSWER.

This question relates to ongoing litigation in which the NRC is involved. In the United States Court of Appeals for the Second Circuit, the NRC is defending its denial of a rulemaking petition asking the agency to expand the scope of license renewal to include ongoing operational safety issues, such as emergency preparedness and security plans, rather than confine its review to "aging" issues (*Spano v. NRC,* No. 07-0324).

The NRC's Second Circuit brief explains the agency's position in full. The case remains before the Second Circuit and has not yet been orally argued or decided. It is thus not appropriate in this response to discuss the contested issues.

QUESTION 13. In his testimony, Commissioner Jaczko advocated that the NRC look back at a few Safety Evaluation Reports for license extensions that have already been issued in light of the Inspector General's findings after reviewing the license renewal program. What is the threshold that would trigger such a retrospective review?

ANSWER.

This question relates to the currently pending petition to suspend four different license renewal proceedings. Therefore, the Commission is limited in its response while it is still deliberating on its decision on that petition.

QUESTION 13.(A). What level of resources would be required to execute such a review?

ANSWER

This question relates to the currently pending petition to suspend four different license renewal proceedings. Therefore, the Commission is limited in its response while it is still deliberating on its decision on that petition.

The scope of such a retrospective review has not been determined, therefore, it is not known what resources would be needed.

QUESTION 13.(B). Did the Inspector General report any safety significant findings related to his review to the Commission?

ANSWER.

To the extent that this question relates to the currently pending petition to suspend four different license renewal proceedings, the Commission is limited in its response while it is still deliberating on its decision on that petition.

The Inspector General report did not find any potential safety-significant issues with respect to any of the specific facilities and licenses reviewed. The Inspector General instead looked at the license renewal program at a more general level to identify areas where the license renewal review process as a whole can be strengthened.

QUESTION 13.(C). What degree of finality do Commission decisions have?

ANSWER:

Once a licensing proceeding concludes, an NRC license issues, and judicial review is completed (or the 60-day time period for judicial review expires), the license is considered "final" and not subject to change absent a license amendment or enforcement order. Only the last Commission adjudicatory decision in a licensing proceeding (or the last Atomic Safety and Licensing Board decision, if no appeals are taken to the Commission) – resulting in license issuance -- is accorded "finality." All other decisions are interlocutory and subject to change prior to the end of the proceeding -- for example, on a motion to reopen the record. Of course, if judicial review of an otherwise "final" NRC license results in a reversal, then licensing proceedings may have to be restarted and earlier decisions reconsidered.

QUESTION 13.(D). Under what conditions does/should the Commission rescind a decision?

ANSWER:

Once an NRC license is issued, and achieves "finality" as described in the answer to question 13(c), then it can be revoked only if NRC shows a health and safety deficiency requiring that remedy. In licensing proceedings, the burden is on the license applicant to demonstrate to NRC that operating its proposed facility will be consistent with all NRC requirements and be safe. In contrast, in revoking a license, the burden shifts to NRC to show that continued operation would be unsafe. The NRC has a public petitioning process (10 CFR 2.206) allowing citizens to seek revocation or modification of licenses.

QUESTION 13.(E). Do any of the Inspector General's findings meet conditions that might warrant a rescission? If not, what purpose would be served by a retrospective review of Safety Evaluation Reports for licenses that have been extended?

ANSWER:

To the extent that this question relates to the currently pending petition to suspend four different license renewal proceedings, the Commission is limited in its response while it is still deliberating on its decision on that petition.

The NRC Staff has not yet acted upon the license renewal applications that are subject of the ongoing adjudications. The question whether a Safety Evaluation Report produced under the current process is inadequate *per se* to support a renewed license, however, is at issue in those ongoing adjudications, and is currently under consideration by the Commission. Therefore, the Commission cannot, at this time, comment as to whether the Inspector General's findings would warrant denying an application for a renewed operating license, or revoking an existing operating license.

QUESTION 14. The Commission has submitted a legislative proposal to eliminate the mandatory hearing requirement in the Atomic Energy Act if there are no admitted contentions. If this proposal is not enacted, what process does the Commission plan to use to conduct the mandatory hearing?

ANSWER.

The Commission believes that it has devised a more efficient way of conducting mandatory hearings. Details of the revised process will be made public in an upcoming revision of the Commission's internal procedures, a revision likely to be completed sometime this Fall. But in outline, the process is likely to take the following form.

The Commissioners themselves would conduct the hearing. A public notice of the hearing would be issued after the NRC staff had completed its safety and environmental reviews and the Advisory Committee on Reactor Safeguards had issued its statutorily required report on the license application. Before the Commission hearing, the applicant and the NRC staff would be required to file written statements that addressed the findings the Commission must make before it can authorize the issuance of a license. Also before the Commission hearing, the Commission might issue written questions to be addressed by the applicant and NRC staff either in writing or during the hearing.

At the hearing, the applicant and staff would make sworn presentations, and undergo rounds of questions from the Commissioners. The hearing would be public and transcribed, and all information made available to the Commission would be made part of the public record, unless the information was classified national security information, "Safeguards Information" under Section 147 of the Atomic Energy Act, or otherwise required by law to be protected. The Commissioners could be assisted by technical advisors who had not participated in the NRC

staff's review of the application. The hearing would not exceed three days, even in complex cases.

As efficient as the Commission believes this process could be, the Commission still believes that the statutory requirement for adjudicatory hearings in which there are no contested issues should be eliminated, for the reasons given in the legislative memorandum that was enclosed with Chairman Klein's June 9, 2008 letter to Congress.

QUESTION 15. Given the industry's interest in small, grid-appropriate reactors and the benefits of developing such safe, proliferation-resistant reactors both domestically and abroad, what resource planning has the NRC done to accommodate requests for pre-application meetings and potential design certification applications? Please provide a five-year funding profile that reflects the resources needed from vendors and customers to proceed with several of these designs.

ANSWER.

With respect to resource planning, the NRC has developed resource estimates for performing pre-application interactions, design reviews, and review timelines for small reactors. Vendors of four different small reactor designs have requested pre-application interactions with the NRC in writing. The four vendors and their designs are PBMR Pty Ltd's 165 MWe high temperature gas cooled pebblebed reactor, Westinghouse's 335 MWe light water cooled reactor, Toshiba's 10 MWe liquid metal cooled reactor, and NuScale's 45 MWe light water cooled reactor. Additionally, pursuant to the Energy Policy Act of 2005, the NRC is working with the Department of Energy in developing the Next Generation Nuclear Plant program, a small high temperature gas cooled reactor.

Because NRC has significant experience in reviewing, licensing, and regulating light water cooled reactors, the resources necessary to perform reviews of this type of reactor (Westinghouse's and NuScale's design) are less than for non-light water cooled reactors (PBMR's and Toshiba's design).

With the resouces discussed below, the NRC could conduct meaningful pre-application interactions with the four vendors in FY 2010. Of the two lightwater cooled designs, NuScale

has said they intend to submit an application for design certification in 2010. Westinghouse has said they intend to submit an application for design certification of their light-water design in 2012.

Because of the very limited knowledge of NRC's current staff with reviewing designs other than lightwater cooled, the NRC will need time to acquire or develop the necessary tools and expertise. Consequently, while Toshiba has said they intend to submit an application for design approval in 2009 and PBMR has said they will submit an application for design certification in 2010, it is unlikely the NRC could support reviewing either application without 2-3 years to prepare for the review. The resource estimates that follow reflect this preparation period and timing of the review.

The estimated future funding profile to perform this additional work is $35M-$40M in FY2010, $40M-$45M in FY 2011, $50M-$55M in FY 2012, $40M-$45M in FY 2013, and $25M-$30M in FY 2014.

Senator CARPER. Mr. Chairman, thank you for that statement.

I also want to thank you for using acronyms sparingly. In reading through the testimony, I don't know about my colleagues, but I came across a couple of places where there were as many as four acronyms in one sentence. We had a Commerce Committee hearing last week, I had five acronyms in one sentence. I am not real good on those acronyms. You guys know what they are, I don't always. So I would just ask that you continue to use those acronyms sparingly. Thank you.

Commissioner Jaczko, has anyone ever mispronounced your name?

Mr. JACZKO. I think not at this Committee.

[Laughter.]

Senator CARPER. When we get to our last witness, I am going to ask Commissioner Svinicki to tell us exactly how she likes to pronounce her name, because I have heard it pronounced any number of ways. My staff was good enough to spell it out phonetically—wrong.

[Laughter.]

Senator CARPER. So I am going to ask you to educate us all once and for all.

Commissioner Jaczko, you are recognized.

STATEMENT OF HON. GREGORY B. JACZKO, COMMISSIONER, NUCLEAR REGULATORY COMMISSION

Mr. JACZKO. Thank you, Mr. Chairman. I appreciate the opportunity to appear before you and the other members of the Committee today to discuss the process for considering new reactor applications and the renewal of existing licenses for nuclear power plants.

I agree with the Chairman that the safety and security of the operating reactors and the other materials licensees is the agency's priority. Therefore, we appreciate that the Committee chose to include relicensing as well as the new reactor discussion at this hearing.

Deciding whether to approve or disapprove an application is just the first step of a process that includes oversight of licensees to ensure compliance with safety requirements and it includes taking necessary enforcement actions when violations occur. Long standing problems, such as implementation of fire protection regulations and emergency core cooling systems sump screen issues at existing facilities must get resolved, both for the benefit of those existing plants and for the NRC to be able to exercise the most efficient oversight of any potential new plants.

I do believe that applicants have more work to do to improve the timeliness, quality and completeness of new reactor applications if the NRC is going to be able to review them in an efficient, and most importantly, I think, predictable manner. I also agree with the Chairman that the NRC is well prepared today to deal with the work of license reviews and if applications are approved, regulating additional reactors. Thanks to the support of this Committee and the Congress, the NRC has been able to accomplish a tremendous amount of work to buildup its own internal infrastructure and it is well-positioned for the task ahead.

But I believe the NRC has more work to do. While we have done a great deal to get ready, there are three remaining areas that require the agency's continued focus to ensure consistent oversight of any new reactors that may get built. We need updated regulations regarding security, aircraft impacts and waste confidence. I believe the staff has made progress in all three of these areas. And in fact, the Commission directed the staff to accelerate the development of the final security rule. The Commission has just received the rule package for consideration and has also made it publicly available. I intend to work quickly to vote on this issue and to do what I can to move it forward.

As I mentioned at the hearing in February, the agency is still working on a final rule to require new nuclear power plants to be designed to withstand the impact of an aircraft crash. I remain hopeful that the final rule the staff provides to the Commission for approval this fall will ensure the requirements apply to any new plant built in this Country and that it includes clear criteria for how the NRC will determine compliance. Almost all of the entities that commented on the proposed rule supported changes in both of these areas.

Finally, turning to the topic of license renewal improvements, the agency has a solid license renewal program in place. But I believe both the scope and the documentation of the process could be improved. First, because the scope of this program is so narrowly focused on the aging of components, members of the public will likely always raise substantive concerns about the license renewal process. I have proposed that the NRC include a review of emergency preparedness planning in relicensing, to reaffirm the safety finding initially made when the plant was licensed to operate. I believe that such a change would provide the NRC with the opportunity to potentially enhance safety and certainly to strengthen public confidence in the license renewal program.

Second, I believe the agency should look back at a few completed license renewal safety evaluation reports these are the major documents that we use to make our safety findings to ensure the documentation issues raised by the Inspector General are easily resolved. This effort, when coupled with more thorough documentation of future relicensing proceedings, should effectively resolve what I believe is an important issue of public transparency in the license renewal process.

Thank you for the opportunity to make these remarks, and I look forward to answering your questions.

Responses by Gregory B. Jaczko to Additional Questions
from Senator Boxer

QUESTION 1. One of the witnesses on the second panel mentioned in his written testimony that the NRC does not require a public hearing for plant license renewal unless a contention is filed and admitted by the NRC's Atomic Safety and Licensing Board. If you feel it is important to have mandatory public hearing for new plant licenses, why not for license renewals?

ANSWER

I would be open to changes that would provide the opportunity for additional Commission and public involvement in the license renewal process to ensure the best possible decisions for public health and safety are being made. An additional requirement for mandatory hearings in license renewal could be implemented through a statutory change to the Atomic Energy Act consistent with the language for new plant licenses.

QUESTION 2. During license renewal, why doesn't the NRC look at terrorist threats or other issues which would not have been considered when a plant was first constructed? Shouldn't the NRC evaluate whether or not the safety and security of a particular plant could be substantially improved, bringing it up at least to the standards set for new plants?

ANSWER.

As I mentioned in my testimony, I do believe the scope of the license renewal process could be improved. Because the scope of this program is so narrowly focused on the aging of components, members of the public will likely always raise other substantive concerns. I have proposed the NRC include a review of emergency preparedness planning in re-licensing to reaffirm the safety finding initially made when the plant was licensed to operate. I believe that such a change would provide the NRC with the opportunity to potentially enhance safety, and certainly to strengthen public confidence in the license renewal program.

QUESTION 3. When we see cooling towers collapsing and leaking at Vermont Yankee, and security guards asleep at Peach Bottom, it raises concerns about the safety and security of our nuclear facilities. What is the NRC doing to ensure they are not renewing licenses for plants that are not meeting current safety or security standards?

ANSWER.

The NRC currently has a process that could result in the approval of a license extension for a plant that is the subject of significant regulatory concern and oversight. Taken to the extreme, the way our process is currently structured, we could potentially renew the operating license for a plant we have ordered to shut down due to safety and performance deficiencies.

I believe it may be appropriate and beneficial to look at a licensee's performance as a part of the license renewal decision. After all, information about the current capabilities of a licensee to operate safety programs at a nuclear power plant is relevant because it could be indicative of how effectively a licensee will be able to implement an aging management program during the period of a renewed license. As the NRC's Advisory Committee on Reactor Safeguards noted in a June 9, 2005, letter raising concerns about the license renewal of the poorly performing Point Beach nuclear plant in Wisconsin, "We recognize that the license renewal rule does not include specific consideration of current operating performance. However, aspects of current performance may affect the development of license renewal programs and commitments as well as the effectiveness of the implemented programs."

In addition, the amount of inspection and oversight resources the NRC may have to expend on a licensee with a poor track record over an additional twenty year period should also be a relevant factor. It may be a more efficient use of resources to at least defer the review of a

license renewal application from a poor performing licensee. Such an approach would have the added value of providing another incentive for a licensee to make improvements

Senator CARPER. Commissioner Jaczko, thank you very much.
Commissioner Lyons.

STATEMENT OF HON. PETER B. LYONS, COMMISSIONER, NUCLEAR REGULATORY COMMISSION

Mr. LYONS. Mr. Chairman and members of the Subcommittee, thank you very much for holding today's hearing to discuss NRC's licensing and relicensing processes for nuclear power plants. These are important issues. They are fundamental to earning the confidence of the American public in the safety of the Nation's nuclear power plants.

I support Chairman Klein's testimony and I would like to elaborate further on just two specific points. Regarding the next generation nuclear plant, or NGNP, as I will refer to it, as the Chairman noted in his written remarks, we expect to deliver to Congress in August, jointly with the Department of Energy, our licensing strategy for the NGNP as required by the Energy Policy Act of 2005. This type of reactor offers specific potential safety enhancements over light water reactor technologies. It may serve to enable the use of nuclear power not only in electricity production with enhanced efficiency, but also as a source of process heat for many industrial applications.

However, this advanced technology presents a set of licensing challenges, such as the safety performance of new types of fuel, to which the NRC must respond with new regulatory research. As we continue to implement this joint strategy with the DOE, the NRC will require resources that are appropriately matched with DOE funding on this project.

In addition to our ongoing work on the NGNP, the NRC is receiving an increasing number of requests for pre-application meetings by potential applicants for small, so-called grid-appropriate advanced reactor concepts, for potential sales to developing nations and into markets with very small grids. There are currently no U.S. licensees expressing serious interest in building such plants. That has limited our associated resource allocations.

In my own view, NRC engagement and research on the safety aspects of these particular reactor designs is in our national interest in helping to assure that safe reactor designs are used abroad, as well as encouraging non-proliferation. I also believe that resources for such research should not be derived from fees paid by our existing licensees. Therefore, my suggestion would be that NRC resources for activities such as these grid-appropriate reactors are a matter for which I believe congressional guidance is needed. And if this work is to be endorsed by Congress, then I think specific funding in that area will be important to the NRC.

I thank the Subcommittee for the opportunity to address the topics today and I look forward to your questions.

Senator CARPER. Dr. Lyons, thank you very much.

Our first question for this panel will be to the last Commissioner, and the question is, how do you pronounce your name?

[Laughter.]

Ms. SVINICKI. Mr. Chairman, similar to many Americans who trace their ancestry to Ellis Island, the spelling you see on the card before me is not reflective of the pronunciation. There are what I

call some phantom vowels that are missing. There is not a unified opinion in my family, but Savenicki, so you would insert an A between the S and the V, and then the first I would become an E.

[Laughter.]

Ms. SVINICKI. I think Commissioner Jaczko has some sympathy with his J.

[Laughter.]

Senator CARPER. I have no further questions.

[Laughter.]

Senator CARPER. You are recognized. Thanks so much, Commissioner Svinicki, welcome.

STATEMENT OF HON. KRISTINE L. SVINICKI, COMMISSIONER, NUCLEAR REGULATORY COMMISSION

Ms. SVINICKI. Thank you, Mr. Chairman, Senator Voinovich and members of the Subcommittee.

I would begin by taking this opportunity to thank each of you and your fellow Senators for supporting my confirmation and thereby making possible, as has already been noted, my inaugural appearance before you today as a Commissioner.

Senator Craig, I may be a bit nostalgic in this moment for the seat I used to occupy behind you, but I thank you for your kind words.

When I appeared before the full Committee at my nomination hearing, I pledged to each of you that if confirmed, I would immerse myself in the issues and challenges facing the agency and that I would commit myself fully to contributing to what I view as the continued success of the Commission. In the approximately 3 months since my swearing in, this has remained my commitment.

Fresh from my experiences as Senate Committee staff, I was no stranger to long days, but since arriving at the Commission, I have never felt more keenly how few hours there are in any given day. Partly this is a result of my approach to addressing the ongoing work of the Commission, which is to research the last few years of Commission action and deliberation, and to try to set issues in a proper context before formulating my own view. I am assisted in this by an agency staff that I have found to be both highly skilled and highly eager to explain and debate its work. Their commitment to public service, as evidenced by their commitment to the work they do every day, has impressed me deeply.

The NRC faces many challenges, already outlined by my colleagues, but none, in my view, are insurmountable. What success will require, however, is a sustained commitment to continual improvement in our processes and an eye always to safeguarding the trust that the public has resided in us. As I continue to develop my "sea legs" at the Commission, these two areas will be my principal focus.

Finally, I would be remiss if I didn't take this opportunity to thank publicly the three gentlemen who sit alongside me here. To a person, my fellow Commissioners and the Chairman have been unfailingly gracious and supportive in easing my transition, which has not always been an easy one, to the NRC. They have welcomed me fully to their ranks. They have been patient with my need to

research issues and come up to speed, and have extended every accommodation to me. I am grateful to each one of them.

And Senator Isakson, just quickly, I support the Chairman's testimony regarding the budgetary resources. Congress, as I am coming to discover, has been extremely supportive of the agency's budget requests. But please know that I don't take for granted that support is ours to lose. We have to re-earn it continually, so although we have had good support, we need to continue to earn your trust and confidence.

I thank the Subcommittee for its support of the important work of the NRC and this opportunity to appear. I will endeavor to answer any questions you may have.

Thank you.

Senator CARPER. Commissioner Svinicki, thank you very much for that statement.

I live in Wilmington, Delaware, the northern part of our State. As we drive south on State Route 13 or State Route 1 down toward our beaches, you can see off to the east a couple of nuclear power plants. In fact, there are three of them that sit over there in Senator Lautenberg's territory in New Jersey, Salem and Hope Creek. I have lived in Delaware since 1973 when I got out of the Navy and moved there. But those plants have had a checkered past in terms of their reliability, in terms of their ability to really be up and operate and provide electricity on an ongoing basis.

I want to say roughly four or 5 years ago, Exelon was invited by PSEG to come in an operate the facilities. And the operating performance was improved dramatically. I cite them today because I think they are a glowing example of what has happened in the industry itself. We don't have to go back all that many years for the ability to operate at full capability was probably in the 60, probably 70 percent range. Today I think it is a lot closer to 90.

So my first question for the panel, and I will just start with you, Chairman Klein, we know there are 104 nuclear power plants. We know that roughly half of them have applied for, initially approved for 40 years, roughly half have applied for and been approved, I think, for 20 years. How many of the 104 have actually been approved? How many are in process in terms of renewal license requests?

Mr. KLEIN. We have approved 48, 17 are in process and we expect more to come.

Senator CARPER. All right. I spent a lot of my life in naval aviation. I have flown in airplanes that were in some cases as old as the crew members that were flying them. We have still flying today P–3s, which I was a part of, we have C–130's, which a lot of us have a lot of familiarity with, some B–52s that are still out there flying. I know there are concerns that we have from time to time about the safety and reliability of those aircraft.

We have nuclear power plants that are 40 years old as well. As we consider renewing them and letting them fly, if you will, for another 20 years, or operate for another 20 years, it is not unexpected there would be some concerns raised about how safe can that be, just as, how safe can it be to fly a B–52 for 50 years or a P–3 for 40 years and so forth. The question I have to start off with is, talk to us about those concerns that we have with allowing these plants,

they are large, complex and aging, to allow them to operate for another 20 years, at least. Why don't you tackle that to start off with, Chairman Klein?

Mr. KLEIN. Thank you, Senator Carper.

Obviously the issue of the operating plants and their life extension is something we take very seriously. As these plants operate, conditions change. So we have a very robust review process to look at aging effects. That doesn't mean for our employees, it means for the plants.

Senator CARPER. Although some of your employees, like us, are aging, I am told.

Mr. KLEIN. There are a few.

So we have a very rigorous program. I think what is important to understand, and I think the IG referenced this in their report, and you will hear from them on the second panel, our technical details for which we look at during these license renewal reviews is very robust. Where we needed to make improvement, and we are making improvement, is on the documentation. In general, we spend over 10,000 hours to look at a license renewal application. So it is very rigorous, we look at it, we hear from the public and we try to communicate in an effective way.

So public confidence, communication, explaining what we do, how we do it, is very important to us.

Senator CARPER. Dr. Lyons, in following up, how long does this process usually take for renewals? Just answer that question in your comment you are going to give now.

Mr. LYONS. The process is typically 22 months. We have had some shorter than that. It also depends on whether there may be hearings. But 22 months is our target, and that has generally been met.

And may I comment briefly on what the Chairman just said?

Senator CARPER. Sure.

Mr. LYONS. To follow your analogy of planes that have been around for some time, those planes, at least I hope it is true, and you can tell me if it is, have also been the subject of continuing oversight, continuing maintenance and continuing, I hope, replacement of components as that became necessary. So in the same sense with nuclear power plants, they have been subject to that continuing oversight, continuing maintenance by the licensee, subject to our oversight, and many of the components have been replaced over that period of time.

Senator CARPER. Thank you.

I have more questions, but I am going to yield to my colleagues for some questions. We will come back for a second round. Senator Voinovich.

Senator VOINOVICH. Thank you, Mr. Chairman.

Chairman Klein, the NRC has had several months to review the first set of COL applications. Do you see anything that might jeopardize, and I would be interested in hearing from the other commissioners, that would jeopardize the agency's goal of completing reviews within three and a half years, which seems to me to be a very long time. I don't know what it takes, Senator Craig found out. How long does it take them to go through an application over in France? Did they get into that?

Senator CRAIG. No, we did not talk specific schedules. It depends, of course, on the design and the standardization.

Senator VOINOVICH. The other thing is, it looks like we are going to have a continuing resolution that may not get done until February of next year. Does that have any impact on what you are trying to get done?

Mr. KLEIN. Senator Voinovich, at this point, we see nothing that is insurmountable, as Commissioner Svinicki indicated in her testimony as well, that would prevent us from meeting our obligations. What we are learning as we work through these combined operating license applications is that we are getting better as an agency articulating what we want to see, and the applicants are getting better in their response. So we are seeing the quality of the applications and the completeness improve. So we are seeing the processes working. We are taking lessons learned as we articulate what we need and the applicants are doing better in terms of what they submit. So I think overall it is a positive story.

Regarding the budget issue, a continuing resolution is challenging for us, because as you know, the Fiscal Year starts October 1. I am now starting my third year at the NRC and we have never received a budget on time. It makes our planning difficult. And we will have some impacts, if the continuing resolution goes beyond February or March. We are planning for a continuing resolution. We can read the papers as well as you all can. So we are planning on a continuing resolution. We are trying to prepare for it. But if it extends beyond February or March, we will have some challenges in meeting our activities.

What that will mean is that we will not compromise safety on that existing fleet. So what will suffer are the new things, which means license renewals, power uprates and the new reactors. We will have to prioritize.

Senator VOINOVICH. One of the things, I had the impression that the designs were kind of cookie cutter, that they had been used in other places. I understand you have approved one design already. But then there are another two of them that are being used in other places in the world. Then you have two more designs that are brand new. Does that pose a real problem with you in terms of the timing?

Mr. KLEIN. Senator Voinovich, it is a challenge. What we had expected as we went through the combined operating license aspects is that the design certifications for these various vendors would be complete. Obviously we have essentially completed the Advanced Boiling Water Reactor application and the Westinghouse AP1000 design has been approved, but we are currently reviewing an amendment to that design. And we are reviewing the ESBWR, Areva, and Mitsubishi's design.

So what Senator Craig had observed in France is they have a much more standard process in their country than we have in our Country. We are free and open. Therefore, we will have more vendors providing reactors. I think what we will have to address as we go through the license review process, we will be doing things in parallel that we expected to do in series. But we will work with the utilities and the stakeholders to make sure we do it right. No li-

cense will be granted until we are confident that it will be safe and complete.

Senator VOINOVICH. Any comments?

Mr. JACZKO. Senator Voinovich, if I could add a few comments. I would perhaps, on the first question of if there are issues that I see jeopardizing the schedule, I would say that there are several, of the five designs that we are looking at. Three of them I would say right now would present challenges for us to complete a review in three and a half years, in the time period that we have talked about. With the AP1000 design, there are some outstanding issues that I referenced in my opening testimony about sump screen design. That is an issue that the staff is working on right now that may present some challenges. Until we have complete information, we can't necessarily be sure when we will be able to complete that part of the review. So that may have an impact on our ability to get that design done. And that design is used by a number of the applicants that we are looking at in front of us.

There are issues with one of the applicants that is referencing the AP1000, some issues again with incompleteness of information that may present challenges to us reviewing that application in a predictable manner. The application that the Chairman referenced related to the ABWR design, we have had some challenges with the vendor that is supporting that application. The applicant had to change the vendor, so that has caused a delay in our ability to review that application.

The General Electric ESBWR design also came in with a modification recently to that design. The staff right now has not been able to publish a new schedule for when they would be able to complete the review of that design. So that may have impacts later on then on the applicants that are referencing that design.

So those are all uncertainties that could create risks from the standpoint of the time it will take to review those designs. And just a specific comment on the continuing resolution, one of the issues that has come to my attention for new reactors in particular is how we treat new activity under a continuing resolution. Generally, the language prohibits the agency from engaging in any new activity. And it is unclear to me at this point, but there has been some discussion about how we treat new contracts that we might need to issue for new reactor application reviews. If that is considered to be a new activity, then under a continuing resolution, we wouldn't be able to initiate some of those contracts. So that again may create some specific challenges with regard to reviewing some of the new reactors under a continuing resolution.

Senator VOINOVICH. Thank you.

Senator CARPER. Senator Lautenberg.

Senator LAUTENBERG. Thank you all for your testimony and the work that you do. The agency obviously has great responsibility, and particularly pronounced since the search for other sources to energize our Country are so much in demand.

Dr. Jaczko, the NRC Inspector General's 2007 report pointed out that the NRC didn't even keep records of their reviews of license applications. Is that possible? And how important is that?

Mr. JACZKO. I think, Senator, that is an issue we need to go back and review and audit, to make sure that we understand the impor-

tance of that information. But what the Inspector General found was that when our teams go out to audit the information that they have in the application to confirm the programs and the information was accurate, the notes and some of the information that they collected onsite they didn't necessarily bring back with them to complete the review. So they would take the notes, they would have conversations with individuals there and then they would formulate their conclusions. And those conclusions would be reflected in their safety reports.

So what I think we need to do is we need to go back and just verify, for the public ultimately, so that they are clear how we made those decisions and how we came to those conclusions. I think that will probably involve——

Senator LAUTENBERG. That is not very reassuring.

Dr. Klein, is that detail critical in the evaluation? Is the IG correct in raising this as a point of some significant concern?

Mr. KLEIN. I think again, as Commissioner Jaczko indicated, there is no evidence that the technical review was not done, the IG will discuss this issue on the second panel, and it is probably best for you to ask them that question. But what they pointed out is an area that we are addressing, what kind of notes and documents do we keep for record. It is no different than normal inspection activities, and everyone has to decide what they keep and what they discard. The IG pointed out that we should keep more complete records. It doesn't imply that we didn't do our job. But we are reexamining the kinds of records we keep.

And as Commissioner Jaczko indicated, sometimes there is proprietary information that a company has. We look at that information but we don't necessarily bring copies back.

Senator LAUTENBERG. But the public is certainly entitled to be aware of the fact that these data are not being furnished as they should be. I am concerned about the fact that, well, it isn't quite where it ought to be. How important is it that these review details be available?

Mr. KLEIN. I think, again, what we looked at and what the IG looked at was, again, they found no weakness in our technical review. What we found was a weakness that we are correcting related to the documentation and the retention of the information.

Senator LAUTENBERG. That is like the audit trail. It ought to be up to date.

I was concerned before when the Chairman was going through a comparison of aging parts of the world, talking about B–52 and so forth. I was afraid he was going to get to Senators and say, all right, so there are replacement components that you can put in there, but nevertheless. It wasn't very comfortable.

[Laughter.]

Senator LAUTENBERG. During the Oyster Creek relicensing, the NRC did not initially insist on a sophisticated three-dimensional analysis of the structure of the dry well. How can the public have confidence in NRC's relicensing process when it took prodding by a non-governmental agency and the company's voluntary action to use the best technology available?

Mr. KLEIN. Unfortunately, the Oyster Creek issue is before the Commission. So the Commission can't talk in a lot of details, because we will be in an adjudicatory role.

So let me just talk in general about the confidence and the communication of how we do our license renewal. We do use technical input. We also expect and we appreciate independent input on things we can do better, and we continue to ask if there are things we can do better.

Again, as I indicated earlier, when we go through the license renewal process, it is a very technical and very involved process taking over 10,000 hours. The public does have an opportunity to participate in that process. Unfortunately, I cannot talk specifically about Oyster Creek.

Senator LAUTENBERG. I will close with this. The public is so skittish. Have you seen an accelerated rate of problems as these plants age? And why, if we had to look at the accident, the alarm rate that does come in the field, is it worthy of the concern that the public seems to exhibit? Or can we say that new technology, especially with the new plants, that new technology will make these plants absolutely safe, more efficient? Can we give any kind of an endorsement that would say to the public, OK, maybe we can bring the older ones up to snuff, but we have designs that now assure safety, no matter what?

Mr. KLEIN. As Commissioner Lyons indicated, as plants age, a lot of the components are continuously replaced and modernized and upgraded. So when you go through a plant that has been in operation for a number of years, you will see a lot of new components, new upgrades, new technology, new techniques.

I think from a public perspective, one of the advantages is, and the industry can talk more about this, the plants are running at a higher capacity factor and running a more reliable operation as people learn more about the operational aspects. What we typically see is high public confidence, and when we go out and hold hearings, in general around the nuclear plants, people are confident, their friends, neighbors and families work there, they go to church there, they go to school. So these are people in the communities that work in these plants.

So in general, what we have seen is confidence in the community around the plants is pretty high. Because the communities are the ones that work and operate these plants. So we have not seen any negative trends.

Senator LAUTENBERG. Thank you.

Senator CARPER. Senator Inhofe.

Senator INHOFE. Thank you, Mr. Chairman.

We are getting bogged down in so many details here. Those of us who are not as familiar with these processes we are looking at, if you could help us out a little bit. We are talking about two different things: the licensing of new applicants and then re-applications, licensing re-applications. Chairman Klein, in my opening statement I said that the hearing notice for the LES National Enrichment Facility included detailed schedule and policy guidance. Since that approach clearly instilled schedule and discipline in the process, I would first ask if the Commission is using that approach. I don't think they are, so I would ask why not.

Mr. KLEIN. It turns out we did learn from LES, and we incorporated that in our processes. We modified a part of our regulatory structure called Part 2, which is not Part 52, but it is Part 2 of our regulatory framework, where we do have milestones and schedules outlined and available. So we knew in terms of this new reactor licensing wave that was coming forward to us, so we do have in our regulations in Part 2 milestones and objectives. So it is there, and we will provide that to you.

Senator INHOFE. That is good. When you mentioned in your opening statement that the time, the hours required for a re-application were 10,000 hours, I believe you said, I asked my staff what it would be for a new application. They looked it up and said between 60,000 and 80,000 hours. Those of us, I think almost all of us up here in our opening statements said our concern is that we get there and get there quick. So we're all concerned about streamlining, to the extent that we can do a better job and meet the best guidelines.

Senator Isakson asked the question of one of you, I don't remember which one, if we do have, if the resources that are there are going to be adequate. What I wouldn't want to happen is to find out when we are having a hearing 6 months from now, well, we could have made these guidelines and these benchmarks, but we didn't have the resources. So I would like to have each one of you responds as to, do you think right now with what you have, do you have adequate resources to try to meet these expectations of the Committee?

Mr. KLEIN. Senator Inhofe, I believe on the resources issue we always try to be prudent and spend our funds wisely. But we, I believe, have hired, trained and held our staff accountable and laid out our clear expectations. At this point, on both license renewals and on new license reviews, we believe that we have the funds, assuming the budgets are passed, for 2009, that we will have the budgets that will meet those obligations. If we have to operate on a continuing resolution for the entire year for 2009, we will have difficulties.

Senator INHOFE. That is a good point to bring out. Far be it from me, being a conservative, to try and push it even to a higher level in terms of the expenditures. But we do, we just want to make sure that you are not going to come back later and say you didn't. That is a good thing to bring out on the CR.

Mr. KLEIN. The other aspect I would like to point out on the efficiency is that we will, being a conservative regulatory body, we will be prudent and cautious as we go through these first phases of design certifications and the first COLs. What we expect to see, after we go through that, we definitely expect to have lessons learned and become more efficient with no compromises.

Senator INHOFE. I don't think anyone would disagree with that. Is that generally the feeling of the rest of the commissioners?

All right, Commissioner—yes, Dr. Lyons.

Mr. LYONS. If I may just add, I certainly agree with the Chairman on the adequacy of the resources as planned and potential concerns on the CR. However, I think we should also mention that if we talk about the Yucca Mountain application, we are quite concerned that we do not have adequate resources by a substantial

amount, depending on whether the House or the Senate versions might eventually be enacted. There may be a substantial shortfall.

Senator INHOFE. All right, and Commissioner Jaczko, first of all, let me apologize to you. We had an appointment set up, and then all of a sudden, I had to be on the floor. So you met with my staff instead of with me, and I regret that. As I recall, during your confirmation hearing, I was the one who initiated the idea that we need to be talking. So we will make sure we get back on that track.

Mr. JACZKO. I appreciate that.

Senator INHOFE. The National Academy of Sciences report issued last November recommends shortening the review time for licensing applications to 3 years. As I understand in your opening remarks, you said that the time that you folks have is a little bit longer than that, it is some 42 months plus Commission action, which would be three and a half to 4 years. You were reluctant to think you could even keep that schedule, let alone 3 years. Is this your position?

Mr. JACZKO. I believe right now there is potential for challenges with that. I think we haven't necessarily seen the completeness and the quality on the applications that we are looking for. If you look at some of the schedules that the staff has published, there are important milestones that they have laid out when they need to see information from applicants. And there have been challenges with applicants meeting some of those milestones. As a result, some of those schedules may not be met. I think that is part of this process.

I think as the Chairman has indicated several times, the new reactor licensing process was generally envisioned to have a complete design that an applicant would literally almost pull off the shelf, they would have an environmental review that was completed that they would pull off the shelf, and then they would marry those two together in a license application. In doing that, you would have a very efficient and a very orderly way to get to the resolution on the remaining issues.

Right now we are trying to do all those things at once, which is allowable under our processes, certainly. But it is a little bit more unpredictable and it has a lot more moving parts that can depend on one piece crucially. And if some of those other pieces are delayed, then we will have challenges.

Senator INHOFE. Mr. Chairman, my time has expired. But for the record, I would like to get a response from the other three, not now but for the record, as to the recommendation on that 3-year time period.

Thank you, Mr. Chairman.

Senator CARPER. And if you would all respond for the record, that would be much, much appreciated. Thank you.

[The referenced information was not received at time of print.]

Chairman KLEIN: Our current combined operating license (COL) application reviews will exceed the 3-year timeframe recommended by the National Academy of Sciences. I believe our initial reference plant COL reviews will take closer to 4 years due to the first time use of our Part 52 combined licensing process, ongoing design certification reviews, and needs for additional information. As the NRC completes its reviews of the reference plant COLs, the process

should become more efficient and move closer to the suggested 3 year timeline. We will continue to improve our process and use lessons learned to become more efficient without compromising our core values.

Commissioner LYONS: I appreciate the thought and analysis that the Academy gave to this subject. The NRC will continue to do our best to be an efficient as well as effective regulator. We have not yet issued a construction and operating license pursuant to 10 CFR Part 52, which is the focus of the Academy's recommendation. Therefore, currently we are in somewhat of a 'learn as we go' mode. The original estimates for our review schedule were based on our historical experience with 10 CFR Part 50 licensing, and we needed those estimates as inputs to our planning, hiring, and budgeting processes. However, there are a great many factors that will influence the actual schedules, not the least of which is the quality and completeness of the submitted applications. We will most certainly continue to improve our efficiency and effectiveness as we go through this process to the actual issuance of a Part 52 license.

Commissioner SVINICKI: As was experienced in the agency's license renewal reviews, over time, efficiencies can be gained through the resolution of generic issues and increased knowledge of the processes. Consequently, I expect that as applicants and the NRC staff become more familiar with the issues and challenges both technical and procedural related to reviewing new reactor applications, the agency will be better able to maximize efficiencies leading to shortened review times, while ensuring a stable and predictable process.

Senator CARPER. Senator Sanders, and we have been joined by Senator Cardin. Welcome.

Senator SANDERS. Thank you, Mr. Chairman. I have about five questions I would beg brief responses, if I could. Let me begin, Chairman Klein, with a request. The State legislature and the Governor have formed an independent panel in Vermont to try to understand how the State relates to Vermont Yankee. There is going to be a meeting tomorrow in Montpelier. There has been a request, as I understand it, from the NRC, to get a representative there to help this panel deal with very complicated issues. Can I have your commitment that you will send a representative to Montpelier tomorrow?

Mr. KLEIN. I certainly would expect, if the State would like us to be there, we will have a representative.

Senator SANDERS. I believe that is the case. Do you think, then, we can have a representative there?

Mr. KLEIN. Yes.

Senator SANDERS. Thank you very much.

Let me ask Dr. Jaczko, as I mentioned earlier, this took place last year. And this was on the front pages of every paper in Vermont, great concern, I get many, many e-mails on this issue. What was the fine that Entergy paid for this mishap? How many millions of dollars was that?

Mr. JACZKO. This did not fall under the part of our enforcement where we issued a fine. So there was no fine, I believe.

Senator SANDERS. There was no fine at all. Do you think that the American people would be a little bit surprised and concerned that

the management of a major nuclear power plant paid no fine for this mishap? Do you think they would say, gee, we think there is something a little bit strange there?

Mr. JACZKO. I think generally the public views issuing fines as synonymous with enforcement action. The staff, when they did review this, found that the licensee had not complied with some of our regulations in regard to keeping up with information in the industry about the ability of this kind of problem to fail. The enforcement action we then took was part of a process where we don't issue fines. And I think——

Senator SANDERS. Well, I would say, on behalf of many millions of people, I think they would be very surprised that a mishap of this scope ends up with no fine at all on the part of the managing company. Which raises a question also about whether the NRC in fact should be actively inspecting all aspects of a nuclear power plant, rather than just the core safety issues. That is another issue I would like to get into in the future.

Let me just raise another issue. I was glad Dr. Lyons mentioned a magic word that I don't believe had been mentioned earlier, it is called Yucca Mountain. Right now, we have a number of plants, including Vermont Yankee, which have very lethal radioactive waste which is now being deposited locally. That was never the intention.

Now, my friends may disagree with me or know more about this than I do, but I have every reason to believe, or at least strong reason to believe that Yucca Mountain as a repository for nuclear waste will never going to happen. We have spent billions of dollars on it, it will never going to happen. There are people here talking about the construction of dozens of more nuclear power plants. We don't have a place to deposit the waste. Somebody please tell me what sense that makes to the American people. Dr. Lyons?

Mr. LYONS. From the standpoint of the safe storage of spent fuel onsite, I have high confidence in dry cask storage, as does the agency.

However, I think your question is, "Is that appropriate national policy?" That is not something that the NRC should be deciding. In other words, I don't think the NRC should be deciding whether storage, albeit safe, at plants is appropriate.

Senator SANDERS. But you may have high confidence in it, and it is a technical issue which I am not prepared to argue. But clearly, that was not the original intention. The original intention was not to have dozens of locations around this Country where we are storing very lethal waste with a half-life of thousands of years.

Mr. KLEIN. Let me just comment. The Nuclear Regulatory Commission just received the application for Yucca Mountain, and we will go through a technical review.

Senator SANDERS. It will go through a technical review. But I happen to know both Senators from Nevada who are not terribly sympathetic about that application.

Let me ask my last question. We have heard, staff told me that at a meeting with the NRC it is projected that the cost of a new nuclear power plant could be as high as $20 billion, cost of going up. Have there been independent studies to figure out what the value in terms of energy savings or energy production would be, using that $20 billion for energy efficiency or sustainable energy?

In other words, $20 billion is a hell of a lot of money for a nuclear power plant. How does that compare to investing in energy efficiency?

Mr. KLEIN. This is not an area that as the Nuclear Regulatory Commission we would get into. We typically do not put a lot of value on economics and where people should invest money. Our charge is safety, security, protecting people and the environment. So that is not our area. While we may have opinions personally, it is not something that the NRC does.

Senator SANDERS. Am I correct in understanding that a new nuclear power plant could cost as much as $20 billion? Is that within the ball park?

Mr. KLEIN. I have not heard numbers that high.

Senator SANDERS. Anyone else want to comment on that? Dr. Jaczko.

Mr. JACZKO. Generally there would be estimates, I would say, of anywhere from $6 billion to $10 billion right now, depending on the size, for a single unit. So a site that might have two units could get into that.

Senator SANDERS. Six to ten for a single unit is what we are hearing?

Mr. JACZKO. Yes.

Senator SANDERS. Dr. Lyons.

Mr. LYONS. Again, I would agree with the Chairman, that is simply not our business. Our focus has to be on the safety, not on the cost.

Senator SANDERS. Fair enough. But it is our business, $20 billion or $10 billion is a heck of a lot of money. We have to make sure that we are investing it in the best way in terms of energy in America, whether it is efficiency or producing new types of energy. That is my only point.

Thank you, Mr. Chairman.

Senator CARPER. That is a good question to ask, and it is one you may want to consider offering to our next panel.

I think Senator Craig is next, if I am not mistaken, then to Senator Cardin and Senator Isakson.

Senator CRAIG. Mr. Chairman, thank you very much, and to all of you again, thank you for your responses to the different Senators. I will try not to travel the same track, so Dr. Lyons, I will go directly to you and comments you made about NGNP and the ability to handle that licensing process in a responsible way.

As you know, we are now looking at the possibility of creating an Advanced Reactor Office, legislating that. We are working inside the Energy Committee now to look at that reality. The President's budget has about $4 million in it that deals with new advanced design high temperature gas reactors. If you visit with me and all of you commissioners certainly could respond, I think I share your concern about doing it right, obviously, and doing it in a timely fashion. It has a broader scope than just licensing for application in this Country. I have spent a good number of years looking at it, in fact, legislated it in part into being because of its flexibility, its safety, what it can do beyond light water. Modularizing it, shaping it to different loads, being able to possibly produce hydrogen, being able to produce processed heat at reasonable cost from smaller

units to chemical facilities and all of that kind of thing in a futuristic approach.

Is it reasonable to assume that you can get your work done with the talent that has been historically focused on light water? Do we need to create an Advanced Reactor office within the NRC that brings that kind of talent and focus to the new concepts? While I am not suggesting that those who look at current light water designs are not flexible, I am saying, I think I am trying to gather from your comments that we need to look at it in a different way. Make your comments in relation to what I have just said, if you would, please.

Mr. LYONS. Senator Craig, I think speaking for myself, at least, I think the Commission would certainly look to guidance from Congress if it wishes to create an Advanced Reactor office. I personally don't think that is essential. I believe that within the existing New Reactor Office there already has been considerable thought given to how we would move forward with licensing of the NGNP. And as I mentioned, I believe it is in the Chairman's written statement, that we will provide a joint strategy with DOE as demanded by the Energy Policy Act of 2005, a joint strategy to work toward the licensing and the research that is required. That would be accomplished whether or not we had a separate Advanced Reactor office. I personally don't feel strongly that is necessary.

Senator CRAIG. OK. Yes, Kristine.

Ms. SVINICKI. Senator Craig, I would support the answer that Commissioner Lyons gave, in that I don't know that a new organization within the NRC would cure the challenges related to this. I think what Commissioner Lyons was expressing in his opening statement, and he can modify this if it is not correct, is that just as we are discussing today an agency that wants to posture itself and lean forward into new reactors, whether that be NGNP or commercial applications, what does that take? It takes a lot of preparatory activities. For a technology such as NGNP that the agency will not have licensed before, is not likely to have licensed before, we need to be able to have the resources to do that.

Now, Congress did foresee NRC's role in legislating the NGNP project. All appropriations, I would note, go to the Secretary of Energy. So the NRC receives its resources as a flow-through. So Congress was forward-looking on that, but we need to maintain a cognizance that we are receiving our resources in order to do that at the discretion of DOE.

Senator CRAIG. OK. Further comments on this discussion?

Mr. KLEIN. I think the comments that Commissioners Lyons and Svinicki both made are really appropriate. What we need to do is work parallel with the Department of Energy to establish a regulatory framework, as these new technologies come forward. We have this minor problem called budgets since we capture about 90 percent of our budget through fees to licensees. So for us, we believe that we should start in parallel, so as the Department of Energy is coming up with new technologies, we need to be working with them, not wait until they have an answer, so that we can do the preparation of our staff, determine the regulatory requirements in process.

But for us, it will come back to budgets, so that we can hire and train those individuals for which we don't have the fee recovery.

Senator CRAIG. A followup briefly to that, then, because my time is up. So what we are hearing from you, instead of taking resources from the fees collected, appropriated dollars going to you, so that you can parallel and cooperate and work as you wish, as you need to with DOE in that relationship? Is that what I am hearing?

Mr. KLEIN. That is absolutely what I think the three of us have stated. We do need basically the consistent funding, so we can hire, train and get these individuals, so we can look at these long-term projects in parallel with the Department of Energy.

Senator CRAIG. Thank you. Thank you, Mr. Chairman.

Senator CARPER. You bet.

Senator Cardin, welcome, we are glad to see you.

Senator CARDIN. Thank you, Mr. Chairman. I would ask unanimous consent that my opening statement could be included in the Committee record.

Senator CARPER. Without objection, so ordered.

Senator CARDIN. Let me thank you very much for holding this hearing. I think it is very important. The Nuclear Regulatory Commission's work is extremely important to our Country. I have had an opportunity to see first-hand the work that is done. I thank all of you for your commitment to safety and to the community issues.

Dr. Klein, I want to concentrate on one part of your statement that has me concerned in response to Senator Inhofe's questions on resources. You State that early COL applications are unlikely to achieve the full benefits of the Part 52 process. If I understand the Part 52 process, it is to have an effective, timely and predictable process. And I want to make sure there is nothing more you need from Congress in order to achieve the full benefits of a process that will give the highest level of assurance to the public of safety and move the system as effectively and efficiently and as timely as possible to achieve the results.

So let me just ask an open-ended question. Is there anything more that we should be doing in order to make sure that the full benefits of the Part 52 process can be achieved?

Mr. KLEIN. The short answer is yes. And it has to do with space. We now have hired, as Senators Carper and Voinovich know, we have hired new people to meet this new workload. One of the challenges that we have now is that we have had to move into four rental locations. And that has a lot of inefficiencies in it. We have to duplicate security, we have to duplicate computer systems, we have to have a shuttle bus, lost time on all those activities. So I would say that there is one aspect that you could help us on, and that is consolidation of our space, so that we can all be back together.

The Kemmeny Commission made a comment after Three Mile Island, that one of the complicating factors was the fact that the NRC was located in seven different locations. We are going right back to that, because we can't seem to get consolidated. So space would help us.

Senator CARDIN. I am very familiar with that issue. Dr. Lyons.

Mr. LYONS. Senator Cardin, I certainly agree with the Chairman's comment. But I would add one more. We have provided rec-

ommended legislation to the Committee on the area of mandatory hearings. Right now, I would say there is a highly antiquated provision in the Atomic Energy Act that requires us to hold a so-called mandatory hearing in the COL process even though there is nothing contested. We have suggested that has been overtaken by many events, everything from sunshine laws to freedom of information to the FACA Committee and commission requirements that have been levied.

The idea of having a mandatory hearing when there is nothing contested is an unnecessary inefficiency.

Senator CARDIN. Is there agreement on that?

Mr. JACZKO. Senator, I respect Commissioner Lyons' views on that, but I don't agree that the mandatory hearing would play little if any role. There is the potential that with these new reactor proceedings, there may not be a contested issue. As a result, if we eliminate the mandatory hearing provision, there would be no formal hearing at all on the licensing process.

I think sometimes we place too much of a burden on the public to generate issues. It is not the responsibility, necessarily, of intervenors to come up with every possible issue. And if they happen to not have tremendous resources, they may focus on one or two issues. Those may not turn out to be the issues of most significance in a hearing process.

So simply relying on the issues that are brought by intervenors I think is not necessarily the measure of whether or not a hearing should happen.

Senator CARDIN. Let me just make sure I have it straight, here. As far as the space efficiency issue, is there any disagreement that space efficiency is an issue that is affecting the compliance with the new procedures? Everybody agrees with that.

On the hearing issue, I hear there is disagreement. Are there any other matters that you want Congress to do to make it more likely that the benefit of this process can be achieved?

Mr. KLEIN. It would help to have timely budgets.

Senator CARDIN. That is beyond any of our—now you have gone too far.

[Laughter.]

Senator CARDIN. Let's get realistic here.

Mr. JACZKO. Senator, if I could add one other point, too. One issue that I think might be helpful is a reexamination of some of the deadlines that were put into the Energy Policy Act. For several of the incentives and the benefits, there are milestones and deadlines. In my view, some of those milestones and deadlines have certainly, I think, achieved their goal, which is to stimulate and generate interest in the industry to submit applications and to submit filings. But one of the downsides of that has been a rush of applications and a rush of filings to meet those milestones. And revisiting some of those milestones may in fact I think actually enhance the process, because it will provide more breathing room for applicants to come to us when their applications are really complete and really ready, and allow us to work through a number of applications in a more focused or smaller number in a more focused way to get those done in a timely and predictable manner, and demonstrate how the process can work.

When I first came to the Commission in 2005, there was talk of two applications. And now we are talking about, over the next several years, 20 some applications for 30 units. A lot of that is driven, the timing is driven by some of those milestones in the Energy Policy Act incentive.

So revisiting those I think could help to alleviate some of that initial crunch.

Senator CARDIN. Mr. Chairman, could I ask that you review the two points that have been raised here about perhaps unnecessary hearings and also the limits, times that are in the law? And if there is a consensus recommendation that would help streamline the process, I think we would welcome receiving that information.

Mr. KLEIN. We will send you something in writing.

Senator CARDIN. Thank you. Thank you, Mr. Chairman.

Senator CARPER. Yes, if you will make that available to the full Committee and Subcommittee, that would be terrific.

[The referenced information was not received at time of print.]

Senator CARPER. All right, Senator Isakson.

Senator ISAKSON. Thank you, Senator Carper.

I am sorry the picture is gone, but Dr. Jaczko, you seem to be familiar with that incident.

Mr. JACZKO. I think we all are, Senator.

Senator ISAKSON. OK. Nobody has told, I don't know what that incident was? What was I looking at? What actually happened?

Mr. JACZKO. That was a bank of cooling towers which are used at the Vermont Yankee Nuclear Power Station to help reduce the temperature in the water, so that it can be discharged to a local river, I believe, in order to meet environmental constraints on the operation of the plant.

Senator ISAKSON. Was that either a safety or an environmental threat?

Mr. JACZKO. Certainly it poses the potential for the licensee to exceed their permitting requirements on the environmental side.

Senator ISAKSON. For discharge?

Mr. JACZKO. For discharge, exactly. Now, they reduced power as a result of that, so that they would stay within their limits. So as a result, they actually had to go down in power to maintain their allowable levels of discharge.

Mr. KLEIN. There is one cell that is safety-related, but only one cell. The affected unit was not a safety cell. And I think one of the difficulties we have had explaining this is obviously that is a very graphic picture. But for us, it is not a safety-related issue. As Commissioner Jaczko indicated, the company had the power down so they did not exceed their temperature limits. But it was not a safety issue for the reactor.

Senator ISAKSON. For the record, I just thought the record ought to reflect, I thought I heard you saying it in your answer, Mr. Jaczko, this was not a safety or environmental violation, which is why it didn't rise to the level of a fine.

Mr. JACZKO. Certainly I wouldn't say that it wasn't, well, in the end, though, the licensee didn't violate their environmental provisions, because they did reduce power. But that is a required system to meet environmental protection issues.

Senator ISAKSON. I understand. I think that needs to be in the record.

Not to pick on you, Dr. Jaczko, but you made a comment about activity. I understand Dr. Klein's statement about a CR and the budgetary constraints that you have. But I heard you say there may be, you used the word may, a statutory prohibition for a new activity under a CR. And I read this graph here that my staff has provided me with, where you have 13 pending applications and are anticipating 9 or 10 or 11 more. Those 9 or 10 or 11, then, if they came in during a CR, are you saying that would be a new activity, therefore you would be statutorily prohibited from beginning the process?

Mr. JACZKO. That is a question that I have had discussions with the staff about. I don't have yet a complete answer, but I think it is one that—I don't think, in my view, that is the intention of what a new activity would be defined as. It may be just a requirement that we have to adhere to.

Senator ISAKSON. Thank you. I would just suggest to the Chairman, that seems like a technicality we need to correct. Because I understand the CR problem, but I don't understand an application actually being prohibited just because you are under a CR.

Dr. Klein, did you say 90 percent of your budget comes in terms of fees from the industry you regulate?

Mr. KLEIN. Yes. In the late 1990's, it was changed from 100 percent fee recovered to 90 percent fee recovered. So all of our licensees pay for our services.

Senator ISAKSON. I think that is important for us to note in this whole CR question, too, of course, it ultimately always is taxpayers' money, whether the utility is paying it, they got it from the taxpayer, or the taxpayer does.

Mr. KLEIN. A lot of these are ratepayer dollars, as opposed to taxpayer dollars.

Senator ISAKSON. Well, ratepayers are generally, not always, but——

[Laughter.]

Senator ISAKSON [continuing].—generally are taxpayers.

Dr. Lyons, you responded on Yucca Mountain, or were in part of that discussion. I will close with this, Mr. Chairman. I understand the controversy at Nevada. I understand the controversy anywhere when you are talking about storing nuclear waste.

But as I understand it, the French process of recycling reduces spent nuclear fuel from nuclear reactors by 90 percent. Is that a proper understanding?

Mr. KLEIN. That is a general rule of thumb. It may not always be 90, but it is significant.

Senator ISAKSON. I think it is important to understand. The members from South Carolina and Georgia have gone to Secretary Bodman extensively over the last few years, as the Savannah River site has ratcheted down in terms of its workload. There is a site that has built the nuclear warheads for our arsenal for I guess 40 or 50 years, has been environmentally totally safe the entire time. In fact, the university system of Georgia has an environmental laboratory that has monitored for decades.

It would seem like although you regulate and don't advocate, it would seem like a MOX facility to reprocess spent fuel and reduce the waste by 90 percent would be something we ought to be investigating as a Nation. I would appreciate, Dr. Lyons, your comment on that.

Mr. LYONS. Speaking from the NRC's perspective, our focus has to be on the safety of whatever is proposed. Speaking as an individual, I do believe that reprocessing is a better approach for the Nation in terms of a spent fuel management overall strategy.

Senator ISAKSON. Do any of the commissioners disagree with that statement?

[Negative responses.]

Senator ISAKSON. Thank you very much, Mr. Chair.

Senator CARPER. And thanks for asking that question.

One more round, and then we will excuse this panel.

The NRC does not require a public hearing, and I think this, we actually started getting into this with one of Senator Cardin's questions. So I am going to followup to that. The NRC does not require a public hearing for plant renewal unless a contention is filed and admitted by the NRC's Atomic Safety and Licensing Board. If you feel it is important to have a mandatory public hearing for new plant licenses, why not for license renewals? You talked a little bit about this, but I want to get back to it.

Mr. KLEIN. Speaking personally, I am not really excited about mandatory hearings if there are no issues that have been brought forward. By the time a hearing or an issue has come up, we have so much dialog with the public, with the opportunity for intervention, that if there are no new issues to be addressed, I am not a supporter of mandatory hearings.

Senator CARPER. Anybody else, briefly?

Mr. LYONS. I think I already indicated my statement against the mandatory hearing.

Senator CARPER. Anyone else? Commissioner Svinicki.

Ms. SVINICKI. Yes, thank you. I didn't respond earlier. I am supportive of the Commission's legislative proposal to eliminate the mandatory hearing.

Senator CARPER. All right. Commissioner Jaczko.

Mr. JACZKO. Just to complete the set, I actually am not supportive of that provision, for the reasons I indicated. The mandatory hearing, or the hearing process, plays an important role. As I said, I think we may over-emphasize the distinction between contested and non-contested. Contested simply means that intervenors have come forward with specific issues. But I certainly would not want to say today that we are dependent upon intervenors to identify what the problems are with any application. The hearing serves as an opportunity for the Commission itself to formally review the application, to formally review the decisions that the staff has made. It provides licensing boards an opportunity to review the decisions and determinations of the staff.

So it serves an important oversight and management function on the part of the Commission, whether there are contested issues or not. So I think eliminating that mandatory hearing provision is tantamount to eliminating the hearing provision. I don't know that I am comfortable with that at this point.

Senator CARPER. So out of the four commissioners, three of you believe that if there is not a contentious issue that is being raised, at least for the license renewals, that a public hearing is not appropriate. But I believe you all feel that whether there is a contentious issue or not, on a new application, there has to be a hearing or series of hearings, is that correct?

Mr. KLEIN. We have a lot of public dialog, a lot of public comments. We expect early on that we will have contested issues and we will have hearings.

Mr. LYONS. And I do not support mandatory hearings for new plants. I concur with the Chairman that there are many, many opportunities for public input, public involvement, and, as I stated earlier, there are a number of pieces of legislation which I believe have provided many more opportunities for public input and public knowledge, which in my mind no longer require the mandatory hearing for the new plant.

Senator CARPER. Very briefly, please.

Mr. JACZKO. If I could just very briefly refer to one comment the Chairman made. With regard to the safety review that the Commission conducts, there is no opportunity for public hearing. We have opportunities for public hearing on the environmental provisions. The only opportunity for public participation on the safety review is through the hearing process.

Senator CARPER. All right, thank you.

For the renewal license hearings, public groups claim that the NRC provides legal support for the industry. Is that true? I'll State it again. For the renewable license hearing, some public groups claim the NRC provides legal support for the industry. Is that a true assertion?

Mr. KLEIN. I don't believe we provide legal support for the industry. We provide legal support for ourselves. But the industry should pay their own bills.

Senator CARPER. There is a member of your staff right over your right shoulder who is nodding her head no. Is that your legal counsel?

Senator CARPER. That is our General Counsel.

Senator CARPER. All right, fair enough. Does anyone else want to respond to that assertion?

Mr. JACZKO. That may be in reference to some of the confusion about how our hearing process works. Because we generally have three parties involved, usually the applicant, the staff and then individuals who raise concerns. And often, by the time we actually get into many of the arguments and the discussions in the hearing process, the staff has done a lot of their review of the application. So the staff positions are often consistent with the positions of the applicant. So sometimes intervenors get the impression that there is a level of working together there that isn't necessarily always the case. But it does pose a challenge, I think, from a perception issue and from a communication issue.

Senator CARPER. Thank you. One more on waste confidence. Senator Voinovich had written to the Chairman of the NRC on the waste confidence rule. But waste confidence is crucial for the health for the health of this industry. Where is the Commission in

the waste confidence rule process, and when do you think it will be finalized?

Mr. KLEIN. We received some information from our trusty Office of General Counsel, behind me, from the staff on recommendations and ways forward. We hope to have a decision on that soon. It is very likely that it will be within the next 2 weeks or less. And we will likely address it through a rulemaking process. We have a few technicalities to address.

I think the important part is to note that dry cast storage is safe. We have a lot of confidence in that. I do believe that as we move forward, it is very important that there is an agreement between the Department of Energy and the utilities for these new plants, so that it will give us as a Commission more confidence that there is a final path forward for those new plants.

Senator CARPER. Does anyone else want to comment? No. OK.

Senator Voinovich.

Senator VOINOVICH. I would just like to point out a couple of things and then ask a question. When the EPA did the analysis of the Lieberman-Warner-Boxer bill, they claimed that in order for them to meet the caps that they specify in the application that there would have to be 150 new plants built by 2050. When the Energy Information Agency looked at the same thing, they came back and said, 65 plants by 2030. We have heard a lot today about the timing it will take in order to move these along. But from a practical point of view, first of all, what are the chances of getting 65 new facilities by 2030, No. 1 and No. 2, even if these applications move through the process, when do you predict that they would come online, which is another issue that people are concerned about?

And the third question really is one that we have been working on for a long time, and that is the issue of security. As we have had these hearings, I have urged the Commission to get more into actually safety, the safety culture, the regimen, the standards that are being implemented at the various reactors, and where have you gone in terms of improving upon that aspect of this? Because prior to this, it seemed that they let the issue of safety culture within the framework of the people that were operating these facilities, and there wasn't any kind of standards that you applied to determine whether or not safety, in effect, was something that was being done at these facilities.

Mr. KLEIN. I will take those in order.

I believe, whether we could have 65 plants online by 2030 is more of an infrastructure issue, rather than a regulatory issue. As I have said before, I don't believe the NRC will be a bottleneck in this process. We intend to be responsive with our obligation of safety and security, but also meeting appropriate milestones. So I think the number of plants that could be available by any given date will probably hinge more on manufacturing, construction and other talents, not the regulator.

In terms of reactors coming online, it is reasonable to believe that if applications come in on time, and we are able to receive requests for additional information, I believe it is reasonable to assume that new plants should be running in the 2016 to 2017 timeframe. And again, the number of those that are in operation prob-

ably depends upon the contracts that the utilities will be able to enable them to actually build. Again, I don't believe they will be limited by the Nuclear Regulatory Commission.

And then to your final question on safety culture. Safety culture is extremely important, as Davis-Besse pointed out. We have two pilots underway with utilities to look at how do you measure, how do you encourage safety culture internally. We are also looking at a safety culture internal. In other words, we should hold ourselves as accountable as those we regulate, so we are looking at a safety culture within the NRC.

The challenge with the safety culture is, how do you measure it? What are your metrics? So you often end up measuring surrogates in terms of, do people have the ability to raise issues without retribution? Is there an open communication channel? Things of that nature. So a safety culture is something that we are focused on. We have pilots. But we haven't, as an industry, and we don't know of any industry that really has a good metric on how do you measure safety culture. But we are trying to find it.

Senator CARPER. Thank you. And I would urge you to continue that search. My hope is that you will find it and put it to good use.

We appreciate very much your being here today and thank you for your testimony. Thank you for your response to our questions. Thank you for the leadership that you provide for our Commission.

I want to say before you leave, what you are doing is just enormously important to our Nation. We face this huge and growing reliance on foreign energy. A lot of it is controlled by people who don't like us very much. I am convinced they are using our money to hurt us. And we have grave threats to our environment, really to our world by virtue of global warming, and enormous threats to our health, especially for us who live on the east coast, because we are at the end of the tailpipe when it comes to sulfur dioxide, nitrogen oxide and mercury. And nuclear energy is certainly not the sole answer, there is no silver bullet here. My colleagues have referred to any number of other things that we need to do, including renewable energy, efficiencies and conservation. There are plenty of other things we can and need to do all at once. But what you are doing is an enormously important part of the solution to get us out of the mess that we are in and right back on the right track.

So thank you very much. Continue to be ever vigilant. Thank you.

We will call our second panel. A vote has been scheduled for 12:15 on an amendment by one of our colleagues to the global AIDS bill. And I will just ask my colleague, Senator Voinovich, how you would feel about heading over to the floor maybe just before 12:15, so we can go ahead, introduce this panel, they can begin and when you return, I can go vote. That way we won't waste any time.

Senator VOINOVICH. That is fine.

Senator CARPER. OK, thanks.

Gentlemen, welcome. We are delighted that you are here on this panel. Hubert T. Bell, Inspector General of the Nuclear Regulatory Commission. Who appoints you, if you don't mind my asking? Who is the appointing authority for the Inspector General at the NRC?

Mr. BELL. I am nominated by the President, confirmed by the Senate.

Senator CARPER. I see. Thanks very much.

David Christian, Mr. Christian, thank you very much. Nice to see you. President and Chief Nuclear Officer at Dominion.

And I hope I don't mangle this name too much. Is it Pietrangelo?

Mr. PIETRANGELO. Correct, sir.

Senator CARPER. Mr. Anthony R. Pietrangelo, Vice President for Regulatory Affairs at the Nuclear Energy Institute.

Mr. Richard Webster, Legal Director of the Eastern Environmental Law Center. Thank you for joining us today.

Dr. Joseph Romm, Senior Fellow at the Center for American Progress.

And finally, H. John Gilbertson, Jr., the Managing Director at Goldman Sachs and Company.

We are delighted that you are here. We welcome your participation. We are going to try to keep this rolling, even during the course of this vote. We all have roughly 5 minutes to speak, then we will followup with questions. We are happy that you are here and look forward to continuing this conversation with you right now.

Mr. Bell, you are up first. Your entire statement will be made part of the record. If you could summarize and keep it to about 5 minutes, please.

STATEMENT OF HON. HUBERT T. BELL, INSPECTOR GENERAL, NUCLEAR REGULATORY COMMISSION ACCOMPANIED BY: ANTHONY LIPUMA, DEPUTY ASSISTANT INSPECTOR GENERAL FOR AUDITS; GEORGE MULLEY, SENIOR LEVEL ASSISTANT FOR INVESTIGATIVE OPERATIONS

Mr. BELL. Thank you, Mr. Chairman, members of the Subcommittee. It is a pleasure to appear before you today.

I am accompanied today by Mr. Anthony Lipuma, Deputy Assistant Inspector General for Audits, and Mr. George Mulley, Senior Level Assistant for Investigative Operations.

As you know, the mission of the Office of the Inspector General at the Nuclear Regulatory Commission is to assist the Nuclear Regulatory Commission by assuring integrity, efficiency and accountability in the agency's programs. My office carries out this mission by independently and objectively conducting and supervising audits and investigations related to NRC's programs and operations, preventing and detecting fraud, waste and abuse and promoting economy, efficiency and effectiveness in NRC's programs and operations.

Over the past year, my office has issued three reports pertaining to the NRC's licensing and relicensing processes for operating nuclear power plants. These reports identify shortcomings relative to the agency's review process. I would like to talk today about two of the reports, each of which focused on NRC's license renewal program.

The first report, Audit of NRC's License Renewal Program, assessed the effectiveness of NRC's nuclear reactor license renewal safety reviews. These reviews are conducted by NRC's license renewal staff and focus on how licensees manage adverse effects of aging to provide reasonable assurance that plants will continue to

operate in accordance with the current licensing basis for the period of extended operations.

The OIG audit found that NRC has developed a comprehensive license renewal process to evaluate applications for extended periods of operation, however, OIG identified areas where improvements would enhance program operations.

One area identified as needing improvement pertained to license renewal reporting. Auditors found that NRC staff did not consistently provide adequate descriptions of review methodology or support for conclusions in license renewal reports, because NRC has not established a report quality assurance process to ensure adequate documentation. In 42 percent of the cases reviewed, OIG found identical or nearly identical word for word repetition of the licensee's renewal application text in the NRC Review Team inspection and safety evaluation reports. The lack of precision in differentiating quoted and unquoted text made it difficult for a reader to distinguish between the licensee-provided information and NRC staff independent assessment methodology and conclusion. As a result, those who read the report could conclude that regulatory decisions are not adequately reviewed and documented.

As a follow on to the audit of the NRC's license renewal program, OIG issued sent a report to the Chairman of the NRC addressing concerns raised regarding the extent of the NRC staff review of license renewal applications. For this report, OIG's investigative unit conducted a review of NRC staff's preparation of license renewal safety evaluation reports that documented NRC assessments of license renewal applications for four nuclear power plants (Browns Ferry, Brunswick, D.C. Cook, and Oyster Creek). OIG determined that the license review staff conducted headquarters and onsite reviews of license renewal application materials. Staff used professional judgment to determine the extent of their onsite review of licensee documents and the number and nature of questions they posed to licensee staff and requests for additional information.

OIG determined that between 70 and 90 percent of the NRC review of license renewal applications was performed onsite. The results of the onsite reviews were documented in license renewal audit reports. Based on information developed by the staff during its headquarters and onsite review activities, as well as written responses to NRC questions and clarifying discussions held with the licensee, NRC reviewers submitted their formal input to be used as the basis for a Safety Evaluation Report.

The OIG report to the Chairman noted that NRC onsite license renewal audit reports are summary in nature. These reports document the findings of the NRC onsite review and provide support for the NRC conclusion in Safety Evaluation Reports. The audit reports also list the licensee documents that were reviewed during the NRC onsite reviews.

Additionally, based on our review of NRC work hour data, OIG noted that significant numbers of hours were used by the NRC staff in their review of the license renewal applications for the four power plants reviewed by OIG. However, during its review OIG learned that as a standard practice the NRC staff does not preserve as permanent records copies of all licensee documents reviewed onsite or their own working papers, for example, inspector

notes. These documents provide additional direct support of the specifics of the NRC onsite review. The lack of licensee documents and NRC working papers made it difficult for OIG to verify specific details of the staff onsite review activities.

In response to the OIG audit recommendations pertaining to license renewal reporting, NRC has proposed or taken specific actions intended to impose standards for report writing and ensure consistent implementation of license renewal reviews. These actions include updating report writing guidance and developing associated training to convey report writing standards for describing the license renewal review methodology and providing support for conclusions and license renewal reports and implementing an enhanced report review process.

OIG is currently assessing NRC's proposed and completed actions to determine whether the actions meet the intent of the recommendations. As resources permit, my staff will continue to conduct audits related to nuclear power industry licensing during Fiscal Year 2009 and beyond. Audits will assess such areas as NRC's quality assurance planning for new reactors, the agency's readiness to oversee the construction of new nuclear power plants, NRC's vendor inspection program and other key issues pertaining to new reactor licensing, as well as the licensing of Independent Spent Fuel Storage Installation.

Mr. Chairman, and members of the subcommittee, this concludes my report to you on my Office's recent activities pertaining to NRC's licensing and relicensing processes for nuclear power plants.

[The prepared statement of Mr. Bell follows:]

STATEMENT FOR THE RECORD

BY THE

OFFICE OF THE INSPECTOR GENERAL

U.S. NUCLEAR REGULATORY COMMISSION

TO THE

SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

U.S. SENATE

FOR THE OVERSIGHT HEARING ON NRC'S LICENSING AND RELICENSING PROCESS

FOR NUCLEAR PLANTS

SUBMITTED BY

HUBERT T. BELL

INSPECTOR GENERAL

JULY 16, 2008

STATEMENT FOR THE RECORD

Introduction

Mr. Chairman and members of the Subcommittee, it is a pleasure to appear before you today. I am accompanied today by Mr. Anthony Lipuma, Deputy Assistant Inspector General for Audits, and Mr. George Mulley, Senior Level Assistant for Investigative Operations.

As you know, the mission of the Office of the Inspector General (OIG) at the Nuclear Regulatory Commission (NRC) is to assist NRC by ensuring integrity, efficiency, and accountability in the agency's programs that regulate the civilian use of byproduct, source, and special nuclear material in a manner that adequately protects public health and safety and the environment, while promoting the Nation's common defense and security. Specifically, OIG supports NRC by carrying out its mandate to (1) independently and objectively conduct and supervise audits and investigations related to NRC programs and operations; (2) prevent and detect fraud, waste, and abuse; and (3) promote economy, efficiency, and effectiveness in NRC programs and operations. OIG also keeps the NRC Chairman and members of Congress fully and currently informed about problems, recommends corrective actions, and monitors NRC's progress in implementing those actions.

Background

To perform these activities, OIG employs auditors, analysts, criminal investigators, technical experts, legal counsel, and support personnel. OIG also uses private sector contractors to audit the NRC's financial statements as mandated by the Chief Financial Officers Act and for other audit, investigative, and information technology technical support services.

To fulfill our audit mission, OIG conducts performance, financial, and contract audits. Performance audits focus on NRC administrative and program operations and evaluate the effectiveness and efficiency with which managerial responsibilities are conducted and whether the programs achieve intended results. Financial audits attest to the reasonableness of NRC's financial statements. Contract audits evaluate the cost of goods and services that NRC procured from commercial enterprises. In addition, the audit staff prepare evaluation reports that present OIG perspectives or information on specific topics.

OIG's investigative program carries out its mission by performing investigations relating to the integrity of NRC programs and operations. Most OIG investigations focus on allegations of fraud, waste, and abuse and violations of law or misconduct by NRC employees and contractors. Additionally, OIG investigates allegations of irregularities or abuses in NRC programs and operations with special emphasis on those activities that could adversely impact public health and safety. Periodically, the investigative staff conducts event inquiries, which yield investigative reports documenting the examination of events or agency regulatory actions that do not specifically involve individual misconduct. Instead, these reports identify staff actions that contributed to the occurrence of an event.

Over the past year, my office has issued three reports pertaining to NRC's licensing and relicensing processes for operating nuclear power plants. These reports identify shortcomings relative to the agency's review process. Following are summaries of the three reports.

Reports Issued

Audit of NRC's License Renewal Program

(Issued: September 6, 2007)

NRC regulations limit the term of an initial nuclear reactor operating license to 40 years. However, the regulations also allow a license to be renewed for an additional 20 years. NRC published requirements for license renewal in the *Code of Federal Regulations* (CFR). 10 CFR Part 54[1] was amended in 1995 to concentrate NRC's reviews on how licensees manage adverse effects of aging to provide reasonable assurance that plants will continue to operate in accordance with their current licensing basis for the period of extended operations. OIG initiated this audit to determine the effectiveness of NRC's license renewal safety reviews.

OIG auditors found that NRC has developed a comprehensive license renewal process to evaluate applications for extended periods of operation; however, OIG identified areas where improvements would enhance program operations. Specifically,

License renewal reporting efforts need improvements. NRC staff do not consistently provide adequate descriptions of review methodology or support for conclusions in license renewal reports because NRC has not established a report quality assurance process to ensure adequate documentation. In 42 percent of the cases reviewed, OIG found identical or nearly identical word-for-word repetition of the licensee's renewal application text in the NRC review teams' review, inspection, and safety evaluation reports. The lack of precision in differentiating quoted and unquoted text made it difficult for a reader to distinguish between the licensee-

[1] 10 CFR Part 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants.*

provided information and NRC staff's independent assessment methodology and conclusion. As a result, those who read the reports could conclude that regulatory decisions are not adequately reviewed and documented.

Guidance for removing licensee documents obtained during site visits could be clarified. OIG found inconsistencies in the guidance provided to NRC's license renewal staff with regard to removing licensee documents obtained during site visits. NRC license renewal review teams should collect and document the information they review during site visits. However, these NRC teams are prohibited by their management from removing licensee documents from the licensee's site, which makes it more difficult for license renewal staff to write their reports. In contrast, NRC regional inspectors are permitted to remove documents from the site during license renewal inspections.

Consistent evaluation of operating experience would improve NRC reviews. NRC license renewal review team members do not consistently review or independently verify licensee-supplied operating experience information. This is because NRC program managers have not established effective controls to standardize the conduct and depth of such reviews. Consequently, NRC license renewal review team members may not have adequate assurances that relevant operating experience was captured for NRC's consideration in the licensee's renewal application.

More attention is needed to planning for post-renewal inspections. Post-renewal inspections are considered vital to ensure that licensees adhere to commitments made for license renewal. However, the agency has only recently focused its attention on developing and overseeing details associated with these inspections, resulting in post-renewal inspections sometimes not being conducted. Inadequate planning increases the risk that licensees could

enter into the extended period of operation without being in full compliance with license renewal terms, inspections will be inconsistently implemented, and inspection and technical support resources will be unavailable when needed.

License renewal issues need evaluation for backfit application. When NRC imposes new staff positions resulting in new license renewal review standards, a documented justification is required pursuant to the backfit rule. However, new license renewal review standards have not followed NRC's backfit policy because NRC does not have a mechanism or methodology to trigger such a backfit review. Furthermore, the organizational accountability for these documented justifications has not been clearly established. Consequently, the use of different license renewal review standards without a backfit justification may result in an appearance that previous approval standards were inadequate, stakeholders questioning continually changing review standards, and licensees managing aging effects differently from plant to plant.

Agency Actions:

In response to the OIG audit recommendations, NRC has proposed or taken specific actions intended to impose standards for report writing and ensure consistent implementation of license renewal reviews. OIG is currently assessing the NRC's proposed and completed actions to determine whether the actions meet the intent of the recommendations. These actions include updating report writing guidance and developing associated training to convey report writing standards for describing the license renewal review methodology and providing support for conclusions in license renewal reports, implementing an enhanced report review process, developing guidance on removing documents from licensee sites, providing additional guidance and management controls to standardize the conduct and depth of license renewal operating experience reviews, and completing revisions to post-renewal inspection guidance. In addition,

the Commission reviewed and reaffirmed an earlier position that backfit does not apply to license renewal applications.

As a follow on to the *Audit of NRC's License Renewal Program*, OIG issued a report to the NRC Chairman.

Report to the Chairman: NRC Staff Review of License Renewal Applications (Issued May 2, 2008)

To address concerns raised regarding the extent of the NRC staff review of license renewal applications, OIG's Investigative unit conducted a review of NRC staff preparation of license renewal Safety Evaluation Reports that documented NRC assessments of license renewal applications for four nuclear plants (Browns Ferry, Brunswick, D.C. Cook, and Oyster Creek). The review focused on two Aging Management Programs for each plant.

OIG determined that the NRC license review staff conducted headquarters and onsite reviews of license renewal application materials. OIG also learned that the staff used professional judgment to determine the extent of their onsite review of licensee documents and the number and nature of questions posed to the licensee staff in *Requests for Additional Information* (RAIs). OIG determined that between 70 and 90 percent of the NRC review of license renewal applications was performed onsite. The results of the onsite reviews were documented in license renewal audit reports. Based on information developed by staff during its headquarters and onsite review activities, as well as written responses to the RAIs and clarifying discussions held with the licensee, NRC reviewers submitted their formal input to be used as the basis for a final Safety Evaluation Report.

OIG noted that the Safety Evaluation Reports are summary in nature as are the NRC license renewal audit reports. These audit reports document the findings of the NRC onsite review and provide support for the NRC conclusions in Safety Evaluation Reports. The audit reports also list the licensee documents that were reviewed during the NRC onsite reviews. Additionally, NRC work hour data examined by OIG indicated that significant numbers of hours were used by the NRC staff in their review of the license renewal applications for the four power plants reviewed by OIG.

However, during its review OIG learned that as a standard practice the NRC staff does not preserve as permanent records copies of all licensee documents reviewed onsite or their own working papers, for example, inspector notes. These documents provide additional direct support of the specifics of the NRC onsite review. The lack of licensee documents and NRC working papers made it difficult for OIG to verify specific details of the agency's review activities.

Audit of NRC's Power Uprate Program

(Issued: March 28, 2008)

Power uprate is the process for increasing the maximum power level at which a commercial nuclear power plant is authorized to operate. Plant components must be able to accommodate any new conditions that would exist at increased power levels. In some instances, licensees will modify and/or replace components in order to accommodate a higher power level. Depending on the desired increase in power level and original equipment design, this can involve major and costly modifications to the plant. All of these factors must be analyzed by the licensee as part of an application request for a power uprate.

In order to make a change to the license of a currently licensed plant, a licensee must file with the NRC an application for an amendment that fully describes the changes desired. NRC's technical staff, legal counsel, and management are involved with the review of the application. After NRC completes its review of the application and acts on any applicable public comments, hearing requests, or Advisory Committee on Reactor Safeguards recommendations, the agency may approve or deny the request on the basis of its findings. This process for requesting and approving such changes is specified in 10 CFR 10, Parts 50.90, 50.91, and 50.92. The overall objective of this audit was to examine the process for reviewing and approving power uprate amendment applications.

OIG auditors identified the following power uprate program matters as needing NRC management attention:

The power uprate inspection procedure has been implemented and documented inconsistently. NRC staff have an inconsistent understanding of the power uprate inspection procedure's use, implementation, and documentation, and some NRC staff are not aware of the procedure. This is because the inspection procedure lacks specification, implementation, and documentation guidance, which results in NRC's external stakeholders being unable to adequately monitor power uprate inspections.

The circulation and written quality of power uprate safety evaluations needs improvement. OIG found that not all regions and resident inspectors are aware of the recommended areas for inspection or the regulatory commitments sections in the power uprate safety evaluations due to a lack of internal controls for distributing safety evaluations. Consequently, inspectors risk developing their inspection samples and plans without knowledge of recommended inspection areas and regulatory commitments in the safety evaluation. In

addition, NRC staff noted shortcomings in the writing quality of uprate safety evaluations that could be improved by strengthening the training for writing inputs to the safety evaluation reports. Poorly written safety evaluation inputs hamper a stakeholder's ability to comprehend NRC's basis for approving an uprate application.

The power uprate coordinating function could be strengthened to ensure program success. The power uprate program does not have a formalized mission statement, defined roles and responsibilities, and adequate communication and knowledge management tools. A key reason for these shortcomings is that the agency lacks an authoritative coordinating entity to oversee the entire program. As a result, power uprate internal stakeholders are left without clear direction and oversight.

Agency Actions:

In response to the audit recommendations, the agency has proposed a number of measures intended to improve staff understanding and implementation of the power uprate activities, including updating the power uprate inspection procedure, developing guidance on communicating safety evaluations associated with power uprate approval and post-approval activities, and developing guidance that outlines roles and responsibilities and identifies a specific branch as the coordinating agent for power uprate activities. OIG is monitoring the implementation of these activities and will assess the activities to determine whether they meet the intent of the recommendations.

Future Work

As resources permit, my staff will continue to conduct audits related to nuclear power industry licensing during FY 2009 and beyond. An audit of NRC's quality assurance planning for new reactors will determine how NRC has identified and incorporated quality assurance lessons learned into their preparations for the next generation of nuclear power plants. This audit will be significant because quality assurance was a significant problem for many power plants when the first generation of plants was licensed. Another audit will evaluate NRC's readiness to oversee the construction of new nuclear power plants. It will be important to understand NRC's inspection philosophy and methodology during the new generation of plant construction. An audit of NRC's vendor inspection program will evaluate how NRC regulates the process by which new reactor licensees will acquire systems, structures, and components for new plants. For example, counterfeit and substandard parts can jeopardize plant operations and imperil public safety. Finally, an audit of NRC's oversight of Independent Spent Fuel Storage Installations (ISFSIs) will examine the agency's process for reviewing and approving ISFSIs, which generally consist of casks on a concrete pad located onsite at nuclear power plants to store spent fuel.

Summary

Since September 2007, my office has issued three reports addressing NRC's licensing and relicensing processes for operating nuclear power plants. Two reports pertained specifically to nuclear power plant license renewal applications and the third focused on licensee amendment requests for power uprates. While none of the reports describe problems with NRC's technical review of license renewal applications or the quality of the outcome, they each identify

shortcomings pertaining to inconsistent approaches to performing the reviews and failure to maintain essential supporting documentation that led to important regulatory outcomes.

Mr. Chairman, and members of the subcommittee, this concludes my report to you on my office's recent activities pertaining to NRC's licensing and relicensing processes for nuclear power plants. I would be pleased to answer any questions at this time.

Responses by Hubert T. Bell to Additional Questions
from Senator Boxer

Question 1. You mentioned in your written testimony that quality assurance was a significant problem for many nuclear plants when the first generation was being licensed and that you are planning to review the NRC's quality assurance planning for new reactors. Can you explain some of the quality assurance problems that occurred in the past and what you are planning to review?

Response. As defined in Title 10, Code of Federal Regulations. Part 50 *(10* CFR 50). Appendix B. *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants* quality assurance "comprise all those planned and systematic actions necessary to provide adequate confidence that a structure, system or component will perform satisfactorily in service."

As early as 1973, the Atomic Energy Commission (AEC) reported quality assurance problems. An AEC study found that some utilities did not know how to implement the 10 CFR 50, Appendix B, quality assurance (QA) requirements; some utilities were not philosophically committed to a high level of QA; and some utilities could not identify a significant payoff from investments of money and manpower in QA

In 1984, the Office of Inspector and Auditor (OJA) (predecessor to the Office of the Inspector General) issued a report, *NRC's Quality Assurance Inspection Program for Reactors Under Construction.* which noted many historical and ongoing problems with utilities' quality assurance programs and NRC's oversight of those programs.
Specifically:

During the past several years the NRC and the industry have witnessed severe construction problems at five units under construction. These construction problems included nonconforming structural steel welds at Zimmer; seismic design errors at Diablo Canyon; inadequate soil compaction at Midland; voids in concrete structures at Marble Hill: and design deficiencies at South Texas. The NRC staff analysis of the experience at the five problem sites resulted in the classification of three primary problem areas: 'failure of the project management team to provide adequate management controls to prevent a significant breakdown in quality from occurring; failure of the owner's quality assurance program to detect the breakdown in a timely manner and to obtain the appropriate corrective action and the failure of the NRC's programs to recognize the true extent and nature of the problems.' (Note: Zimmer, Midland, and Marble Hill were never completed.]

The 1984 OJA report also provided the statement of an NRC Commissioner before the American Nuclear Society. He said in part:

A sound and effective quality assurance program by the licensee and its contractors is especially important given our audit approach . . . we review a sampling of the licensee :s documentation. records and actual construction work in order to assess the effectiveness of the licensee's quality assurance program We do not have the capability or the resources to inspect independently all or even a major portion of the construction activities that are involved in building a nuclear power plant if the licensee s quality assurance program is flawed-if we cannot rely on it to verify the quality of plant construction and to identify and correct plant deficiencies-then this seriously hampers our ability to make the findings required to issue an operating license for the plant.

Because quality assurance is critical to the construction and operation of a nuclear
power plant throughout its life cycle. My office plans to examine the historical issues and problems with quality assurance: what the NRC has learned from these issues and problems and how it is positioning itself to avoid them when overseeing the construction and operation of future nuclear plants.

Question 2. You mention that the NRC has only recently begun to focus its attention on post license renewal inspections. It is troubling that the NRC would renew licenses and then not conduct any follow up inspections. What actions do you think the NRC needs to take to ensure licensees are adhering to the commitments they made in their license renewal application?

Response. NRC has long planned to conduct post-license renewal inspections to verify that license renewal programs and activities have been implemented in accordance with the requirements of Title 10, Code of Federal Regulations, Part 54 (10 CFR 54), *Requirements for the Renewal of Operating Licenses for Nuclear Power Plants.* These inspections are to be conducted in accordance with NRC Inspection Procedure 71003, *Post-Approval Site Inspection for License Renewal.* During the course of our audit of the agency's license renewal program, we found that NRC had not adequately prepared for these inspections, including, among other matters, the timing of the inspections. [1] The timing of the post-license renewal inspections is critical because NRC will use the results to determine whether a licensee can safely continue to operate its plant into an extended licensing period.

One of our primary concerns with regard to inspection timing is the importance of inspecting licensee commitments-including any plant modifications or tests required by the commitments-prior to the commencement of the period of extended operation. Licensees may make a number of commitments in their application to gain NRC approval, some of which are to be implemented prior to, or at the onset of, trle period of extended operation. While other commitments may be phased in at different points of time during the 20-year extended period.

The recommendation in our September 2007 report to complete the details for a revised Inspection Procedure 71003 is intended, in part, to address the lack of planning information with respect to the issue of timing in the inspection procedure. Ultimately, properly documented and communicated planning details need to ensure that NRC inspects licensee commitments prior to their implementation dates. This would help the licensee avoid being in potential non-comptiance with the conditions of NRC s approval of the renewal application

[1] At the time of our review none of the reviewed plants had entered the period of extended operation and NCR had not yet conducted any post-approval inspections.

Response by Hubert T. Bell to an Additional Question
from Senator Carper

Question. What has been the percentage of growth in NRC staff and resources compared to the percentage in growth in the Inspector General office?

Response. From FY 2006 through FY 2009 (estimate). NRC's dollar and staff resources grew by 37.5 percent and 17.2 percent respectively. In contrast, Office of the Inspector General's dollar and staff resources grew by only 8.9 percent and 4.1 percent, respectively. The following table provides the details for each fiscal year.

Fiscal Year	Agency Budget Total	FTE	OIG Budget Total	FTE	Agency $ Increase %	Agency FTE Increase %	OIG $ Increase %	OIG FTE Increase %
2006 (Enacted)	$ 733. 204.000	3.239	$ 8 308,000	49				
2007 (Enacted)	$ 816. 500.000	3.405	$ 8 360,000	49	11.4%	5.1%	0 6%	0 0%
2008 (Enacted)	$ 91(.300,000	3.676	$ 8.744.000	51	12 3%	8.0%	46'/J	4 1%
2009 (Request)	$ 1.008 000,000	3.797	$ 9 044 000	51	9 9%	3.3%	3 4%	0 0%
FY 2006 - FY 2009 Percentage Increase:					37.5%	17.2%	8.9%	4.1%

Response by Hubert T. Bell to an Additional Question
from Senator Inhofe

Question. In your review of the license renewal process, did you discover any safety- significant findings? If so, have you notified the Commission of those findings?

Response. The OIG does not and cannot make a determination of safety significance. Ultimately, the NRC and its technical experts make that determination. Our review was focused on the license renewal safety review process, including the management and oversigrlt thereof. We routinely do not attempt to assess or validate NRC's technical work or outcomes and that was also the case for our review of the license renewal process.

Our review disclosed several areas for improvement which, in our view could have implications for safety. For example, our work revealed that the operating experience at a license renewal applicant's plant is not consistently reviewed or independently verified Such independent verification would include NRC reviewers conducting independent searches of the licensee's corrective action databases to verify that the information represented in the licensee's renewal application is accurate. We reported that the corrective action program at one plant indicated that the plant's aging management program for containment coatings had not been implemented consistent with the statements in the plant's license renewal application. We briefed these findings to the agency 1n December 2006 and May 2007. Furthermore, the final report published in September 2007 was hand-delivered to NRC senior management the Chairman and each of the Commissioners.

Senator CARPER. Mr. Bell, thank you very much for your testimony.

Mr. Christian, again, welcome and please proceed.

STATEMENT OF DAVID A. CHRISTIAN, PRESIDENT AND CHIEF NUCLEAR OFFICER, DOMINION NUCLEAR

Mr. CHRISTIAN. Mr. Chairman, Ranking Member, I am pleased to be able to have the opportunity to participate today. As you mentioned, I am the Chief Nuclear Officer and President of Dominion's nuclear organization.

Dominion is one of the Nation's largest producers of energy. We operate seven reactors on four sites in three States, two sites in Virginia with two reactors each, one site in Connecticut and one site in Wisconsin. We are actively involved in the Federal process that we believe will lead to the first new nuclear unit to be built in the United States in 30 years.

I was invited here today to give you my company's opinion and experience with the new nuclear licensing process. Overall, I will say that my observations are that the Nuclear Regulatory Commission has been both professional and open in developing and implementing the new licensing process, previously referred to as the Part 52 process. Although there is still some work to be done, we believe that the goals are achievable. Continued oversight will be necessary and continued attention will be required to assure that the progress achieved through the licensing process improvements is sustained.

My basis for saying that our experience with the NRC's new licensing process is positive is that Dominion has hands-on experience with two of the three elements in the new licensing process, that being early site permitting and combined licenses, and we are actively cooperating with General Electric Hitachi Nuclear Energy on the third element, the design certification for the ESBWR, or Economic Simplified Boiling Water Reactor advanced design, a design which includes a combination of passive reactor safety designed in unit security, economic and reliable operation.

In 2002, we were the first company to begin working with the U.S. DOE on demonstrating the early site permit process. Following our submittal, an extensive NRC staff review and public input and a mandatory hearing, the NRC issued our early site permit in November 2007. On the same day that we received our early site permit, we submitted and applied for a combined operating license for a new 1,500 megawatt unit at North Anna, some 90 miles from here. Dominion's COL application was based on NRC guidance, developed with significant interactions between the public and the industry. The NRC acknowledged the quality of our application and completed its acceptance review in less than the prescribed time. The NRC is scheduled to complete its detailed reviews in August 2010.

Our assessment of the NRC's positioning is that they are prepared to handle a large, but not unlimited, number of applications from utilities and vendors. The NRC strongly encourages and encouraged the design-centered working group approach or design-centered review approach to maximize its review efficiency. Dominion supports this approach through its participation in the ESBWR

design-centered working group and its role as the lead license applicant for this design.

The NRC has taken a number of actions to prepare for new unit applications and those were enumerated in Chairman Klein's testimony.

In sum, the NRC can issue reasonable schedules when provided with quality applications that meet its requirements. What this results in is applications that are accepted in a timely manner and review schedules that are unencumbered with conditions.

The NRC, through its Office of New Reactors, is working to maintain its published schedule. In addition, much has been said here today about the efficiency of the license review process, and the timing of the license review process. It is important to remember that the concept of reviewing common issues one time for a reference application and then expecting subsequent applications to use that reference to reference the resolved issues promises to make future application reviews far more efficient.

One aspect of the combined license process which has yet to be proved is to confirm that what was built is the same as what was licensed. This final aspect is sometimes referred to as ITAAC or Inspection Test Analyses and Acceptance Criteria. These tests are conducted prior to fuel load and bringing the reactor into service. We view this will be a challenge, but we expect to resolve it in a manner that ensures public health and safety is maintained.

In conclusion, let me reiterate that our observations are that the NRC has been professional and open in developing and implementing the new licensing process. It is capable of implementing the process to license new units and the industry is capable and prepared to submit quality applications. Although there is some work still to be done to implement the new process, the goal of deploying new reactors in the U.S. appears achievable.

Thank you.

[The prepared statement of Mr. Christian follows:]

David A. Christian
President and Chief Nuclear Officer
Dominion Nuclear
Testimony before Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety
July 16, 2008

Mr. Chairman, Ranking Member and members of the subcommittee: Thank you for the opportunity to appear before you today. I am David A. Christian, President and Chief Nuclear Officer of Dominion Nuclear, a unit of Dominion Resources of Richmond, Va.

Dominion operates four nuclear generating stations in three states -- two in Virginia, and one each in Connecticut and Wisconsin. Dominion is one of the nation's largest producers of energy, with a portfolio of approximately 26,500 megawatts of generation. These generating assets include a diverse portfolio of stations fueled by uranium, coal, natural gas, oil, water and wind. Our philosophy is that a diverse mix of generating facilities is necessary in order to minimize volatility. We also believe that all forms of energy and conservation initiatives are needed to meet growing customer demands for electricity in the future.

We appreciate the support of Congress in addressing America's future energy needs by passing the Energy Policy Act of 2005. This Act encourages the development of energy facilities across the board, including incentives for new nuclear generation through federal loan guarantees for the first new units and continued funding for the Department of Energy's Nuclear Power 2010 Program. Dominion has been a participant in this program to offset our costs, working through the new NRC regulations

for licensing new nuclear units that will benefit the entire industry by providing regulatory stability for the licensing process.

I was invited here today to give you our experience with the new nuclear unit licensing process. Overall, my observations are that the Nuclear Regulatory Commission has been professional and open in developing and implementing the new nuclear unit licensing process. Although there is still some work to be done to fully implement the new licensing processes, we believe the goal is achievable. Continued attention will be needed to assure that the progress achieved through the Part 52 process improvements, the unprecedented industry commitment to standardization, and the adoption of Design Centered Working Groups and reference COL applications, is sustained.

Dominion is a leader in the nuclear renaissance.

Our involvement in the newest phase of nuclear development started at the beginning of this decade. Since 2001, Dominion has been responsive to U.S. Department of Energy solicitations involving the advancement of new nuclear generation technology. We were awarded DOE funding and completed studies to identify the issues and barriers associated with the development of new nuclear power units. We evaluated candidate sites for a new nuclear unit as well as activities, resources costs and schedule considerations associated with obtaining an Early Site Permit from the NRC. We studied the staffing, schedules, costs and eventual decommissioning of new nuclear units in the United States. We are also the recipient of

Cooperative Agreements from DOE for the Early Site Permit demonstration project and the Combined License demonstration project.

Our commitment to these programs has been significant. Dominion has received funding of up to 50 percent through the Cooperative Agreements of DOE's NP2010 program on new-nuclear related activities. Dominion has also committed toward a viable nuclear option by ordering large, long lead-time equipment such as the reactor vessel. We are now considering the construction of a third nuclear reactor at a site located at our North Anna Power Station in central Virginia, a project that would be subject to approvals including that of the Virginia State Corporation Commission.

Dominion's Experience with NRC's new licensing process is positive.

The NRC's new licensing process is found in Title 10, Part 52 of the Code of Federal Regulations, and is commonly referred to as "Part 52." Part 52 has three elements: early site permitting, design certification, and combined licenses.

An early site permit, or ESP, is intended to achieve early resolution of site safety issues, evaluate environmental impacts, and consider certain emergency preparedness issues in advance of a decision/license to construct and operate a new nuclear unit.

Design certification is intended to facilitate the NRC's safety review of advanced reactor technologies and to maintain standardization of the design once it is certified.

A combined license (COL) is intended to build on the ESP and design certification elements of Part 52. It ultimately results in an NRC approval that combines both a construction permit and an operating license. The combined license must be issued prior to beginning safety related construction.

Dominion has "hands-on" experience with two of the three elements in the Part 52 process – early site permitting and combined license – and is cooperating with General Electric-Hitachi Nuclear Energy (GEH) on the third element: design certification for the ESBWR. The ESBWR is an advanced Generation III+ design that incorporates the combination of reactor passive safety, unit security and economic, reliable operation.

In 2002, DOE expressed interest in demonstrating the NRC's ESP rules, which were ready to be used, but no company had yet done so. Dominion was the recipient of a DOE Cooperative Agreement to work through this process, with DOE providing funding of up to 50 percent. Dominion submitted an ESP application on schedule in 2003 for our North Anna site. After extensive NRC staff review, public input and a mandatory hearing before the NRC's Atomic Safety and Licensing Board, the NRC issued the early site permit to Dominion on November 27, 2007.

As a next step to further the development of new nuclear units, the DOE sought to demonstrate the NRC regulations allowing for issuance of a Combined Operating License, or COL. Dominion received a Cooperative Agreement in 2005 that provides

funding of up to 50 percent of the cost of the COL process and engineering activities necessary to prepare for construction. On the same day we received the Early Site Permit, Dominion, along with North Anna co-owner Old Dominion Electric Cooperative, filed the COL application.

This application, again submitted on schedule, is for a General Electric-Hitachi (GEH) ESBWR to be built at North Anna. The application incorporated both the ESP for the North Anna site as well as GEH's ongoing effort to certify the ESBWR design.

Dominion's COL application was based on NRC guidance developed with significant interaction with the public and the industry. The NRC acknowledged that Dominion had submitted a high-quality application. The NRC completed its acceptance review in less than the prescribed time and published a detailed review schedule. The NRC is scheduled to complete its technical review in August 2010 with a mandatory administrative hearing to follow.

In parallel with Dominion's process, GEH had applied to NRC for certification of the ESBWR in August 2005. The NRC is currently conducting its technical review of the ESBWR design. Once completed, NRC action to certify the design through rulemaking would follow and will need to be completed prior to NRC issuance of the combined license for the new North Anna unit.

Dominion's assessment is that NRC is prepared to handle a large (but not unlimited) number of early site permit, design certification, and combined license applications from utilities and vendors.

The NRC strongly encouraged the "design-centered review approach" to maximize its review efficiency. Dominion supports this approach through its participation in the ESBWR design-centered working group and in its role as the lead combined license applicant that has incorporated the ESBWR design. Others in the ESBWR design-centered working group are Entergy, Exelon, and DTE Energy. The goal of the working group is to maximize standardization, not only with respect to licensing, but for all facets of new unit construction and operation.

The NRC has taken a number of actions to prepare for new unit applications. NRC has acquired a substantial number of additional resources to support the expected licensing activity and established a new organization, the Office of New Reactors. It has revised its Part 52 regulations to reflect experience from its earlier licensing efforts under the original 1989 version of the regulation and published guidance (called Regulatory Guide 1.206) on how applicants can meet the new regulation. NRC also updated its internal guidance for conducting reviews under the new rule. The NRC established an enterprise-wide project management system to help manage its new licensing activities. It has established a new inspection resource, headquartered in Atlanta, to support the substantial inspections that must be conducted in order for NRC to ensure that its regulatory requirements are being met.

Dominion's experience with NRC has been positive and the benefits of the new licensing process are being realized. All three elements of Part 52 are currently being implemented, although some final aspects remain to be tested.

NRC requirements are adequate to ensure public health and safety. NRC's safety mandate and regulations haven't changed. Part 52 is primarily a regulation that implements a process improvement.

NRC guidance is useful and consistent with its regulations. By and large, NRC guidance is consistent with and clarifies NRC regulations. When inconsistencies or ambiguities are identified, NRC has shown a willingness to work with applicants to resolve or clarify the concern.

The NRC can issue reasonable schedules when provided with applications that meet its requirements and guidance. Dominion has demonstrated that NRC regulations can be met and NRC guidance followed. That results in high quality applications the NRC can accept in a timely manner and review schedules unencumbered with caveats and conditions.

The NRC is working to maintain its published schedule. NRC has its new enterprise-wide project management tool to more effectively allocate resources and monitor review status. More importantly, it has established a strong project management organization within the Office of New Reactors to oversee its licensing

review activities. The concept of resolving site-related issues in an ESP and standard design issues in a DCD is different from the prior licensing process. In addition, the concept of reviewing common issues once for the reference application, and then expecting subsequent applications to reference these resolved issues, promises to make future application reviews more efficient.

Part 52 is an improved process. Dominion took advantage of the early site permit feature of NRC's regulations for its North Anna site. The process resulted in early identification and resolution of issues that otherwise would have only surfaced during the subsequent combined license review and would likely have had an adverse impact at the time on Dominion's plans for acquiring a combined license for a new nuclear unit.

The aspect of the combined license process intended to confirm that "what was built" is the same as "what was licensed" is the final aspect of the Part 52 rule to be demonstrated. To its credit, the NRC has been actively working with the nuclear industry to define the "end game" element of Part 52, commonly called ITAAC, or Inspections, Tests, Analyses and Acceptance Criteria. ITAAC are key features of the design or site by which the licensee demonstrates that what was built is the same as what was licensed. This final aspect of the new rules occurs prior to actually loading nuclear fuel and starting up the new unit. This remaining aspect of Part 52 is a challenge. Dominion will work with the industry and NRC to resolve it in a manner that ensures public health and safety is maintained.

In conclusion about the new licensing process, let me reiterate our observations that the NRC has been professional and open in developing and implementing the Part 52 process. The NRC is capable of implementing the process to license new units, and the industry is capable of preparing quality applications. Although there is still some work to be done to establish processes that fully implement Part 52, it appears the goal is achievable.

I also understand that the committee is interested in the topic of nuclear unit license renewal. Dominion is a proponent of nuclear unit license renewal and, to date, has successfully renewed the licenses for six of our seven operating units.

The federal license renewal process has been extremely important for ensuring that the nation continues to benefit from the safe and reliable operation of the existing fleet of nuclear power generating units. As required by federal law, Dominion successfully demonstrated that we have programs in place to ensure that passive components and structures – such as concrete, structural steel, pipe and cable – will continue to perform their intended functions beyond 40 years. As part of this thorough process, companies must also evaluate the environmental consequences of continued operation and summarize these findings as part of its application to the NRC.

The NRC uses this information, the technical information it receives from the company, and comments from the public to issue an environmental impact statement and a safety evaluation report to determine whether the existing operating license should be renewed.

We found this process to be sound.

Thank you for your leadership, and I'll be glad to answer any questions you may have.

Responses by David A. Christian to Additional Questions
from Senator Inhofe

Question 1. For applications to construct new reactors at sites with existing units, should the NRC limit consideration of emergency planning issues to those issues uniquely resulting from the addition of the new unit?

Response. The NRG should limit review of emergency planning issues resulting from the additional plant to those issues uniquely resulting from the addition of the new unit. Emergency planning reviews should be limited to onsite program changes and offsite interfaces specific to the new unit. The offsite emergency plans that are implemented by state and local governments at existing sites are mature programs that are subject to regular drills and exercises and continual assessments by both the NRG and FEMA. These activities provide continuing reasonable assurance that offsite emergency preparedness is adequate. Therefore, there is no need for a new comprehensive review of offsite emergency preparedness for a new plant located at an existing site.

Question 2. To what extent should the Commission defer "need for power" determinations to state regulatory bodies and regional transmission organizations?

In states where the generation of electricity remains regulated or in areas where reliability of electric service is maintained by a regional authority (such as an independent system operator), the NRC should defer entirely to any need for power determination made by a cognizant state regulatory body or regional authority. Such agencies have not only the direct and primary responsibility to maintain system reliability, but also the specific expertise and knowledge of the relevant service territories best suited to make such determinations.

The NRG does not have statutory responsibility to maintain system reliability and has no specific expertise in this area. Further, independent NRG analysis of need for power (which NRG performs simply as part of its environmental review under the National Environmental Policy Act) results in duplicative reviews and creates the potential for determinations inconsistent with decisions of the state or regional authorities having primary jurisdiction. The NRG is mindful of this issue. Its Environmental Standard Review Plan permits NRG Staff reviewers to rely on state or regional authorities' analyses concerning need for power if the NRG reviewers determine that such analyses are reliable and meet high quality standards. See, U.S. NRG, Environmental Standard Review Plan, NUREG-1555 (Oct. 1999), at 8.1-1, 8.1-2.

Question3. In your testimony you state that the Inspections, Tests, Analysis, and Acceptance Criteria process is a "challenge." What must the industry and the NRC do to ensure that this process is carried out smoothly and in a timely manner, while ensuring the safety of the new plant?

Response. Simply put, both industry and the NRG must remain vigilant.

The NRC's Part 52 process has, for the most part, been tested. Designs have been certified; sites approved. Applications for combined licenses have been submitted and NRG reviews are underway.

The last part of the last process currently being tested (i.e., combined license) is the Inspections, Tests, Analyses and Acceptance Criteria (ITAAC). The ITAAC is different in one critical aspect from the licensing activities that precede it. The prior licensing phases, up to and including issuance of the combined license, occurs prior to the huge capital investment a company must make to actually construct a new nuclear plant. Part 52 was designed with that in mind. ITAAC occurs later, after construction is complete, but before the nuclear fuel is loaded, and is intended to demonstrate that "what was built" is "what was licensed." ITAAC is the final licensing hurdle, so to speak, before a new nuclear plant begins to operate.

The "challenge" is for both NRG and industry to remain focused between now and then to ensure that ITAAC serves its intended purpose, and no other. ITAAC is not intended to replace the NRC's existing oversight and inspection function. Nor is ITAAC intended to impose new requirements at the end of the licensing process. Attention by NRG and industry will ensure that the ITAAC process is carried out smoothly and in a timely manner. Such focus will ensure that the new plant about to operate will do so safety. To their credit, both NRG and the nuclear industry have been working diligently to clearly define this final element and ensure that the scope, process and criteria to successfully meet ITAAC is well-understood by all. Continued attention is the best safeguard we have to ensure that we meet the challenge of ITAAC.

Senator CARPER. Mr. Christian, thank you very much.
Mr. Pietrangelo, you are welcomed.

STATEMENT OF ANTHONY R. PIETRANGELO, VICE PRESIDENT, NUCLEAR ENERGY INSTITUTE

Mr. PIETRANGELO. Chairman Carper, Ranking Member Voinovich, I appreciate the opportunity to testify today and on behalf of the nuclear industry, thank this Subcommittee for its longstanding interest in and oversight of the NRC's activities and the issues important to the continued beneficial uses of nuclear energy.

In particular, we appreciate the leadership shown by Senator Carper and Senator Voinovich on key issues including infrastructure, the loan guarantee program and waste confidence that are critical to new plant build. My testimony today addresses the following topics: one, the performance of the 104 power reactors and the contribution nuclear energy makes toward the U.S. energy and environmental policies; two, the importance of license renewal to extending the value of nuclear power plant assets and NRC's license renewal process; and three, the prospects for building new nuclear plants in the U.S. and the importance of an effective and efficient NRC licensing process.

The U.S. nuclear fleet continues to operate at record high levels of safety and reliability. In 2007, the highlights include the industry's capacity factor at 91.8 percent, an all-time high. U.S. reactors produced 806 billion kilowatt hours at an average production cost of 1.76 cents per kilowatt hour, both new industry standards. With this excellent performance, nuclear energy continues to generate about 20 percent of U.S. electricity, despite the fact that nuclear power plants represent only about 12 percent of the installed electric generating capacity.

In addition, nuclear energy accounts for more than 70 percent of the Nation's carbon-free electricity generation and prevented the emissions of CO2 equivalent to those from all passenger vehicles in the United States in 2007. The outstanding performance of the U.S. nuclear fleet, along with its contributions to our energy and environmental goals, provide the context and foundation for renewing the licenses of existing plants and preparations for new plant build.

License renewal of nuclear power plants in this Country is founded upon technical research begun in 1982 through the nuclear plant aging research program established by the NRC. The program concluded that aging phenomena are manageable and should not preclude extended operation for reactors. The rulemaking that followed, 10 C.F.R. Part 54, included two fundamental principles: the regulatory process will ensure that the licensing basis provides and maintains plant safety and that the licensing basis carries forward throughout the renewed period of operation.

The license renewal process does not attempt to duplicate the regulatory oversight that occurs continually at all reactors. Rather, it appropriately focuses on managing the effects of aging on key structures and components that are not routinely inspected. Applicants for renewal are required to identify the important structures and components within the scope of the rule. Second, they must identify the aging mechanisms or effects that these structures and

components are subject to. And finally, they must describe how they will address and manage the aging effects through plant programs and inspections.

The NRC developed the Generic Aging Lessons Learned, or GALL report, to capture experience on aging effects. The report also captures practices acceptable to the NRC for managing those aging effects. Applicants routinely reference the practices detailed in the GALL report in their applications. This in large part explains some of the findings in the NRC Inspector General's audit of the license renewal process.

Turning to new plant build, I cannot overState the importance of available loan guarantee program to kick start the first wave of plants, and that would lower the cost of electricity to consumers. NEI expects four to eight plants will be deployed by the middle of the next decade. The industry is well aware of the areas that plague the construction of the existing fleet, and we have focused our efforts on mitigating those risks. This must be demonstrated by completing these first projects within schedule and budget constraints to build confidence for a more significant expansion to occur.

From a licensing perspective, the NRC and the industry are on a steep learning curve with regard to the implementation of Part 52. Thus far, the reviews are progressing per established schedules. Of utmost importance is the completion of key rulemaking activities, including Part 73 on security, aircraft impact assessments and the revision of the waste confidence rule that will further strengthen the current regulatory basis for NRC's waste confidence determination.

In addition, we expect that efficiencies in the licensing process will be gained as the design certifications are completed and lessons learned are incorporated from the initial early site permit and combined license reviews.

Going forward, the industry's highest priority will remain the continued safe and reliable operation of the existing fleet. It is this performance that enabled successful license renewal thus far, and that will sustain the recognition of nuclear energy as an indispensable element of meeting our Nation's energy and environmental goals.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Pietrangelo follows:]

Statement for the Record
Anthony R. Pietrangelo
Vice President
Nuclear Energy Institute

U.S. Senate
Committee on Environment and Public Works
Subcommittee on Clear Air and Nuclear Safety

Washington, D.C.
July 16, 2008

Chairman Thomas Carper, Ranking member George Voinovich, and distinguished members of the subcommittee, I am Anthony Pietrangelo, vice president at the Nuclear Energy Institute (NEI). I am honored to provide this testimony to address issues related to the nuclear energy industry before this subcommittee today.

NEI is responsible for developing policy for the U.S. nuclear industry. More than 320 NEI corporate and other members represent a broad spectrum of energy interests, including every electric utility licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

As the country and the world confront the pressing and inexorably linked issues of energy and environmental policy, nuclear energy has received increased attention as a necessary technology for providing new sources of large-scale, reliable electricity while preventing greenhouse gas emissions. Indeed, emissions avoided by the U.S. nuclear industry for the 1995 – 2007 period included 8.7 billion metric tons of carbon dioxide (CO_2), 47.2 million tons of sulfur dioxide (S02), and 18.9 million tons of nitrogen oxide (N0x). At the same time, America's 104 commercial reactors generated 9.6 trillion kilowatt-hours of electricity.

My testimony today addresses the following issues:

- The performance of the 104 power reactors and the contribution nuclear energy makes toward the United States energy and environmental policies. Nuclear energy generates 20 percent of our nation's electricity supply, and is America's largest source of carbon-free electricity.

- The importance of license renewal to extending the value of nuclear power plant assets and the U.S. Nuclear Regulatory Commission's (NRC) license renewal process. License renewal contributes to the industry's ability to meet fast-

growing electricity demand while enhancing economic stability and employment in communities that host nuclear plants. The NRC will approve license renewal applications only after determining that a plant can continue to operate safely during the period of extended operation.

- The prospects for building new nuclear plants in the United States and the importance of an effective and efficient NRC licensing process for those projects. Because U.S. electricity demand is expected to grow 25 percent by 2030, according to the U.S. Energy Information Administration, there is an acute need for additional baseload electricity generation. The nuclear industry is already responding to the market, with electric companies having already submitted nine license applications to the NRC for 15 new reactors. NEI estimates that at least another five applications will be submitted this year. This could result in 15 to 20 new nuclear plants by 2020 providing an additional 20 gigawatts to 25 gigawatts of electric generating capacity.

U.S. Nuclear Power Plant Are Operating at Record-High Levels

The nuclear power industry's commitment to safety and efficiency in 2007 resulted in a record year for U.S. nuclear plants, on average.

Safety remains the highest priority for the industry and we have demonstrated a continuous record of outstanding safety and reliability, which have led to increased efficiencies.

The industry's capacity factor—the amount of electricity produced relative to the amount that could have been produced operating each day around the clock—was a record-high 91.8 percent in 2007. U.S. reactors produced 806 billion kilowatt-hours of electricity at an average production cost of 1.76 cents per kWh—both new industry standards. The cost of producing electricity at nuclear power plants is more than three times lower than electricity produced using natural gas (6.78 cents/kWh) and is more competitive than coal (2.47 cents/kWh).

With this excellent performance, nuclear energy continues to generate about 20 percent of U.S. electricity despite the fact that nuclear power plants represent only about 12 percent of all of installed electric generating capacity nationwide.

Given the importance of emission-free electricity in a carbon-constrained economy, it is important to note that nuclear energy accounts for more than 70 percent of the nation's carbon-free electricity generation. In 2007, U.S. nuclear power plants prevented the discharge of 690 million metric tons of CO_2, nearly one million tons of NOx emissions, and three million tons of SO_2. The industry is committed to maintaining the clean air benefits of nuclear energy that the United States and the world have come to expect.

The extraordinary value of nuclear energy to a carbon-constrained electricity portfolio has been recognized internationally by the United Nations Intergovernmental Panel on Climate Change; the World Economic Forum and analyses conducted by the European Union and the OECD's Nuclear Energy Agency. Domestically, this role has been affirmed by the National Academy of Sciences, the Earth Institute at Columbia University and analyses by scientific, environmental and financial organizations.

License Renewal -

Nuclear power plants are licensed by the federal government to produce electricity for 40 years. The 40-year license reflects the amortization period generally used by electric utility companies for large capital investments; it is not based on safety, technical or environmental factors. The Atomic Energy Act of 1954 permits energy companies to renew their nuclear plant operating licenses as long as the companies can demonstrate that the facilities will continue to meet federal safety standards for the additional period of operation. Interest in license renewal dates back to the late 1970s and early 1980s. Initial studies focused on technical and economic feasibility of operating beyond the 40 year license period, and identified the long-term material condition of large components such as pressure vessel integrity, cables, and critical concrete structures as the key determinants of whether a reactor can continue to operate beyond 40 years.

Sustained high levels of safety and operation at U.S. reactors have resulted in a steady progression of applications to renew operating licenses for an additional 20 years. To date, 48 license renewals have been granted by the NRC, 17 are under review, and companies have announced plans to pursue 30 additional license renewal applications. In parallel, companies are undertaking a series of material condition improvements, such as steam generator and reactor vessel head replacements, and turbine, generator and pump upgrades to ensure the existing fleet continues to operate safely and efficiently. These material improvements, in some cases, cost hundreds of millions of dollars and have been completed on-schedule and within the budgeted estimates.

Background

In 1982, the NRC established the Nuclear Plant Aging Research Program to assess materials and component aging issues related to continuing operations and license renewal of operating reactors. The program concluded that many aging phenomena are manageable and should not preclude license renewal for reactors. Subsequent to this finding, the NRC in 1991 issued 10 CFR Part 54, which included two fundamental principals: (1) The regulatory process will ensure that the licensing basis of all operating plants provides and maintains plant safety, and (2) the licensing basis must be maintained during the renewal period in the same manner and to the same extent as during the original licensing term.

A demonstration program to apply the rule to pilot plants and develop experience to establish implementation guidance was put in place. The pilot program confirmed that aging effects were being effectively managed by the industry during the initial license period. In addition, the license renewal review did not provide sufficient credit for existing programs, particularly those under NRC's maintenance rule. In 1995, the NRC amended the license renewal rule. The amended Part 54 established a regulatory process that is more efficient, more stable, and more predictable than the previous license renewal rule. The NRC's revised Part 54 clarified that the focus of license renewal activities should be on managing the adverse effects of aging. These rule changes were intended to ensure that important systems, structures, and components will continue to perform their intended function during the 20-year period of extended operation.

The NRC also developed license renewal guidance documents recommending safety standards for aging management programs and an acceptable format for the renewal applications. Today, NRC has developed a comprehensive license renewal process to evaluate applications for extended periods of operation. The license renewal process calls for both a technical review of safety issues and an environmental review.

NRC's responsibilities under the National Environmental Policy Act call for a review of the environmental impact of license renewal. In parallel with aging efforts, the NRC pursued a separate rulemaking, 10 CFR Part 51, to focus the scope of review of environmental issues. In 1996, the NRC published the Generic Environmental Impact Statement (GEIS), which examines the possible environmental impacts that could occur as a result of renewing licenses of individual nuclear power plants under 10 CFR Part 54. To the extent possible, it establishes the bounds and significance of these potential impacts. The analyses in the GEIS encompass all operating light-water power reactors. For each type of environmental impact, the GEIS attempts to establish generic findings covering as many plants as possible. While plant and site-specific information is used in developing the generic findings, the NRC does not intend for the GEIS to be a compilation of individual plant environmental impact statements.

The agency said many potential environmental impacts of license renewal are common to all nuclear power plants and could be resolved for all plants through the revised rule. A provision of the regulatory process allows the public an opportunity to express concerns about environmental impacts related to the license renewal application.

Additionally, the license renewal application review process includes an independent examination of reactor operations, the focus of which is directed at two questions:

> Does the reactor operator understand the effects of aging on critical safety components?
>
> Has the operator taken appropriate actions to assure safe operation?

Constellation Energy's Calvert Cliffs plant in Maryland was the first to file a renewal application in April 1998 and the NRC approved the application for renewal of two reactors at the site in March 2000. Duke Energy's Oconee plant (07/98 to 05/00), Entergy's Arkansas Nuclear One (02/00 to 06/01, and Southern Company's Hatch (03/00 to 01/02) plants followed. Lessons learned from these first license renewal approvals resulted in the creation of the Generic Aging Lessons Learned Report (GALL). The GALL report contains the staff's generic evaluation of the existing plant programs and documents the technical basis for determining where existing programs are adequate without modification and where existing programs should be augmented for the extended period of operation. The NRC staff's evaluation documented in the GALL report indicate that many of the existing industry programs successfully manage the aging effects for many structures or components for license renewal without change.

The GALL report also contains recommendations on specific areas for which existing programs should be augmented for license renewal. An applicant may reference the GALL report in a license renewal application to demonstrate that the programs at the applicant's facility correspond to those reviewed and approved in the GALL report and that no further staff review is required. The focus of the staff review is on the augmented existing programs for license renewal. The incorporation of the GALL report information into the NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," as directed by the Commission, should improve the efficiency of the license renewal process.

Developing license renewal applications involves tens of thousands of man-hours and millions of dollars to demonstrate to the NRC that the licensee can monitor and manage the effects of aging on major passive structures and components during the renewal period. Applicants must identify all systems, structures and components that would be affected by extending the operating period at a specific plant and they must analyze the environmental effects of extended reactor operation

Typically, a license renewal team collectively work 60,000 hours preparing a 1,800-page application. This involves review of thousands of documents, a detailed review of equipment and component performance, and a rigorous review of the existing maintenance and engineering programs to ensure that the licensee is capable of maintaining plant systems over the extended license period.

The license renewal activities and the material condition improvements will provide the nation with another 20 years of stable, low-cost, zero-CO_2 emitting electricity generation. This will assist our nation in meeting state, regional and emerging national greenhouse gas reduction programs and enable U.S. industry to become more competitive in an era of increasing energy costs.

New Plants

Global Expansion of Nuclear Energy

Mr. Chairman, as of this date, there are 35 new nuclear power plants under construction world-wide representing approximately 30 gigawatts of additional electric power generation, according to the International Atomic Energy Association. Additionally, 200 projects are under consideration in 27 countries as reflected in statements of intent and various proposals. The interest in nuclear power is spurred by the need for electricity, energy economics, health – water, sanitation, deployment of health technologies, and improving education. The U.S. is poised to take a leadership role in sharing its regulatory framework, operational safety practices, and security programs for countries considering nuclear power around the world.

U.S.-based nuclear plant designers such as GE and Westinghouse are involved in international discussions with government officials and utility executives. The need for industry infrastructure, workforce and manufacturing capabilities may provide an opportunity for U.S.-based manufacturing companies and factories to be a part of the global resurgence, depending in part on the growth of the U.S. nuclear energy market

U.S. New Nuclear Plant Activities

U.S. energy companies have submitted nine combined construction and operating license applications for 15 advance-designed reactors, and at least four more applications for eight additional reactors are expected to be submitted to the Nuclear Regulatory Commission by the end of the summer. NRC reviews of these applications are in the early stage. As expected, there have been some issues related to learning the extent of information required by the NRC in this new licensing process. The lessons learned from the early submittals have been distributed to other applicants throughout the industry reactor design-centered working groups.

Additionally, an NRC rulemaking on "waste confidence" is moving forward. Upon completion, the NRC's rulemaking on this issue is expected to strengthen the regulatory basis for used nuclear fuel management as the industry moves further into the licensing process. The continuing interest and oversight of the Senate Subcommittee on Clean Air and Nuclear Safety has been beneficial and has provided direction that has enabled the industry and NRC to continue to move in the right direction. The industry is appreciative of the Chairman and Ranking members efforts to encourage the NRC to update its waste confidence ruling.

A Clear Need for New Nuclear Plants

There is a growing need for baseload power plants as part of the electricity portfolio that must be developed to meet the 25% increase in electricity demand by 2030. In

some states, it has been nearly 20 years since baseload coal or nuclear power plants were built, yet the economy and population have continued to grow. Now, some companies are experiencing annual customer growth rates of 20,000 to 30,000 new customers per year. As a result, electricity generating margins are shrinking. The Southeast, Southwest and Mid-Atlantic regions already are below accepted reserve margins for electricity generation. Even with expanded energy efficiency and conservation programs that many electric companies are putting in place, utility planning forecasts show a need for additional baseload generation.

The outstanding safety and operational performance of U.S. nuclear power plants, coupled with high and volatile fossil fuel prices, make new nuclear plants an attractive proposition for new electricity production. Baseload generating option assessments are complex and focus on plant cost, environmental factors, fuel price and availability and other factors. One of the most important factors in today's energy environment is the long-term cost of generating electricity once the plant is in service. Extensive sensitivity analyses demonstrate that new nuclear generating plants are among the best options, especially when considering the long term stability in the cost of electricity generated from the plant that benefits the retail, commercial and industrial rate payers. In separate analyses of the Florida and Connecticut markets, only natural gas-fired plants without carbon sequestration are forecasted to be less expensive than advanced nuclear power plants for new electricity generation.

A recent assessment by the Brattle Group found that, between 2004 and 2007, the cost of steam generation plants, transmission projects and distribution equipment rose by 25-35 percent, compared to an eight percent increase in the GDP deflator. The cost of gas turbines: Up by 17 percent in 2006 alone. Prices for wind turbines: Up by more than $400/kWe between 2002 and 2006. Prices for iron ore are up by 60 percent between 2003 and 2006, and for steel scrap up by 150 percent. Aluminum prices doubled between 2003 and 2006, and copper prices almost quadrupled. These cost increases hit all new generating capacity – nuclear, coal-fired, gas-fired and renewables.

The benefits of new nuclear plants also are linked to environmental considerations given that nuclear power plants do not generate greenhouse gases during the production of electricity.

Current schedules developed by energy companies and the NRC show that the first permits for new reactors could be issued in 2011, with preconstruction activities (land clearing, construction of support buildings, excavation) starting at some sites next year

The industry expects that four to eight plants will move directly into construction as soon as the combined construction permits and operating licenses are issued. If these plants move forward on schedule and remain within budget estimates, confidence in and within the industry will increase. This could result in an additional 55 gigawatts

(about 40 plants) of new nuclear generation by 2030, preventing an additional 260 million metric tons of CO_2 emissions per year.

Long-term energy challenges require short- and long-term solutions

The implementation of the new licensing process did not contemplate today's energy landscape of shrinking electric capacity margins, high, volatile fossil fuel costs, and state, regional and national policies to reduce the nation's carbon footprint. The result is that some companies are moving forward with new reactor projects in a more expeditious manner than was initially envisioned.

COL applications are being submitted before some new reactor designs are certified, and few companies are using the early site permit process. In addition, the learning process that normally evolves from the first license application submittals is being accelerated through the use of design-centered working groups. Experiences are being incorporated into lessons learned, which are being distributed to other applicants through these working groups. They are working on issues as they pertain to each of the five new reactor designs. The intent is to further improve standardization within a particular reactor design, accepting that there will be some differences because of unique site-specific circumstances, topography, geology and location (such as, whether it is adjacent to a river, lake or ocean.)

In addition to improving the quality of NRC license submittals, we believe that there are procedural improvements that could be made once the industry has completed the first reviews. This was true in the case of safety certification for advanced reactor designs. The NRC and industry also have developed lessons learned from the early site permit projects. The NRC is preparing a plan to improve the environmental review process within the bounds of the National Environmental Policy Act (NEPA). If the recommendations from the lessons learned are fully implemented, the licensing schedules for subsequent licensing projects could be significantly reduced.

Toward construction of new reactors

Initial steps are being taken by the industry to set the stage for construction of new reactors, principally in the Mid-Atlantic and Southeastern states. Two electric utilities have signed engineering, procurement and construction contracts with a consortium of reactor designers and construction firms, and other companies are in intense negotiation with designers and architect-engineers. Long-lead items, such as ultra heavy forgings for reactor pressure vessels and turbines, are being ordered.

Public dialogue with the NRC on construction inspection and the implementation of inspections, tests, analyses and acceptance criteria (ITAAC) of the new licensing process has started as the industry and NRC look beyond the initial licensing processes.

Detailed implementation guidelines have been drafted and are being reviewed by the NRC. Interactions have started within the industry on assuring that there is a common licensing basis and understanding for implementing quality assurance programs, a major lesson learned from the nuclear plant construction projects of the 1970s.

The industry also is working with Japanese and French companies to gain insights on building nuclear plants using modular construction techniques. As a result, the schedule for the first construction projects from first concrete pour of the power block to fuel load is 48 months to 54 months, followed by a four-to-six month start-up and testing schedule. Most recently, Japanese nuclear plants are being built in 39 months, followed by the start-up phase. Based on these schedules, the first U.S. plants will be in commercial operation around 2016-17.

Industry is committed to reactor standardization

The U.S. nuclear power industry is fully committed to nuclear power plant standardization. The industry is focusing on all aspects of plant licensing and construction—from the scope and content of license applications through the development of procurement and construction specification into construction. This is being controlled through the five design-centered working groups. The industry is striving for at least a 70% level of standardization.

This concept of standardization is being taken to the component level, with companies who intend to build the same reactor design seeking to use the same plant configuration, valves, breakers, cabling, instrumentation, and computer systems. The degree of component specification may be governed by supplier capacity, such as the supply of large turbines.

Financing

Consensus estimates suggest that the electric power industry, over the next 15 years, must invest between $750 billion and $1 trillion in new generating capacity, new transmission and distribution infrastructure, and environmental controls. This new capital spending represents a major challenge to the electric power industry.

The Energy Policy Act of 2005 recognized this financing challenge and provided limited investment stimulus for construction of new baseload power plants. In the case of nuclear power, that stimulus includes:

— a production tax credit of $18 per megawatt-hour for 6,000 megawatts of new nuclear capacity for the first 8 years of operation.

— a form of insurance (called standby support) under which the federal government will cover debt service for the first few plants if commercial

operation is delayed. This coverage is capped at $500 million for the first two reactors, and $250 million for the next four reactors. The delays covered include NRC failure to meet schedules and litigation.

— federal loan guarantees for up to 80 percent of total project cost.

Of the three major incentives for new nuclear power plant development provided by the Energy Policy Act, the loan guarantee program is the most effective in addressing the major challenge facing new nuclear power plant construction – construction financing.

A properly priced loan guarantee program would enable companies to employ project financing on a non-recourse basis. The ability to use non-recourse project finance structures offsets one of the most significant financing challenges facing new nuclear power plant construction – the cost of these projects relative to the size, market value and financing capability of the companies that will build them. A new nuclear plant is a $5-7 billion project (including interest during construction). Although $5-7 billion projects are not unique in the energy business, such projects are typically built by consortia of major oil companies with market values many times larger than the largest electric companies.

Project financing, supported by loan guarantees, also allows a more efficient, leveraged capital structure, which reduces the weighted average cost of capital and thus provides a substantial consumer benefit in the form of lower electricity prices. Loan guarantees also mitigate the impact on the balance sheet of these large capital projects which would otherwise place stress on credit quality and bond ratings.

The Department of Energy finalized the loan guarantee program in October 2007. According to the final rule, a guarantee may cover 100 percent of the project debt, provided that the debt does not exceed 80 percent of the project's cost. In December 2007, Congress authorized DOE to grant $18.5 billion worth of loan guarantees to new nuclear projects.

Now that the rules and authorization are in place and the Energy Department has released its solicitation for new nuclear projects, we expect that energy companies will submit applications and begin to negotiate terms and conditions of the guarantee later this year. Industry believes that the recent proposals in the Senate and House appropriations, when combined, will be beneficial and provide long-term benefit to American consumers.

Concluding Statement

The nuclear industry appreciates the Congressional oversight, which has been very beneficial and should continue to ensure that the full value of the incentives in the 2005 Energy Policy Act are attained, not only for nuclear, but for all non-emitting, innovative

generating technologies. Progress towards new nuclear plant deployment is being made. Combined licenses are being reviewed and schedules have been established; construction and procurement contracts are being signed; the manufacture and fabrication of long-lead components has started; and financing discussions are taking place. The industry is reasonably confident that at least four new nuclear plants will be operational around 2016. How many more projects move into the construction phase depends on numerous factors, which include the implementing conditions imposed on the loan guarantee provisions in the 2005 Energy Policy Act.

Regulatory Program Prior to Adopting Mandatory Hearing Requirement	Current Regulatory Processes Render Mandatory Hearings Unnecessary
• No public notice of application for construction permit.	• *Federal Register* and web notice of application for COL.
• Application not publicly available.	• Application is publicly available. NRC holds pre-application meetings in vicinity of proposed facility. All meetings between applicant and NRC also are open to the public.
• No opportunity for a hearing provided to intervenors.	• Intervenors have an opportunity to submit proposed contentions and challenge the license application. If contentions are admitted, the ASLB will conduct a hearing on contested issues.
• NRC Safety Evaluations of license applications not made public.	• NRC Safety Evaluations are publicly available, as are all NRC licensing documents.
• No environmental review required.	• NRC NEPA-based licensing documents are publicly available. Also, the NEPA process specifically provides for public notice, public meetings, and public input.
• Construction permits issued without prior public notice.	• Issuance of NRC licenses is publicly noticed and the license is publicly available.
• Report by Advisory Committee on actor Safeguards not required.	• Report by independent ACRS is required by statute for each COL and Early Site Permit application. The ACRS report is publicly available. ACRS meetings are open to the public.
• AEC included both "promotional" and regulatory functions.	• By statute, the NRC is now strictly a regulator. Additionally, the ASLB is no longer the only source of an independent review of license applications.
• Immature technology with no operating history.	• The NRC now has nearly 50 years of plant operating experience and agency experience conducting licensing reviews.

RESPONSE BY ANTHONY R. PIETRANGELO TO AN ADDITIONAL QUESTION FROM SENATOR BOXER

Question 1. Mr. Webster's written testimony mentioned that improving the NRC's licensing procedures would actually be good for the nuclear industry because it would help improve public confidence and reduce resistance to the siting of new plants. Do you agree with his statement? Aren't you concerned that eliminating the mandatory hearing requirement for new licenses would reduce public confidence in the NRC and the safety of new facilities?

Response. In response to the first question, NEI agrees with the general proposition that improving the NRC's licensing procedures should enhance public confidence in the NRC licensing process and thereby reduce public resistance to siting new plants. In our view, eliminating the mandatory hearing from NRC licensing reviews would affirmatively improve the NRC licensing process with no attendant decrease in protection of public health and safety and no change in opportunities for public participation. Discontinuing the unnecessary and duplicative reviews conducted in mandatory uncontested hearings would reduce the burden on the NRC Staff, the NRC Atomic Safety and Licensing Boards (ASLB) and applicants, and shorten the overall licensing process for new plants.

In response to the second question, NEI believes that eliminating mandatory hearings should have no effect on public confidence in the NRC, NRC licensing decisions, or the safety of new nuclear power plants. The mandatory hearing is a vestigial artifact of a different era and a different regulatory framework for commercial reactor licensing. The original purposes of the mandatory hearing—to provide public notice of the project and an additional, independent review by the NRC Atomic Safety and Licensing Board are now achieved through other, more effective NRC processes and other avenues for public participation and independent review. The NRC licensing process is thorough, fair, and transparent, and protects public health and safety against radiological hazard. This process clearly merits public confidence in NRC licensing decisions absent a mandatory hearing. Additionally, eliminating mandatory hearings would have no effect on public participation in the NRC licensing and hearing process.

History of the Mandatory Hearing Provision: Following passage of the Atomic Energy Act of 1954 (AEA), the Atomic Energy Commission (AEC), the predecessor of the NRC, issued three reactor construction permits without any public hearing or notice of intent. To address this lack of notice, Congress amended the AEA in 1957 to require a hearing for each new reactor application. This change was intended to ensure that the public was aware of applications for a new power reactor—that is, the mandatory hearing served a "public notice" function. In 1962, Congress again amended the AEA to create the Atomic Safety and Licensing Board, to alleviate concerns with the AEC's dual role as both a regulator and a promoter of nuclear energy. Since 1962, the mandatory hearing provisions in the AEA have not changed. However, there have been substantial changes in the NRC licensing process, the agency's organizational structure, and the AEA that render the mandatory hearing redundant and unnecessary.

The "Public Notice" Function: NRC uses a variety of mechanisms to offer the public detailed information regarding new nuclear plant (or combined license (COL) applications. Before an application is submitted, letters of intent describing the location and timing of an expected COL application are available on the NRC's website, http://www.nrc.gov. The NRC also holds public meetings near the proposed new reactor site to explain the licensing process and identify ways in which the public may participate in the process. Once the NRC receives an application for a COL or Early Site Permit (ESP), it publishes in the Federal Register a separate Notice of Receipt and Availability of an Application, a Notice of Docketing of an Application, and a Notice of an Opportunity to Request a Hearing. The application and related documents are available on a webpage dedicated to each proposed facility. During its review, the NRC holds additional public meetings in the vicinity of the proposed facility to solicit public input on the application.

NEPA Considerations: The National Environmental Policy Act of 1969 (NEPA), which post-dates the AEA's mandatory hearing provision, requires NRC to conduct environmental reviews for each application and to provide notice and specific opportunities for the public to participate in those reviews. Even absent a mandatory hearing, the "public notice" function of the mandatory hearing would continue to be performed by other, more comprehensive and effective means of public communication.

Mandatory Hearings and the Functions of the AEC/NRC: Since the mandatory hearing reqUirement was instituted in 1957, the regulatory function of the AEC has

been separated from the promotional function. This resulted in the creation of the NRC, whose function is to regulate and license commercial nuclear materials and facilities and conduct related research. The creation of the NRC as an independent regulatory agency in 1975 eliminated the structural conflict of interest that prompted the establishment of the ASLB in 1962, rendering redundant the ASLB's original role as an independent reviewer of uncontested issues.

Mandatory Hearings and the Role of the ACRS: The Advisory Committee on Reactor Safeguards (ACRS) is now reqUired by statute to conduct an extensive and independent review of the Staff's licensing review for every new reactor application. Because the ACRS includes subject matter experts from a range of technical disciplines, the ACRS is perhaps even better-equipped to probe the NRC Staff's review than the ASLB. Also, ACRS meetings are open to the public and any report issued by the ACRS on an application is also publicly available. Thus, the "independent review" objective of the mandatory hearing is served by ACRS review, which is equally independent and arguably more insightful.

Mandatory Hearings and Public Participation: Eliminating the mandatory hearing would not eliminate the opportunity for the public to participate in hearings on license applications for new nuclear plants. Currently, members of the public have no right to participate in the NRC's mandatory hearing. Eliminating mandatory hearings would therefore have no effect on the public's right to participate in the NRC licensing process. Importantly, members of the public with standing would still be able to offer proposed contentions on the application. If proffered contentions were admitted, NRC Licensing Boards would still conduct a hearing on those contentions and make de novo factual findings on the contested issues raised by intervenors.

This table compares the NRC reactor licensing processes and procedures at the time the mandatory uncontested hearing requirement was first introduced to the current regulatory program.

Response by Anthony R. Pietrangelo to an Additional Question from Senator Carper

Question. Collapsing cooling towers and leaks at Vermont Yankee do not build public confidence in the nuclear industry. However, these are considered non-safety issues and are not under the jurisdiction of the NRC. Does the industry have best practices available—similar to NRC's Guidelines for Aging

Response. The industry does collect and disseminate operating experience on non-safety-related structures, system and components through the Institute of Nuclear Power Operations (INPO). This includes operating experience on cooling towers as well as many other categories of non-safety-related equipment used to produce electricity. INPO also generates "good practice" documents that provide guidance on key aspects of operations and maintenance for both safety and non-safety systems that are important to plant reliability.

A Topical Report on Cooling Tower Structure Events was published in March 2008 by INPO that captures key observations from operating experience between 2000 and 2007. This report is similar to the NRC's Generic Aging Lessons Learned report. It details the causes and contributors to cooling tower events and provides considerations for improving plant practices in order to preclude such events.

The industry recognized long ago that unreliable non-safety systems can undermine reliable electricity generation and public confidence simultaneously. Many industry programs were developed in the 1980's to improve the operation of the balance of plant (the non-nuclear part of the plant) because of its adverse impact on plant capacity factors. Since that time, the industry has demonstrated steady improvement in fleet average performance to the record level of generation in 2007. However, we must continue to learn lessons from our operating experience to avoid events that both impact reliable generation and degrade public confidence in the overall operation of our plants.

Responses by Anthony R. Pietrangelo to Additional Questions from Senator Inhofe

Question 1. Of the Requests for Additional Information (RAI's) that the industry has received, what percentage of the applicants' responses have been returned to the NRC within the response deadline?

Response. Overall, applicants have responded to more than 5000 Requests for Additional Information (RAIs) by the deadline about 80 percent of the time. That percentage rises to nearly 90 percent for the early site permit and combined license applicants. For design certification applicants, who have received far more RAIs, the percentage is apprOXimately 76 percent.

Note: The on-time performance for design certification applicants includes ESBWR design certification RAI responses since March 2007, when GE-Hitachi Nuclear Energy (GEH) and NRC established explicit agreements on response times for individual RAIs. Since submittal of the ESBWR design certification in August 2005, GEH's overall on-time response rate has been approximately 32 percent; however, since March 2007, their on-time response rate has been roughly equivalent to the industry average.

Question 2. In the hearing, Chairman Klein testified that a Continuing Resolution, if in effect until February, would impact license renewals, power uprates, and new reactor reviews. Does the industry have a clear understanding of the criteria that will be used to prioritize reviews if the NRC must cope with a funding shortfall?

Response. The industry understands that NRC's first priority is the safety oversight of the existing fleet of operating plants, whether there is a Continuing Resolution or not. We also understand that if a Continuing Resolution is in effect until February, and assuming the NRC is funded at its Fiscal Year 2008 levels, that reviews already underway would not be impacted. The impact would be on newly submitted applications beginning in Fiscal Year 2009.

Question 3. For applications to construct new reactors at sites with existing units, should the NRC require consideration of alternate sites under NEPA, without an indication of new and significant information that calls into question the NRC's prior determination that the site was acceptable?

Response. The requirement for an evaluation of alternative sites is based on Section 102(2)(C)(iii) of the National Environmental Policy Act (NEPA). Consistent with NEPA's mandate that reasonable alternatives to an action be evaluated, the site selection process focuses on those alternative sites considered to be reasonable considering the purpose of the application. The alternative site review is designed to determine whether there is an "obviously superior" site, in terms of environmental impacts and economic costs, compared to the proposed site.[1] It is well-established that NEPA's requirement to examine alternatives is subject to a "rule of reason." [2] Agencies need only discuss those alternatives that are reasonable and that "will bring about the ends" of the proposed action. Hydro Resources, Inc. (P.O. Box 15910, Rio Rancho, NM 87174), CLI 01–4, 53 NRC 31, 55 (2001).

NRC regulations require Early Site Permit (ESP), construction permit (CP) and combined license (COL) applicants to address certain topics, including alternate sites, in their Environmental Reports (ERs). See 10 CFR 51.50(a) and (c); 52.17(a)(2). The requirement that COL applicants conduct an alternative site analysis is less explicit than that for ESP applicants; [3] nevertheless, this obligation clearly applies to all ESP and COL applicants, including those who propose to construct a new reactor at a site with existing units (a so-called "brown field" site).[4]

The NRC Environmental Standard Review Plan (ESRP), which contains non-binding NRC Staff gUidance for reviewing applicants' Environmental Reports, currently recognizes as a "special case" reviewing an alternative site analysis conducted for a new plant to be co-located at an existing reactor site. This guidance illuminates agency expectations that the scope of the alternative site review in this situation need not reflect the same level of evaluation:

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[1]This standard was first established by the NRC for evaluating alternative sites for new nuclear power plants in Public Serv. Co. of New Hampshire (Seabrook Station, Units 1 and 2), CLI0977098, 5 NRC 503, 5260930 (1977). "Obviously superior" was later interpreted to mean "substantially better." Rochester Gas and Elec. Corp. (Stirling Power Project, Nuclear Unit No. 1), CLI09800923, 11 NRC 731, 737 (1980).

[2]NRDC v. Morton, 458 F. 2d 827 (D.C. eire 1972); Citizens Against Burlington v. Busey, 938 F.2d 190, 195 (D.C. Cir.), cert. denied, 502 U.S. 994 (1991).

[3]ESP applicants must include in their ERs "an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed." In this regard, the ER must discuss "all environmental effects of construction and operation necessary to determine whether there is any obViously superior alternative to the site proposed." 10 CFR § 51.50(b)(1)-(2). For COL applicants that do not reference an ESP, NRC regulations do not contain a specific requirement for an evaluation of alternative sites. However, among the information to be included in the COL Environmental Report is a discussion of "alternatives to the proposed action/' which must be "sufficiently complete to aid the Commission in developing and exploring, pursuant to section 102(2)(E) of NEPA, 'appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.'" See 10 CFR 51.45(b)(3).

[4]See NRC Regulatory Guide 4.2, Rev. 2, "Preparation of Environmental Reports for Nuclear Power Stations," Chapter 9 (July 1976); NUREG–1555, "NRC Environmental Standard Review Plan," Rev. 1, Section 9.3 (July 2007).

Recognize that there will be special cases in which the proposed site was not selected on the basis of a systematic site-selection process. Examples include plants proposed to be constructed on the site of an existing nuclear power plant preViously found acceptable on the basis of a NEPA review and/or demonstrated to be enVironmentally satisfactory on the basis of operating experience, and sites assigned or allocated to an applicant by a State government from a list of State approved powerplant sites. For such cases, the reviewer should analyze the applicant's site-selection process only as it applies to candidate sites other than the proposed site, and the site-comparison process may be restricted to a site-by-site comparison of these candidates with the proposed site. The site selection process is the same for this case except for the fact that the proposed site is not selected from among the candidate sites based on a site by site comparison. ESRP, NUREG–1555, Rev. 1, p. 9.3–12 (July 2007).

Generally consistent with other NRC regulatory guidance in Regulatory Guide 4.2 (which is directed at applicants preparing Environmental Reports), this discussion expands the gUidance for "Candidate Areas" and "Potential Sites" to focus on a more elaborate, top down site selection process—beginning with Regions of Interest (ROI), then extending to screening candidate areas, identifying potential sites, and screening candidate sites, and then selecting the proposed site and alternative sites. While this is an appropriate process for establishing a newly licensed "green field" site, it may not offer the most logical or expeditious approach for a site that is colocating at an existing nuclear site. (Many existing nuclear sites were already developed to have multiple units where the environmental factors were addressed during initial site selection review and approval.)

This "special case" affords the NRC Staff reviewer flexibility in assessing the adequacy of alternative site reviews on a case-by-case basis. Arguably, however, the guidance could go further in recognizing that considerable environmental and operational information about the impacts of a nuclear plant exists with respect to each commercial reactor site, and that such information could preclude the need for a typical broad site alternative site review process. In particular, where an applicant seeks to add a nuclear unit at an existing nuclear site, a more limited assessment may be sufficient to demonstrate that green field or non-nuclear brown field sites are not obviously superior. An existing nuclear site would have been selected originally based on a comprehensive evaluation and determination that no obViously superior alternative in the region exists. Also, an existing nuclear site may have been originally intended and evaluated for additional nuclear units that were not built. The characteristics and the impacts of operation at existing nuclear sites are well known. If this information demonstrates no major environmental impediments to adding units at the existing nuclear site (no factors that would make the development of a new site enVironmentally preferable), green field and non-nuclear brown field sites should arguably be exempted, at least in part, from detailed site-specific consideration.

Under such circumstances, NEPA's rule of reason should not require COL applicants to scour a region to identify and evaluate new potential sites, or for NRC, in turn, to perform independent evaluation of those sites. As the ESRP states, the purpose of this evaluation process is not to determine that the applicant has selected the best site, but "to determine if any candidate site can be judged as environmentally preferable and, if so, obViously superior to the applicant's proposed site." Another, less laborious process for determining that an obviously superior site does not exist may be to allow consideration of fewer alternatives, and/or reduce the scope of evaluation factors.[5]

COL applicants may consider economic factors in choosing to co-locate new plants at existing sites. Additionally, unless there are significant environmental concerns with an existing site, the incremental increase in environmental impact necessarily would be much less than the impacts for a new site. A substantial expenditure of time and resources to evaluate multiple alternative options would not provide useful conclusions and would not be necessary to satisfy NEPA.

The "special case" discussion in the NRC Environmental Standard Review Plan quoted above indicates that NRC is forgoing the initial evaluation process and instead would apply the "candidate site" selection phase. However, the application of the "candidate site" portion of the selection process is also not proper for existing nuclear sites. The candidate site selection process, as described in the ESRP, is one sequential step of the more extensive process. As discussed in the ESRP, the result of that process would be three to five alternative sites in addition to the preferred

[5]The evaluation factors presented in NUREG–1555, Ch. 9.3., Appendix A, provide an expansive list of assessment requirements that is representative of a new site selection process. A subset of these factors would arguably be more appropriate when evaluating an existing site.

site. That selection process arguably should not be required for an applicant that proposes to use a viable existing nuclear plant site. Instead, NRC should consider revising the ESRP to set forth guidance for those cases where an existing nuclear site appears to be the most appropriate option. Under such an approach, applicants would perform as-needed comparisons against the existing site. That approach should satisfy the NEPA requirement to determine whether any other candidate site is enVironmentally preferable to—and, if so, "obviously superior" to—the applicant's proposed site.

Question 4. How should the Commission address contentions that challenge the cost of building a new plant based on the basis of historical cost overruns?

Response. The NRC should disposition proposed contentions challenging the estimated cost of building a new nuclear plant using the same criteria the agency applies to other types of proposed contentions in NRC licensing proceedings. Because NRC Atomic Safety and Licensing Boards evaluate each proposed contention on its own merits, generalizations as to the admissibility of "cost-related" contentions in NRC licensing proceedings for new plants are not determinative. However, the limited regulatory jurisdiction of the NRC presumably limits (and may preclude) the adjudication of many cost-based challenges in NRC licensing hearings.

Notably, NRC's jurisdictional limits do not foreclose opportunities to address cost-related concerns relating to new nuclear power plants. Economic regulatory agencies and processes outside of the NRC hearing process are in place at both the State and Federal levels to evaluate new generation needs, to ensure that new plant costs are prudently incurred, and to consider whether power sales at both the retail and wholesale levels are just and reasonable. Responsibilities for energy supply and planning, and for the economic regulation of new energy projects, lie with the Federal Energy Regulatory Commission (FERC) and State public service commissions.

The Scope of NRC Regulatory Jurisdiction: Under the Atomic Energy Act and the National Environmental Policy Act, the NRC is tasked with specific regulatory responsibilities related to public health and safety, common defense and security, and protection of the environment. Responsibilities for energy supply and planning, and for the economic regulation of new energy projects, lies with other State and Federal Government agencies, such as FERC and State public service commissions. Recognizing the differing roles of various Federal and State regulators, the NRC has consistently found, for example, that the economic interests of a ratepayer or taxpayer do not confer standing to raise economic issues in the NRC hearing process.[6]

COL Applicants Must Provide Plant Cost Information: The scope of NRC licensing hearings (and, consequently, the scope of contentions that may be admitted in a licensing hearing) is limited by the nature of the application and relevant Commission regulations. Similarly, the findings that NRC must make concerning project costs prior to issuance of a combined operating license (COL) are limited. Nevertheless, COL applicants must submit certain cost information to NRC, including an estimate of total construction costs for the facility and the source(s) of funds to cover these costs. See 10 CFR 50.33(f)(1)-(3); see also 10 CFR 52.77. Further, NRC regulations in 10 CFR 50.33(f)(1)-(3) governing COL applications now require applicants to submit: (i) information demonstrating that the applicant possesses or has reasonable assurance of obtaining the funds necessary to cover estimated construction costs and related fuel cycle costs; (ii) estimates of the total facility construction costs and related fuel cycle costs; (iii) the source(s) of funds to cover these costs. Section 50.33(f)(1). Additionally, the COL applicant must submit: (iv) information demonstrating that the applicant possesses or has reasonable assurance of obtaining the funds necessary to cover estimated operation costs for the period of the license; (v) estimates for total annual operating costs for each of the first 5 years of operation; (Vi) the source(s) of funds to cover these costs. Section 50.33(f)(2). Other information that NRC may require to enable it to determine an applicant's financial qualifications is addressed in 10 CFR 50.33(f)(4).

Historical cost overruns for nuclear units constructed in the 1970's and 1980's were based on many complex historical factors that are not necessarily attributable to today's NRC licensees or the current economic environment. To be admissible under NRC rules, proposed contentions that challenge estimated project costs or an applicant's proposed funding plan must be focused on the applicant's analysis and plan as presented in the licensing documents. The proposed contention must articulate a specific challenge—with the necessary basis—to that current cost analysis. It should not be sufficient (and, in our view, it is not sufficient under NRC requirements) simply to allege that historical overruns existed and therefore create an ad-

[6]Tennessee Valley Authority (Watts Bar Nuclear Plant, Units 1 and 2), ALAB–413, 5 NRC 1418, 1421 (1977).

missible issue. Any specific proposed contentions related to the cost of building a new facility will be evaluated carefully by the Commission for admissibility in an NRC licensing hearing.[7] Other Forums for Considering Plant Cost: Additionally, proposed contentions primarily related to electric rates or prudency concerns should not be admitted in NRC proceedings because they are more appropriately addressed in other forums. Issues related to new project planning and siting, including the costs of a proposed project and alternatives, normally will be considered in a State public service commission process. Issues related to costs actually incurred, and whether those costs can be recovered in rates, are then considered after the fact, based on actual experience, rather than the now-dated experience of the 1970's and 1980's. With respect to the cost overruns experienced for some earlier generation nuclear plants, there were substantial disallowances as a result of these prudency proceedings, demonstrating that the economic regulatory process functions effectively, independent of the NRC process.

• Provide a specific statement of the issue of law or fact to be raised or controverted.

• Explain the basis for the proposed contention.

• Demonstrate that the issue raised is within the scope of the proceeding.

• Demonstrate that the issue raised is "material" to the findings the NRC must make to support the licensing action.

• Provide a concise statement of the alleged facts or expert opinions that support the petitioner's position on the issue, and on which the petitioner intends to rely at the hearing, together with references to the specific sources and documents the petitioner intends to use to support his/her position.

• Provide sufficient information to show that a genuine dispute exists with the applicant/licensee on a material issue of law or fact. This information must include references to specific portions of the application that the petitioner disputes and the reasons supporting each dispute. Alternatively, the petitioner must identify and explain the relevance of information allegedly absent from the application. See 10 CFR 2.309(f)(1)(i)-(vi).

For new nuclear plants, the "justness and reasonableness" of a generating company's wholesale power sales are subject to review and approval by the FERC under Section 205 of the Federal Power Act. At FERC, generating companies can request authority under Section 205 to sell power wholesale at negotiated, market-based rates, or at cost-based rates. With respect to market-based sales, FERC employs rigorous market share analyses to determine whether the generator has the ability to impose price increases on power purchasers such that they are required to pay more than they otherwise would in the market. FERC does not directly determine the sales price; rather, the generator must be able to negotiate rates that are sufficient to cover its carrying costs, costs of production, and a reasonable return. When generating companies seek to establish cost-based rates, FERC reviews the elements of the company's cost of service (including the project capital costs) to determine whether those costs support a rate that is just and reasonable overall. In setting the authorized rate, FERC has authority to consider the prudence of the generator's expenditures and whether the overall investment is "used and useful" for public utility service.

Similar authority exists at the State level to review and approve the justness and reasonableness of the price of power sold at retail. States with retail electric choice permit consumers to select the most economical supplies from competitive electric suppliers, or to purchase electricity from the incumbent utility at pre-determined "provider of last resort" rates established by the public service commission. In states without retail choice, State public service commissions review the rates charged for retail electric supply service, including the prudency of the costs incurred, to prOVide the service. When an electric utility purchases power at wholesale from a generating company, the states are typically obligated to accept the rate established by FERC as just and reasonable and allow a full pass-through of the costs. (An exception to this rule allows states to disallow the cost of purchased power if the purchasing utility did not take advantage of an opportunity to purchase more economic supplies.)

Question 5. How should the Commission address contentions that challenge the safety of new units based on historical events such as Three Mile Island or Chernobyl?

Response. As stated in response to Question 3, above, the NRC should evaluate proposed contentions challenging the safety of new nuclear plants on the basis of

[7]NRC rules require petitioners who request a hearing and/or seek to intervene and participate in an NRC licensing hearing to "set forth with particularity the contentions sought to be raised." The provisions for basis and specificity in proposed contentions require that the petitioner:

"historical events" such as the accidents at Three Mile Island and Chernobyl under the same standard the agency applies to all other proposed contentions in NRC licensing proceedings. Because NRC Atomic Safety and Licensing Boards evaluate each proposed contention on its own merits, the admissibility of a hypothetical contention in an NRC licensing proceeding cannot be addressed adequately in the abstract. Long-established NRC requirements for admission of contentions are likely to preclude the adjudication of broadly based safety challenges that lack an adequate basis and adequate specificity.

NRC rules of practice require petitioners who request a hearing and/or seek to intervene and participate in an NRC licensing hearing to "set forth with particularity the contentions sought to be raised." The provisions for basis and specificity in proposed contentions require that the petitioner:

- Provide a specific statement of the issue of law or fact to be raised or controverted.
- explain the basis for the proposed contention.
- Demonstrate that the issue raised is within the scope of the proceeding.
- Demonstrate that the issue raised is "material" to the findings the NRC must make to support the licensing action.
- Provide a concise statement of the alleged facts or expert opinions that support the petitioner's position on the issue, and on which the petitioner intends to rely at the hearing, together with references to the specific sources and documents the petitioner intends to use to support his/her position.
- Provide sufficient information to show that a genuine dispute exists with the applicant/licensee on a material issue of law or fact. This information must include references to specific portions of the application that the petitioner disputes and the reasons supporting each dispute. Alternatively, the petitioner must identify and explain the relevance of information allegedly absent from the application. See 10 CFR 2.309(f)(1)(i)-(vi).

Given this standard for admissibility of contentions in NRC licensing hearings for COL applications, a proposed contention that challenges the safety of a new reactor based solely on historical events such as the events at Three Mile Island or Chernobyl, without more, likely would be rejected.

Moreover, generalized contentions like those described in this question appear to ignore the fact that NRC constantly takes into account the results of research and operational experience in developing and modifying its ongoing regulatory oversight process. That process applies to all existing nuclear plants licensed by the NRC, and it also will apply to those new reactors that may be constructed and operated under the combined license (COL) process. The Commission has described this oversight process as follows: "Since initial licensing, each operating plant has continually been inspected and reviewed as a result of new information gained from operating experience. Ongoing regulatory processes provide reasonable assurance that, as new issues and concerns arise, measures needed to ensure that operation is not inimical to the public health and safety and common defense and security are 'backfitted' onto the plants."[8]

The Atomic Energy Act of 1954 establishes a "comprehensive regulatory framework for the ongoing review of nuclear power plants located in the United States." County of Rockland II. NRC, 709 F.2d 766, 769 (2d Cir. 1983). Under the AEA, the NRC is charged with the responsibility to "ensure, through its licensing and regulatory functions, that the generation and transmission of nuclear power does not unreasonably threaten the public welfare." Id. Consistent with its mandate, the NRC promulgates rules and regulations governing the construction and operation of nuclear power plants. Id.

Moreover, when a reactor is licensed, the NRC makes a comprehensive determination that the design, construction, and proposed operation of the facility satisfies agency requirements and provides reasonable assurance of adequate protection to

[8]"Final Rule, Nuclear Power Plant Ucense Renewal," 56 Fed. Reg. 64,943, 64,945 (Dec. 13, 1991) (promulgating the NRC's initial license renewal regulations). Regarding the adequacy of its regulatory oversight process, the Commission further stated: "The Commission cannot conclude that its regulation of operating reactors is 'perfect' and cannot be improved, that all safety issues applicable to all plants have been resolved, or that all plants have been and at all times in the future will operate in perfect compliance with all NRC requirements. However, based upon its review of the regulatory programs in this rulemaking, the Commission does conclude that (a) its program of oversight is sufficiently broad and rigorous to establish that the added discipline of a formal license renewal review against the full range of current safety requirements would not add significantly to safety, and (b) such a review is not needed to ensure that continued operation during the period of extended operation is not inimical to the public health and safety." Id

the public health and safety and common defense and security. See 56 Fed. Reg. 64,943, 64,947. Each nuclear plant has a "current licensing basis" (CLB), a term of art that encompasses the gamut of NRC requirements applicable to a specific facility over its entire license term. The current licensing basis includes, for example, all license conditions, orders, exemptions, and licensee commitments that are part of the docket of that facility's license (including responses to NRC bulletins, generic letters, enforcement actions and other commitments documented in NR safety evaluations or licensee event reports)—pius all of the NRC regulatory requirements with which the licensee must comply. Significantly, the CLB does not remain fixed or static. Rather, as is true for the regulatory process generally, the CLB evolves over the term of the license, as new requirements are imposed on the plant's existing licensing basis to address ongoing NRC regulatory requirements.[9]

A proposed contention based solely on historical events would necessarily assume NRC has not imposed new technical requirements over time to further enhance nuclear power plant safety. Such an assumption is completely incorrect, as emphasized by the follOWing 2006 discussion by the Commission itself:

The NRC notes that the regulatory process considers new scientific and technical knowledge since plants were initially licensed and imposes new requirements on licensees as justified. The NRC engages in a large number of regulatory activities that, when considered together, constitute a regulatory process that provides ongoing assurance that the licensing basis of nuclear power plants provides an acceptable level of safety. This process includes research, inspections, audits, investigations, evaluations of operating experience, and regulatory actions to resolve identified issues. These activities include consideration of new scientific or technical information. The NRC's activities may result in changes to the licensing basis for nuclear power plants through issuance of new or revised regulations, and the issuance of orders or confirmatory action letters. Operating experience, research, or the results of new analyses are also issued by the NRC through documents such as bulletins, generic letters, regulatory information summaries, and information notices. In this way, the NRC's consideration of new information provides ongoing assurance that the licensing basis for the design and operation of all nuclear power plants provide an acceptable level of safety.[10]

Senator CARPER. Mr. Pietrangelo, thank you for that testimony.

Mr. Webster, before we recognize you and Dr. Romm and Mr. Gilbertson, the vote that has occurred, we are about halfway through that vote. Senator Voinovich went over earlier, but the vote had not started. So we will recess the Subcommittee for probably 10 minutes, but we will be right back. I just ask that you make yourselves comfortable, take a break. No smoking.

[Laughter.]

Senator CARPER. We will be back shortly. Thanks for your patience.

[Recess.]

Senator CARPER. We will resume now. Thank you, Mr. Webster, for being in the on-deck box for the last 10 minutes. We are glad you are here, and are looking forward to your testimony. Thanks for coming.

STATEMENT OF RICHARD WEBSTER, LEGAL DIRECTOR, EASTERN ENVIRONMENTAL LAW CENTER

Mr. WEBSTER. Thank you, Mr. Chairman, Senator Voinovich. It is a great pleasure to be here. I am Richard Webster, from the Eastern Environmental Law Center.

Before I go on, I would just like to say, if you have any trouble with my very thick New Jersey accent, feel free to stop me and I can clarify for you.

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[9]See 56 Fed. Reg. 64,943, 64,947.

[10]See 71 Fed. Reg. 74,848, 74,854 (Dec. 13, 2006) (NRC Denial of Petitions for Rulemaking from Andrew J. Spano and Joseph C. Scarpelli); see also 56 Fed. Reg. 64,943, 64,947.

[Laughter.]

Mr Webster. Basically, 40-year old reactors, they are really like old cars that have been improved and given a new paint job for the purpose of resale. They look great, but you have to really tap the panels to make sure there is no rust underneath. In the case of Oyster Creek, we, the intervenors, have tapped those panels, and we found some of them are almost rusted through. As we probed further, with the help of the Inspector General and a number of States attorneys general, we realized that NRC staff was not effectively tapping those panels. They are really admiring the paint job and saying everything looks good.

We believe there are two broad classes of problems. One is with the regulations themselves, regarding relicensing, the hearing process and safety. The other concerns agency safety culture, which leads to a lack of thoroughness on behalf of the NRC staff. We believe the lessons of Davis-Besse were either never learned or quickly forgotten.

In terms of the regulatory problems, the relicensing rules don't require a comprehensive look at whether safety standards could be improved. What happens over time is that the old plants licensing basis basically stays about the same, the margins decline slightly. The new plants have higher standards applied. Relicensing would be the opportunity to close that gap and require higher standards for old plants. That opportunity is being missed. There is no attempt whatsoever to improve, well, actually that is not quite true. There is a minor attempt, but in many areas, such as the storage of spent fuel, evacuation plans and so forth, there is no attempt to improve the current licensing basis.

Second, as Commissioner Jaczko mentioned, the scope is extremely narrow. For the moment, relicensing, the safety regulations only concern the aging managing of long-lived passive components. They fail to look at everything else such as vulnerability to terrorism, evacuation plans and spent fuel storage, even though we know that many issues that currently present themselves were not examined during initial licensing, which remember was nearly 40 years ago. Even for the narrow issues that are reviewed, there is no de novo review, so there is an assumption that if it has already been signed off on, everything is fine.

The current relicensing process relies upon the ongoing safety regulations to solve all the problems, basically. That would be OK, if those ongoing regulations were perfect. Unfortunately, like most things in life, they are not. At minimum, the relicensing process therefore needs to review the ongoing safety processes and review compliance with the licensing basis.

I think there are many examples of issues where the NRC has allowed industry the benefit of the doubt in terms of safety and has allowed these issues to drag on for far too long. Fire safety is an example, Davis-Besse is another example.

Now, turning to the safety culture problems, we found many examples of these. And these have come out primarily through public participation. At Oyster Creek, when the staff assessed that the primary containment might not meet the engineering code, instead of taking action to try to improve that primary containment, they tried to waive the standard and say the code was no longer applica-

ble. Really, in a rare moment of agreement, both the licensee and the intervenors thought the code was applicable. In effect, the NRC staff wanted to take the same approach to safety as a well-known Supreme Court opinion took regarding obscenity: they know it when they see it. Unsurprisingly, the ASLB, the board rejected the staff's completely subjective approach.

This shows two things. First, we need safety culture improvements. Second, we need clear statements of what safety standards plants must be required to meet. At the moment, we ended up litigating all the way through the hearing process what the safety standards were. That simply doesn't make sense. Both the public, the owners of the plants and potential investors need to know what the safety standards are. I don't quite understand how you can regulate safety effectively with unclear standards.

Second example, in the Vermont Yankee proceeding, the petitioners pointed out a defect in the metal fatigue calculations. It turned out that the NRC had failed to spot that defect during the relicensing of nine other reactors.

Now, we have a lot of prescriptions for solutions, and they basically involve more transparency, more transparency to empower and encourage citizens to participate in reactor oversight. This could include funding of citizens groups, which has been a longstanding recommendation since Three Mile Island, never been done; access to licensee documents and more agency notification of problems and events. We need to change administrative procedures to allow citizens a fair process. At the moment, and I have been through this process, I can tell you, this process is like being Alice in Wonderland at a communist show trial. The timing is so strict that you can have an issue admitted yesterday, you might be able to have an issue admitted tomorrow, but you can never have an issue admitted today. That is why 44 relicensings went through with no hearing whatsoever.

Now, even if you get Alice to Wonderland and you get a hearing, you can't effectively represent the clients at that hearing, you can't cross-examine witnesses, you can't depose witnesses. And the NRC staff participate as a party, and they nearly always oppose the public. Senator Carper, you asked the question earlier, did the staff assist the licensee. I can tell you in my hearing, the staff actually tried to exclude two of my exhibits, even though the licensee was ready to consent to let them in.

So in conclusion, the experience in relicensing shows that the alarms regarding nuclear safety are ringing. But like the Peach Bottom guards, the NRC is snoozing. We have to make sure we don't relicense rust buckets, and further undermine the public's confidence in the industry. Public participation works to highlight safety problems, but the NRC has tried to restrict meaningful participation as much as possible. Even today, the NRC is now proposing, it appears, or at least three of the four commissioners are now saying that mandatory hearings should be abandoned. That is completely the wrong direction. Public confidence will only be increased by greater transparency, not less.

Unless we increase public confidence, nuclear power will end up being in the cross-hairs of an intense battle. No good solution will be developed.

So what we need to do is we need to encourage and invigorate meaningful public participation. Thank you very much.

[The prepared statement of Mr. Webster follows:]

TESTIMONY SUBMITTED BY
RICHARD WEBSTER[1]
LEGAL DIRECTOR, EASTERN ENVIRONMENTAL LAW CENTER
TO THE
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

JULY 16, 2008

Mr. Chairman and members of the subcommittee I thank you for holding this hearing and giving me this opportunity to present my views on the Nuclear Regulatory Commission's reactor relicensing process. The paper below presents my testimony, starting with an outline of the current problems and our recommendations for improvements. The relicensing process is deficient and there are severe weaknesses in the oversight of reactor safety. If not addressed, these issues will further undermine confidence in the NRC and raise the risk of an accident that could severely harm the public and the nuclear industry.

Problem Outline

Through participation in the relicensing process for the Oyster Creek Nuclear Power Plant ("Oyster Creek") and observing other proceedings, I have learned that the NRC's systems for ensuring safety at old nuclear plants are opaque, legally and scientifically flawed, burdened with unjustified assumptions, and counter-productively exclude much useful public participation. In addition, the relicensing process is excessively narrow in scope, uses procedures that unreasonably limit the ability of the public to intervene on issues, and fails to fully examine how safety standards at old plants could be improved. These problems are leading to a loss of confidence in the effectiveness of NRC's oversight among the public, States, legislators, and even some judges that work for NRC. The rest of this testimony provides greater details on these issues and provides some suggestions for addressing them, primarily by enhancing public participation.

Suggestions For Solutions

Those that live close to existing nuclear plants deserve to be better served by the NRC. In addition, improving the NRC would be actually be good for the nuclear industry, because it would make the system more robust and would reduce public resistance to the siting of new

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[1] I am the legal director of the Eastern Environmental Law Center and represent a coalition of six Citizens' groups opposing the relicensing of the Oyster Creek Nuclear Power Plant, the oldest in the nation. In addition to a law degree from Columbia Law School, I have a degree in physics from Oxford University, a Masters degree in engineering hydrology from Imperial College of Science and Technology, and long experience as a scientific consultant for industry, governments, multilateral entities, and environmental groups. The views expressed in this testimony are my own, not those of my clients. Full citations to support the facts mentioned in this testimony are available upon request.

plants. Therefore, citizens and the nuclear industry should now come together to improve the processes for maintaining the safety of operating nuclear plants and for nuclear power plant relicensing. Safety oversight improvements should include:

i) published, clear plant-specific safety standards upon which citizens, the NRC, and investors can rely (i.e. codification of the Current Licensing Basis ("CLB") and licensee commitments);
ii) requirements that CLB safety standards be met with a specified high degree of statistical certainty;
iii) a centralized publicly accessible database of exemptions, corrective actions, violations of CLB safety standards, and violations of licensee commitments;
iv) prompt notice to interested parties when the safety requirements in the CLB or licensee commitments are changed or not met;
v) citizen access to all non-proprietary non-safeguards licensee documents containing information relevant to nuclear safety and access to redacted versions of proprietary or safeguards documents;
vi) a publicly available log of all NRC documents withheld from public release and a simple process to challenge Staff decisions to withhold documents;
vii) technical assistance grants to local citizens groups to enable them to hire expert assistance; and
viii) reform of the adjudicatory procedures used when disputes about ongoing safety arise to make the procedures as simple as possible, while preserving the essentials required to ensure fairness, such as the right to cross-examination, the prevention of NRC itself participating as a party, and the right to meaningful judicial review.

Improvements specific to the relicensing process include:

i) expand the scope beyond the aging management of long-lived passive components to include:
    a. a comprehensive review of whether safety standards in the CLB should be improved; and
    b. a *de novo* review of current compliance with all CLB safety standards and licensee commitments;
    c. plant-specific resolution of generic safety issues (tentative recommendation – needs more analysis).

ii) change the Part 2 adjudication rules to more closely mirror the federal rules of civil procedure, including:
    a. notice pleading;
    b. construe disputed facts in favor of petitioners, especially when definitive information is unavailable to the public;
    c. a liberal standard for adding or amending issues for adjudication as more information comes to light;
    d. full discovery, including depositions;

e. the right to live cross-examination; and
f. preventing NRC itself from participating as a party.

Background

There is mounting evidence that the Nuclear Regulatory Commission has forgotten its mandate to guard public safety, and, like the Atomic Energy Commission before it, has become a promoter of the nuclear industry. Flawed safety oversight at old nuclear facilities combined with very narrow scope relicensing reviews and procedures and practices that hinder public participation are leading to a loss of confidence in the NRC. This loss of confidence is hindering efforts to relicense a number of old plants and is slowing the development of any new nuclear plants. Unless the tide is turned, and the NRC addresses the concerns of the public thoroughly and openly, the industry will remain at the cross-hairs of an intense battle, which could ultimately result in an undesirable outcome for both sides: slow atrophication of old plants, construction of a few heavily subsidized new plants, and no adequate resolution of a number of safety issues including terrorism, evacuation, and nuclear waste disposal. The industry will also face the danger that there will be a repeat of the events of the late seventies, when the Three Mile Island accident stopped the industry in its tracks and caused huge losses. The solution to these problems lies in encouraging robust public participation in NRC processes that are supposed to maintain safety and in transforming the safety-culture of the agency so that it prioritizes public safety above licensee concerns.

Recent Evidence of Poor Performance on Safety Issues

A few dramatic recent events illustrate that the NRC's current approach to safety has serious flaws. In 2002, severe corrosion on the top of the reactor pressure vessel caused the Davis-Besse reactor near Cleveland to come within months of a melt down. The NRC Office of the Inspector General ("OIG") concluded that by allowing the plant to operate beyond a deadline for fixing the problem, the agency had placed the economic interests of the plant owner above the safety of the public. In addition, the OIG found that NRC had "informally established an unreasonably high burden of requiring absolute proof of a safety problem" instead of acting when the licensee can no longer affirmatively show that safety is reasonably assured. A 2002 survey showed that 47% of the NRC's employees are afraid to speak out about safety issues because they fear doing so would jeopardize their jobs, and that employees were concerned that pressure from industry is greatly undermining the agency's ability to oversee safety. In 2003, the Witt report regarding the evacuation plan at Indian Point highlighted many flaws in that plan.

In 2005, a National Academy of Sciences Report for Congress showed that the NRC had failed to adequately assess the huge risk of storing spent fuel in elevated pools that are vulnerable to terrorist attack. The consequences of a spent fuel pool fire would be enormous. For example, estimates show that one fuel pool fire could cause 24,000 lung cancers and economic damage that would be three times that caused by hurricane Katrina. Even though it is privy to safeguards information that the NRC claims has resolved this issue, the State of New Jersey has stated that the spent fuel pool at the Oyster Creek plant is a "major security concern." In August of last

year, a cooling tower cell at the Vermont Yankee plant completely collapsed. In October, a video showing sleeping guards at the Peach Bottom nuclear plant aired on national television. Most recently, a GAO study showed that the NRC has failed to resolve fire safety issues for over fifteen years. Because the NRC has failed to take decisive action, one NRC Commissioner believes the current regulations fail to deal with fire safety in an appropriate manner.

Two of the three relicensing proceedings that have commenced to date have also revealed major flaws in the current oversight process. First, during the discovery process in the Oyster Creek proceeding, the intervenors discovered that the thickness measurements that the NRC and the licensee had used to show safety for ten years were systematically wrong so that the containment was thinner than those results showed. Then, in August last year, the NRC Staff concluded that the containment at the Oyster Creek did not meet the required safety standards, but instead of taking any action, they amended the testimony and attempted to waive the standard. This was later found to be completely unjustified. *AmerGen Energy Co. LLC* (License Renewal for the Oyster Creek Nuclear Generating Station), LBP-07-17, 66 NRC 327 at n. 20 (2007). Second, in April of this year, it became clear that the NRC Staff had approved license renewal at nine plants based on non-conservative calculations regarding metal fatigue. This issue only came to light because a citizens' group raised it in the Vermont Yankee relicensing proceeding. Multiple citizens' groups have also shown that the NRC's relicensing safety reviews rely excessively upon unchecked licensee summary documents, and that the NRC Staff prematurely destroyed the working documents showing in detail how the safety review at Oyster Creek was conducted.

Furthermore, in a recent audit of the relicensing process, OIG highlighted that NRC's relicensing safety reviews suffered from a lack of quality control and were inconsistent in terms of thoroughness. In addition, the safety review of the Oconee plant stated that Staff had verified adequate performance of the coating system, when problems with coating failures were well known to the NRC. In a follow up memorandum, the OIG found that because the Staff had destroyed their working papers after each review was complete, it is very difficult to verify in detail how well the safety reviews were carried out.

Recent Evidence Of Poor Staff Performance From NRC Adjudications

Few NRC regulatory decisions are scrutinized by the adjudicatory arm of the NRC, the Atomic Safety and Licensing Board ("ASLB"), but in the proceedings that have occurred, some judges within the ASLB have been critical of the how the NRC Staff has been approaching safety issues. For example, one judge recently raised questions about the safety culture of the NRC Staff stating that the approach taken to two issues "may be symptomatic of safety culture deficiencies, and thus raise a serious question about a foundation of nuclear safety – the culture of the government organization responsible for promoting it." *Shaw Areva MOX Services* (Mixed Oxide Fuel Fabrication Facility, LBP-08-10 at 44 (Concurring Opinion of Judge Farrar, June 27, 2008). Although the judge stated that an alternative explanation could be that the NRC Staff behavior in that proceeding was "aberrational," other proceedings confirm that it was not. For example in the relicensing proceeding regarding the Oyster Creek power plant in New Jersey

the Staff announced that that the safety of the containment vessel should not be judged by whether it meets the engineering code.

In another recent case, the ASLB found that the NRC Staff had exhibited a "more than casual attitude" regarding the safety of the public living close to a site where piles of radioactive wastes had been left uncovered for ten years after the plant stopped handling radioactive materials. *Shieldalloy Metallurgical Group Corp.* (Licensing Amendment Request for Decommissioning of the Newfield, New Jersey Facility), LBP-08-08 at 13-14 (June 2, 2008). The Board found that residents who might be affected by groundwater contamination were entitled to greater consideration.

In yet another proceeding, the ASLB found "many instances" in which "the technical portions of the Staff documents in the record (particularly the SER [safety evaluation report] and to some degree, the EIS [environmental impact statement]) did not support a finding that the Staff's review supported its decisions." *Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), LBP-06-28, 64 NRC 460, 474-75 (2006). It also noted that the Board's "confidence in the Staff's judgment would have been materially improved had the more important of those facts [the Staff's factual findings] been checked." *Id.* at 492. The ASLB stated that it did not conduct further enquiries into these issues because it felt bound by a Commission instruction to defer to the NRC Staff. *Id.* at 492. Without that instruction from the Commission, the ASLB would have conducted "a much more probing review" into the quality of the review and reporting. *Id.* at 496.

The Scope Of The Relicensing Reviews Are Too Narrow

The current relicensing rules rely upon the assumption that ongoing NRC processes adequately maintain compliance with the safety requirements for each plant. If this is not the case, the focus on the aging management of long-lived passive components is far too narrow. At minimum, the relicensing process should verify this assumption through analysis of compliance with the CLB and licensee commitments. In addition, the review should also include a comprehensive study of whether the safety standards for each plant could be improved, including consideration of outstanding generic safety issues. The aim should be to bring old plants up to the safety standards of new plants as far as is reasonably possible and address new issues that have arisen since plant design, such as terrorism. As an example of an area that can be easily improved, old plants often have their back up generators located close together running off the same tank of fuel. Newer plants have the generators separated to make them truly redundant. This makes the plant less likely to have an accident and improves the ability to withstand a terrorist attack. At present relicensing reviews do not examine how to improve safety standards in many areas, including spent fuel storage and resistance to terrorism.

Public Participation In Relicensing Is Inadequate

In 2004, the NRC reformed the procedural rules on public participation in nuclear power plant licensing and relicensing to make it much harder for Citizens to raise concerns about safety

issues. As a consequence, until last year, no public hearings regarding relicensing of nuclear power plants had occurred, even though over 44 plants had renewed their licenses. Illustrating the positive effects of public participation, the intervention at Vermont Yankee highlighted a safety issue with metal fatigue calculations that the NRC Staff had missed at nine other reactors, but later acknowledged needed to be addressed.

One fundamental problem is that the standards which plants are supposed to meet are not clearly published for all to see and the NRC allows the standards to be changed by plant operators without NRC approval. It is very difficult to locate problems with an application when the standards are totally opaque and constantly changing. In addition, while applicants have many years to prepare an application, intervenors only have 60 days to submit their proposed issues for adjudication. *Shaw Areva MOX Services* (Mixed Oxide Fuel Fabrication Facility, LBP-08-10 at 49 (Concurring Opinion of Judge Farrar, June 27, 2008). Furthermore, because experts are an essential part of the process, intervenors must quickly find and fund experts willing to testify against the nuclear industry.

Even when a hearing is granted, intervenors face formidable hurdles in obtaining a fair hearing. One judge noted that intervenors had brought valuable issues to the Board's attention, despite these disadvantages and wondered how much more the public might contribute to nuclear safety, if the NRC's procedural rules allowed them to. *Id.* at 49. For example, raising new issues is very difficult and intervenors are forced to dissipate scarce resources on duplicative filings to try to overcome very strict timing requirements. *Id.* at 54. Unless the judges are sympathetic, the proceeding turns into a shell game "with the usual street corner outcome: whatever guess petitioners make is wrong." *See Id.* Furthermore, in nearly all proceedings intervenors must not only litigate against the applicants, they must also litigate against the NRC Staff, who opt to become a party.

In practice, rules which were supposed to generate a streamlined process generate endless procedural motions.[2] Because lawyers and experts cost money, the huge imbalance in resources between citizens and plant operators hampers citizens' ability to get a fair hearing. This became obvious at the Oyster Creek hearing when NRC and Exelon presented 21 expert witnesses to oppose the one witness the citizens could afford. In addition, two public interest lawyers for the intervenors were opposed by two lawyers for the NRC Staff and four lawyers for the applicant. The resource imbalance is made all the more important because there is no cross-examination right at the hearing. This means there is no opportunity for the intervenors to get the applicant's experts to make the intervenor's case.

Furthermore, if citizens try to find out what is going on at their local plant without resorting to litigation they face many obstacles in obtaining information. For example, prior to our intervention, my clients tried to obtain measurements of the thickness of the containment shell at Oyster Creek, but found the NRC did not possess the information and the licensee

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[2] See http://www.nirs.org/reactorwatch/licensing/oyster.htm for the many pleadings filed in the Oyster Creek relicensing process to date.

refused to release it. Even during litigation, licensees may try to exclude citizens by refusing to release information. For example, even though the NRC has recognized that there may be a problem with the metal fatigue calculations at Oyster Creek, Exelon has refused to release these calculations. In addition, because the information obtained is highly technical, citizens need experts to interpret it. In the wake of the 1979 accident at Three Mile Island, all of the major accident reviews recommended that funding be made available to responsible citizens' groups so that they could act as a deterrent to regulatory agency complacency. Congress has so far failed to do this, but it is long overdue.

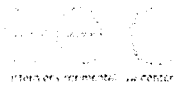
External Response To NRC Problems

The stirrings of a diverse effort to expose the NRC's lack of oversight are already evident. Last year, a citizens group in California won a lawsuit forcing the NRC to consider the potential impacts of terrorism on initial licensing. However, in contrast to the Department of Energy, the NRC decided to limit the effect of court's decision to facilities in the ninth circuit. The State of New Jersey and the Massachusetts Attorney General sought to have terrorism considered in the relicensing review, but both were rejected by the NRC. The State of New Jersey has a lawsuit pending on that issue. The Massachusetts Attorney General is currently petitioning for a rulemaking to require the consideration of terrorism during relicensing. The Attorney Generals of New York and Connecticut are supporting two New Jersey citizens' groups and Westchester County in their appeal to the Second Circuit of NRC's rejection of their attempt to get the rules for relicensing of old nuclear power plants changed. Citizens' groups in New Jersey and Massachusetts have now obtained hearings on relicensing, and a citizens group in Vermont is about to have a hearing. The New York Attorney General as well as a number of citizens' groups are also seeking a hearing regarding the relicensing of Indian Point nuclear power plant.

Conclusion

Unless the safety oversight processes and the relicensing rules are changed substantially to encourage meaningful public participation, public safety will continue to be impaired and public confidence in the NRC will continue to decline. This lack of confidence will hinder the opening of any new nuclear plants, as well as the extension of the life of some existing plants. If the nuclear industry and others genuinely want nuclear power to be considered as a viable option for power generation, they should welcome a debate on the proposals I have set forth with a view to meaningful reform in the near future.

I thank the sub-committee for holding this hearing and highlighting these issues.



RESPONSE BY RICHARD WEBSTER[1]
LEGAL DIRECTOR, EASTERN ENVIRONMENTAL LAW CENTER
TO THE FOLLOW UP QUESTIONS REGARDING TESTIMONY TO
THE SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

Responses by Richard Webster to Additional Questions
from Senator Boxer

1. What is the most important thing the NRC could do to improve the safety of nuclear plants?

The most serious current safety deficiency regarding operating nuclear plants is the failure to properly define the standards that those plants must meet, coupled with a failure to systematically calculate and regulate the chance that those standards are being violated. Recently, the Atomic Safety and Licensing Board (the "ASLB" or "Board") confirmed that the safety standards that govern the operations of nuclear plants (called the "Current Licensing Basis" or "CLB") do not have to be compiled into a single document that can be easily accessed. *In the Matter of Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13 at 18-19 (July 31, 2008). The ASLB found it "troubling" that the public cannot easily find out the CLB and asked rhetorically "if the CLB has not been compiled in one easy to access location, how can the public be assured that the NRC is adequately monitoring the facility?" *Id.* at 18 n. 84. The Board also agreed that the failure to compile the CLB makes it much harder to review safety issues. *Id.* at 19. In addition to the Board's concerns about the need for the public to know the safety standards, in the Oyster Creek case we found that the NRC Staff were also unclear about which safety standards applied. The lack of a compiled CLB is therefore impairing the ability of the public and the NRC Staff to verify on-going compliance with the safety standards. I therefore recommend that the CLB should be compiled and made publicly available.

However, merely compiling the CLB would not improve safety sufficiently. In addition, the NRC must require licensees to comply with the safety standards in the CLB to a specified

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[1] I am the legal director of the Eastern Environmental Law Center and represent a coalition of six Citizens' groups opposing the relicensing of the Oyster Creek Nuclear Power Plant, the oldest in the nation. In addition to a law degree from Columbia Law School, I have a degree in physics from Oxford University, a Masters degree in engineering hydrology from Imperial College of Science and Technology, and long experience as a scientific consultant for industry, governments, multilateral entities, and environmental groups. The views expressed in this testimony are my own, not those of my clients. Full citations to support the facts mentioned in this testimony are available upon request.

high degree of certainty. To facilitate this, the NRC should require licensees to analyze how certain they are that they meet each standard. The NRC should also set standards for how certain licensees must be about compliance with each of the numeric standards. At minimum, the NRC should not allow the chance of violating any single safety standard to exceed 2.5%. Plants that do not comply with the standards in the CLB to the required degree of certainty should be given a short period of time (less than six months) to resolve the uncertainty. Thereafter, they should not be permitted to operate until the licensee affirmatively proves the plant meets all the CLB standards with the required amount of certainty.

In short, the legislature should clarify that where there is greater than a 2.5% chance of non-compliance with any single requirement of the CLB for six months or more, the adequate protection requirement of the Atomic Energy Act is not met. In addition, the legislature should require the NRC to devise rules that:

i) require the CLB to be compiled into a single easily accessed document or computer file;
ii) require licensees to submit to the NRC a certified assessment of the chance of non-compliance with each CLB requirement at least annually.

2. What is the most important thing the NRC could do to improve public confidence in the safety of nuclear plants?

Public confidence in the safety of operating nuclear plants can only be achieved by encouraging the public to participate meaningfully in a transparent regulatory process. To facilitate such participation, the legislature should require the NRC to ensure each nuclear plant provides:

i) A publicly accessible log detailing the history of compliance with: the CLB safety standards (including the chance of non-compliance with numeric standards); licensee commitments; and implementation schedules for corrective actions.
ii) Prompt notice to interested parties when the safety requirements in the CLB or licensee commitments are changed or not met.
iii) Public access to all non-proprietary non-safeguards licensee documents containing information relevant to nuclear safety and access to redacted versions of proprietary or safeguards documents.
iv) Annual technical assistance grants to local citizens groups to enable them to hire expert assistance.

In addition, the legislature should require the NRC to:

i) Compile a publicly available log of all NRC documents withheld from public release and provide a simple process for the public to challenge Staff decisions to withhold documents;

ii) Reform the adjudicatory procedures used when disputes about ongoing safety arise to make the procedures as simple as possible, while preserving the essentials required to ensure fairness, such as, discovery (including depositions), the right to cross-examination, the prevention of NRC itself participating as a party, and the right to meaningful judicial review. If a citizens group raises a valid safety concern in an adjudicatory process, they should be entitled to recover expert costs and attorney fees.

Response by Richard Webster to an Additional Question
from Senator Carper

I believe Senator Voinovich was referring to a hearing on the New Jersey Energy Master Plan. The written testimony I submitted at that hearing is attached. I would also like to confirm that I do not believe it is helpful to make blanket statements about being for or against "nuclear power." Power generation technologies should compete in a well-regulated, fair marketplace and should be evaluated in comparison to the alternative methods of achieving the same objectives. No doubt more people were in favor of transport by horse and cart before the internal combustion engine came into widespread use. Similarly, nuclear power generation must be evaluated by comparing its performance to other ways of either satisfying or reducing the demand for electricity. Finally, even if a witness before the sub-committee were anti-nuclear, I do not think it would be appropriate to dismiss their views automatically, any more than it would be appropriate to entirely dismiss the views of those who promote nuclear power.

Once again, I thank the sub-committee for holding this hearing and asking such insightful questions.

Comments On Two Aspects Of The Draft New Jersey Energy Masterplan:

Public Sector Energy Efficiency And The Need To Fully Transition To Renewable Energy Sources

Introduction

The Eastern Environmental Law Center has prepared these comments on two aspects of the Draft New Jersey Energy Masterplan ("EMP") on behalf of Beyond Nuclear, Inc. and Grandmothers Mothers and More For Energy Safety (collectively, the "Clients"). The Clients reserve the right to submit comments on other aspects of the plan separately, and individual members of the Clients also reserve the right to comment on their own behalf.

These comments address the need to rapidly improve energy efficiency in the public sector and the need to fully transition to renewable generation technologies. On the first issue, the State can use the public sector to show that energy efficiency is not only good for the environment, it is also financially prudent and good for the economy as a whole. The EMP proposals fail to fully account for the present economic conditions and the need for an economic stimulus, particularly in the construction industry. Rapid investment in energy efficiency in the public sector could not only provide such a stimulus, it would also bring a host of long-term benefits, including lower taxes and an improved environment. The State should therefore invest heavily in energy efficiency at State and municipal facilities in the short-term.

On Monday, Mayor Bloomberg expressed similar sentiments by announcing New York City's plan to reduce greenhouse gases emitted from municipal buildings and operations by 30% below 2006 by 2017 using cost-effective measures.[1] The City will increase efficiency using a wide range of measures including improving air and heating systems, fixing methane leaks at water treatment plants and using that gas to run electric generation equipment, and using more fuel efficient vehicles. On a cash flow basis, the City will break even in 2013 and by 2015, it will have saved more on its energy bills that it will have spent by that time.

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[1] http://www.nyc.gov:80/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2008b%2Fpr264-08.html&cc=unused1978&rc=1194&ndi=1

Moving on to the second issue, if the goals of the EMP concerning energy efficiency, renewable generation, and combined heat and power are met, there is no need for other additional generation capacity before 2020. Furthermore, after 2020, it is likely that solar power will be able to supply cost-competitive electricity without subsidy and local and imported wind-power may also be option. Therefore, there is no need for the State to promote nuclear power as a long-term option. Instead, the State should continue to foster the transition to renewable energy sources.

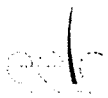
Issue 1: Rapid Investment In Public Sector Energy Efficiency Has Major Benefits

EELC has found that a number of states around the country have established mechanisms to borrow money to invest in energy efficiency measures that then save more money than the cost of borrowing. The idea behind this approach is that public entities should be encouraged to become as energy efficient as possible, but there is a danger that the current tight fiscal environment will lead to under-investment in energy efficiency retrofits for public buildings and other efficiency measures. Establishing an Energy Efficiency Fund to borrow money and then lend to public entities to allow such investments to occur would mitigate that danger. The Fund would provide an economic stimulus, including the development of green jobs, save taxpayers money, and improve the expertise in energy efficiency within the state government. By acting as a model for enlightened self-interest, this approach would also encourage cost effective energy efficiency in the private sector.

BACKGROUND

A number of states have successfully taken this approach. New Mexico's Energy Efficiency and Renewable Energy Bonding Act authorizes up to $20 million in bonds to finance energy efficiency and renewable energy improvements in state and school district buildings. See N.M. Stat. Ann. § 6-21D-2 et seq. (2008). The Bonding Act created a special "energy efficiency and renewable energy bonding fund" that pays the principal and interest on bonds issued pursuant to the act. N.M. Stat. Ann. § 6-21D-5(B). To repay the fund, the estimated energy cost that will annually be achieved as result of the efficiency measures is first calculated. N.M. Stat. Ann. § 6-21D-6(A). Ninety percent of that cost is then deducted by the Public Education Department, see N.M. Stat. Ann. § 6-21D-6(B) (school district buildings), or from the budget of the agency responsible for paying the utilities of a state building, see N.M. Stat. Ann. § 6-21D-6(E) (state buildings). The deductions stop when the cumulative deductions equal the amount necessary to service the bonds issued for the improvements. See N.M. Stat. Ann. § 6-21D-6(C) (school district buildings); N.M. Stat. Ann. § 6-21D-6(F) (state buildings).

Like New Mexico, Montana's program uses energy savings to repay bonds issued to fund a state projects used for state-owned buildings, structures, and facilities. See



Mont. Code Ann. § 90-4-602 et seq. (2007). The State Building Energy Conservation Bond Program requires that the total amount of energy costs saved as a result of the efficiency improvements be placed into an energy conservation payment account until the total cost of the project is paid off. Mont. Code Ann. § 90-4-615(2)(a). This account is also responsible for providing the funds necessary to issue the bonds. Mont. Code Ann. § 90-4-613.

Two other states, California and Texas have similar programs that are constructed around the issuance of loans, not bonds. Under California's statute, loans are provided to local jurisdictions for the purchase of energy efficient equipment or small power production systems, and to improve the operating efficiency of existing transportation systems, among others. See Cal. Pub. Res. Code § 25442 (2007). Similarly, Texas has enacted LoanSTAR (Loans to Save Taxes and Resources), a state energy efficiency demonstration program using a revolving loan mechanism. Loan recipients repay the principal and interest from the accrued value of energy savings realized as a result of the energy conservation measures implemented with the borrowed money. Tex. Gov't Code Ann. § 2305.032(d) (2007). Though the financing from these two programs is not achieved through bonds, the improvements soon pay for themselves, and save large amounts of money after that. Thus, energy savings are driving further efficiency.

CASE STUDY

Two examples from a recent energy audit conducted for a municipality in New Jersey show how a similar program would benefit the state. In one building, the audit estimated a replacement cost of $30,000 for an old air handling system that had poor duct insulation and poor temperature control. The energy savings from the more efficient replacement were estimated at $6,779 per year, quickly making up for the initial cost. In a second building owned by the municipality, retrofitting the lighting system would save a substantial amount of money. The audit estimated that replacing existing lights with T8 lamps and electronic ballasts, along with the installation of a lighting occupancy sensor, would have a total cost of $43,412 ($36,253 for the lights and $7,159 for the sensor). When looking at the total savings, including maintenance, from these retrofits the audit estimated a total savings of $15,768 per year at the second building.

Implementing these project not only saves money, it also reduces the demand for energy, benefiting the public as a whole through lower emissions and lower energy prices. Replacing the air handling system and patching up the leaks would reduce the energy consumption of the first building by an estimated 2,760 therms/yr (natural gas) and 24,800 kWh/yr. Likewise, replacing the lighting and installing the sensor in the second example would reduce electricity consumption by an estimated 143,071 kWh/yr. Thus, providing money upfront would provide not only an economic stimulus in the short run, but also reduce energy demand for the long term.

CURRENT SITUATION IN NEW JERSEY

Two programs in New Jersey encourage energy efficiency. In 2003, the New Jersey Board of Public Utilities (BPU) established the Clean Energy Council to administer the Clean Energy Program (CEP). Programs under the CEP include the Municipal Audit Program, which will pay for 75% of an energy audit for any qualifying municipality or government agency, and will pay the remaining balance of that audit if they complete all of the recommended projects. However, the State has earmarked only $800,000 for this program. Because this is insufficient to pay for audits of all municipal facilities, many municipalities will presumably be left out. In addition, to date, the program does not address implementation of the audit recommendations.

Furthermore, Governor Corzine created of the Office of Energy Savings on April 22nd, 2006 through Executive Order No. 11. This office oversees energy audits at State buildings, centers and facilities to analyze energy efficiency, Exec. Order No. 11(2)(a) (2006), and develops energy plans in conjunction with the Economic Department Authority. Exec. Order No. 11(2)(e) (2006). This demonstrates the State's recognition of its role in promoting energy efficiency.

This is further demonstrated in the EMP. The EMP included among its goals the need to redesign efficiency programs to emphasize a whole building approach and the need for a statewide building code to make construction at least 30% more efficient. Id. at 11. It did this because conservation and energy efficiency are the most economical methods of lowering New Jersey citizens' energy costs. Id. at 51. However, the majority of energy losses come from already constructed facilities, not from those to be constructed in the future. As the EMP recognizes, retrofitting these existing buildings is the best way to change the existing baseline. Id. at 52-54. In addition, the EMP recognizes that the state must lead by example. Id. at 75-79.

To enable state and municipal entities to fund cost-effective energy improvements, the EMP suggests that the law should be changed to allow long-term contracting for energy efficiency. Id. at 78-79. It is understood that a law enabling such contracting is awaiting the Governor's signature. However, while this is a reasonable approach, it is unlikely that this will be sufficient to provide the needed short term stimulus for a number of reasons. First, access to private capital is currently very tight. Second, performance contractors tend to favor large industrial-scale projects,that are seldom available because most of New Jersey's municipalities are relatively small. Moreover, public entities can generally borrow on more favorable terms than private entities making more energy saving measures cost effective.

IMPLEMENTATION METHODS

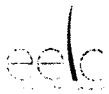
Bonds are issued with the idea that an improvement should be paid for by those who have the opportunity to benefit from it, not just those who are alive at the time the

process begins, and are often utilized in New Jersey to spread costs over time and pay for income producing assets. See N.J. Stat. Ann. § 40:11A-8 (2008) (parking authorities may issue bonds payable from income and revenues of parking projects). The State of New Jersey is not prohibited from guaranteeing bonds and obligations for a public purpose. See Behnke v. N.J. Highway Authority, 25 N.J. Super 149 (Ch. Div. 1953) (the State's guarantee of bonds was not a prohibited by the financial limitation clause, N.J. Const. art. VIII, §2, ¶ 1).

At least three options exist to create an Energy Efficiency Fund in New Jersey to promote the public purpose through bonds and obligations. One option is to create an office within an existing department to administer loans for energy efficiency projects funded directly by state debt. The main advantage of this method is the ability to centralize expertise within a state agency, which would lead to a transparent and more effective way of promoting energy efficiency in the public and private sectors. However, the State has expressed a desire not to borrow any more money in the current economic climate.

Another option is to create an independent state authority responsible for issuing bonds and maintaining the fund. The Environmental Infrastructure Trust (EIT), created in 1986, is an example of this. EIT works in partnership with DEP and combines interest-free loans from state revolving funds with market-rate loans from AAA-rated Trust bonds, granting a loan that is half of the market rate to municipalities and utility and sewerage authorities. This provides a way to distribute substantial amounts of capital for large projects in an arm's-length manner, while still enabling some centralization of expertize. Although this method avoids direct issuance of state debt, the use of independent authorities has sometimes led to a lack of accountability.

A third option is to encourage local governments to borrow to fund local improvements. Municipalities and counties in New Jersey have the authority to issue obligations up to the statutory limits of indebtedness to finance "any capital improvement...which it may lawfully make." N.J. Stat. Ann. § 40A:2-3(a) (2008). Thus, it should be possible for municipalities and counties to issue bonds for the purpose of promoting energy efficiency, with the principal and interest (if any) payable by the energy savings that accrue from the adopted energy conservation measure. Demonstating the practicality of this approach, we understand that the Bergen County Improvement Authority, has already funded energy efficiency projects. However, while this would encourage energy efficiency to a small degree, it would create a patchwork of expertise and implementation throughout the state, in place of the centralized knowledge in the previous two options. Thus, at minimum, this approach would have to be supported by technical assistance and co-ordination from the OES.



CONCLUSION

A state energy efficiency fund would have many benefits, including stimulating the state economy by creating construction activity, reducing local air pollution and greenhouse gas emissions, saving taxpayers money, and enabling the public sector to lead the private sector by example. There are a number of ways to accomplish this, but it would be ideal build upon the existing expertise in energy efficiency within the State. In our view, this would be best accomplished by establishing an Energy Efficiency Authority which would borrow wholesale and then lend to State and local entities, taking a small spread to fund its operations. In the short term, the people of New Jersey could benefit from public sector energy efficiency while conserving scarce public money. In the long term, the expertise gained by using the public sector as the first mover, would act as a model for the private sector and could be used as the basis for educational efforts.

Issue 2: The EMP Should Promote Renewable Energy, Not Nuclear Power

At present New Jersey consumes approximately 82,000 GWh of electricity each year, EMP at 17, of which approximately 75% is generated within the state. *Id.* at 35. The demand in 2020 is projected to be 80,000 GWh. *Id.* at 13. The plan calls for installing approximately 10,000 GWh of new combined heat and power before 2020. *Id.* In addition, the renewable portfolio standard increases from approximately 6% to 22.5% i.e. an increase from approximately 5,000 GWh to 18,500 GWh. *Id.* at 63. This is an increase in capacity of 13,500 GWh. Thus, state mandates will lead to an additional 23,500 GWh of generation capacity being installed, while overall demand is expected to be constant. The demand on the existing plants will therefore fall to 56,500 GWh by 2020.

It is unclear why the EMP suggests that existing plants will not be able to meet this demand prior to 2020. *Id.* at 13. Contrary to the EMP's assumption, age does not seem to be the main issue. More than half the existing capacity is under 30 years old, *id.* at 33, and power plants normally have a useful life of approximately 40 years. Indeed, some fossil fuel plants are over 50 years old. *Id.* In addition, merchant plant owners of old coal plants have shown a willingness to retrofit those plants to extend their life. Therefore, instead of planning for the retirement of old coal plants, it would make sense to encourage owners repower the plants to make them as efficient as possible, perhaps through the inclusion in air permits of standards for CO2 emissions per MWh generated and encouraging use of pipeline quality bio-methane. Because the clearing price in the system is generally set by efficient natural gas plants, this approach should not cause the price of electricity to change significantly.

Old nuclear plants present a different proposition, because their safety systems degrade over time and the current regulatory system is failing to properly address this issue. For the Oyster Creek plant (600 MW) there is currently no certainty that it meets

its safety requirements. Therefore, it should be retired before the next refueling outage in October. For other nuclear plants, the State should plan on them closing after 40 years or when they can no longer establish that they meet their safety requirements with a high degree of certainty. Currently, the license for Salem 1 (1100 MW) expires in 2015, Salem 2 (1100 MW) expires in 2020, and Hope Creek (1100 MW) expires in 2026. This shows that less than half of New Jersey's nuclear capacity is scheduled to go offline before 2020. Because nuclear plants run around 90% of the time, this amounts to around 4,700 Gwh retiring in 2008 or 2009, and another 8,700 Gwh retiring in 2015. Thus, if properly planned, short term demand reduction measures combined in the longer term with new renewable and combined heat and power capacity should replace the nuclear capacity that is scheduled to retire without incurring a major penalty in terms of greenhouse gas emissions.

Another possible cause of a generation shortage cited by the EMP is power export. *Id.* at 13. However, New Jersey's prices are already high. *Id.* at 35-36. Any generation shortage would send prices higher, curtailing exports. Thus, it is unlikely that power export will lead to a shortage of generation.

The situation after 2020 is considerably less certain, but is likely to be less constrained. Renewable energy, particularly solar power, is anticipated to become financially competitive with natural gas-fired baseload prices at around 2020.[2] McKinsey & Co., *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost*, 62-63 (December 2007). Thereafter, solar power could experience explosive growth, as seen in the electronics industry. *Id.* at 63. In addition, there are innovative storage technologies being developed, which should assist with the problem of intermittency and large scale investments in on-shore wind farms in other states are anticipated.

As the EMP acknowledges, using coal to produce baseload power is unacceptable for a host of reasons, including high emissions of many pollutants, including mercury, particulates, and greenhouse gases. *Id.* at 71. The EMP then gravitates towards the idea that a new nuclear power plant could help to lower the price of electricity. *Id.* at 71. This is incorrect, because the latest estimates are that nuclear power cannot compete with existing generation capacity in the short run, and cannot compete with the reducing cost of renewables in the long run.[3] Moody's Corporate Finance stated in its May 2008 report on nuclear power that "our concerns reside in the fact that nuclear generation has a fixed design where construction costs are rising rapidly, while other renewable technologies are

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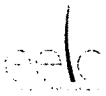
[2] The Department of Energy has programs that aim to reach this point in 2015. http://www.energy.gov/news/4855.htm

[3] One low but somewhat realistic estimate is that nuclear power would have a cost of 8 to 11 cents/kWh delivered to the grid. http://www.keystone.org/spp/documents/FinalReport_NJFF6_12_2007(1).pdf ("Keystone Report") at 11. This compares to less than 7 cents/kWh for wind, and less than 6 cents/kWh for combined heat and power. In its May 2008 special comment Moody's Investors Service stated that the construction cost for a new nuclear plant potentially exceeds $7,000 per kW, which equates to a cost of 13 to 14 cents/kWh, after operating costs are added in. *See Keystone Report* at 42.



still experiencing significant advancements in terms of energy conversion efficiency and cost reductions." Moreover, because building a nuclear power plant would likely take more than 10 years, *id.* at 33, a new nuclear plant could only supply power after 2020, but would absorb a large amount of capital prior to that time.

As the proposal above illustrates, there are many more economically beneficial places to deploy that capital, particularly in energy conservation and development of renewable generation technologies. In addition, one major problem with nuclear power is that we would have to commit to build a plant at least 10 years before it could produce any energy. If nuclear power turns out to be more costly than renewables by the time any plants are built, as many anticipate, the State could not change course without incurring a huge penalty. On the other hand, if we stay flexible by avoiding committing large amounts of capital to nuclear power, at worst in 2020 we would be required to pay a modest premium for renewable energy compared to nuclear power. Given the major issues associated with nuclear power, such as the loss of State control over safety to a federal agency with a poor record, the inability to dispose of the nuclear waste generated, and the risk of proliferation of nuclear weapons, any small premium that may be required would be worth paying. In short, the high financial and environmental risk of building a nuclear power plant is simply not worth taking, when it is compared to the low risk alternative of transitioning to renewable energy sources.

Senator CARPER. Mr. Webster, thank you very much.
Dr. Romm, you are recognized at this time.

STATEMENT OF JOSEPH ROMM, SENIOR FELLOW, CENTER FOR AMERICAN PROGRESS ACTION FUND

Mr. ROMM. Mr. Chairman, Senator Voinovich, I am delighted to be here. I was Special Assistant for Policy and Planning to Deputy Secretary Bill White from 1993 to 1995. He had oversight responsibility for all the energy programs, including nuclear energy. Then I went on to be Principal Deputy Assistant Secretary and then Acting Assistant Secretary for Energy Efficiency and Renewable Energy.

Senator CARPER. What years did that encompass, please?

Mr. ROMM. From 1993 to 1998, I was at the Department of Energy, the first two as Special Assistant, and then 3 years at the Office of Efficiency and Renewables.

I was asked to address the cost issue here. I have three main points. First, the licensing process should not be expedited because the economic and safety risks are too high. Second, nuclear power has become so expensive, it is unlikely to achieve net growth by mid-century without tens of billions of dollars more in Government subsidies. And third, Congress should focus Federal support on energy efficiency and renewables, because they have now become better bets than nuclear power.

The first point I think is that since the nuclear action could have such harsh consequences with costs ultimately borne by the American taxpayer, Congress must enforce the strictest safety standards. If power plants take six to 10 years to build, that is because the industry has failed to develop and standardize a limited set of simple, modular, fail-safe reactor designs that could tap into a cognitive scale for mass production. In the American market, there are at least five new designs.

I don't think delays are due to red tape. Nuclear plants face similar delays in other countries. Why? Quality problems. The first advanced reactor design built in the west in Finland is already 25 percent over budget and 2 years behind schedule because of "flawed wells for the reactor's steel liner, unusable water coolant pipes and suspect concrete in the foundation."

Second, once billed as too cheap to meter, nuclear power simply became "too costly to matter," as the economists put it back in 2001. Yet nuclear power is now triple the price that it was in 2001. An industry trade magazine headlined a recent article, "For some utilities the capital cost of nuclear power plants are prohibitive." Nuclear economic expert Jim Harding e-mailed me that his current reasonable estimate for levelized cost range for nuclear power is 12 to 17 cents per kilowatt hour lifetime, much higher than current U.S. electric rates.

Last August, AEP CEO Michael Morris said he was not planning to build any new nuclear plants: "I am not convinced we will see a new nuclear station before probably the 2020 time line. So I do not consider nuclear a near-term solution."

In October, Florida Power and Light testified that two units totaling 2,200 megawatts would cost up to $18 billion, which is a stunning $8,000 per kilowatt. Progress Energy told Florida regu-

lators that twin 1,100 megawatt plants would cost $14 billion, which triples estimates the utility offered little more than a year ago. Its 200 mile transmission project would add $3 billion more. Total costs, again, nearly $8,000 a kilowatt. Nuclear plants are now so expensive that Duke Power actually refused to reveal cost estimates for a proposed plant in the Carolinas, and a recent California Public Utility Commission study puts the cost of power from new nuclear plants again at 15 cents per kilowatt hour. Energy efficiency, wind and solar all beat that price.

To date, California's efficiency programs have cut total electricity demand by 40,000 gigawatt hours for two to three cents per kilowatt hour. California plans to more than double those savings by 2020. If that effort would reproduce nationwide, efficiency would deliver enough savings to avoid the need to build any new U.S. power plants for two decades. A May report by this Energy Department concluded Americans could get 300 gigawatts of wind by 2030 at a cost of under 8.5 cents per kilowatt hour.

Utilities in the Southwest are already contracting for concentrated solar thermal power at 14 to 15 cents per kilowatt hour. The Western Governors Association expects that the price will drop to 12 cents a kilowatt hour within 5 years. That would include 6 hours of storage capacity, which would allow concentrated solar to follow the electric load from early morning to late evening and eliminate the intermittence issue associated with solar. Even solar photovoltaics with battery storage can now be installed cheaper than what Florida ratepayers are being asked for nuclear power.

In conclusion, nuclear power's many limitations, especially its escalating price, will constrain its growth in America. Merely maintaining the current percentage of generation provided by nuclear through the year 2050 will probably require building some 75 large replacement reactors with a total cost approaching $1 trillion, and that won't happen without massive congressional subsidies. A U.S. cap and trade system, such as you propose, will help all low carbon energy resources, including nuclear. After 50 years and nearly $100 billion in subsidies from Congress, if new nuclear plants can't compete in this emerging low carbon market, then frankly, it doesn't deserve yet more taxpayer support or any expedited licensing.

Thank you.

[The prepared statement of Dr. Romm follows:]

STATEMENT OF

Dr. JOSEPH ROMM

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CENTER FOR AMERICAN PROGRESS ACTION FUND

before the

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY

of the

UNITED STATES SENATE

July 16, 2008

Mr. Chairman, members of the Committee, I am delighted to appear before you today to discuss the subject of nuclear power. I am a Senior Fellow at the Center for American Progress Action Fund (CAPAF) here in Washington, DC where I run the blog *ClimateProgress.org*. I am author of the recent book *Hell and High Water: Global Warming—the Solution and the Politics* (Morrow, 2007) and have published and lectured widely on energy and climate issues, including the recent CAPAF report, "The Self-Limiting Future of Nuclear Power."

From 1993 to 1995, I was special assistant for policy and planning to the deputy secretary of energy, who oversaw all of DOE's energy programs, including nuclear energy. I served as Acting Assistant Secretary at the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy during 1997 and Principal Deputy Assistant Secretary from 1995 though 1998. In that capacity, I helped manage the largest program in the world for working with businesses to develop and use clean energy technologies. I hold a Ph.D. in physics from the Massachusetts Institute of Technology.

Nuclear power generates approximately 20 percent of all U.S. electricity. And because it is a low-carbon source of around-the-clock power, it has received renewed interest as concern grows over the effect of greenhouse gas emissions on our climate. Yet nuclear power's own myriad limitations will constrain its growth, especially in the near term. These include:

- Prohibitively high, and escalating, capital costs
- Production bottlenecks in key components needed to build plants
- Very long construction times
- High electricity prices from new plants

The carbon-free power technologies that the nation and the world should focus on deploying right now at large scale are efficiency, wind power, and solar power. They are the lower-cost carbon-free strategies with minimal societal effects and the fewest production bottlenecks. They could easily meet all of U.S. demand for the next quarter -century, while substituting for some existing fossil fuel plants. In the medium- term (post-2020), other technologies, such as coal with carbon capture and storage or advanced geothermal, could be significant players, but only with a far greater development effort over the next decade.

Since nuclear power is a mature electricity generation technology with a large market share and is the beneficiary of some $100 billion in direct and indirect subsidies since 1948, it neither requires nor deserves significant subsidies in any future climate law.

The High Cost of Nuclear Power

For three decades, no new nuclear power plants have been ordered in the United States. Now a number of utilities are proposing to build nuclear power plants, because of the escalating cost of electricity from new fossil fuels plants, growing concern over greenhouse gas emissions, and the federal government's promise of production tax credits and loan guarantees for investments in new nuclear power capacity.

Yet, as a 2003 interdisciplinary study by the Massachusetts Institute of Technology on "The Future of Nuclear Energy" concluded, "The prospects for nuclear energy as an option are limited ... by four unresolved problems: high relative costs; perceived adverse safety, environmental, and health effects; potential security risks stemming from proliferation; and unresolved challenges in long-term management of nuclear wastes.[1]

New nuclear power now costs more than double what the MIT report assumed in its base case, making it perhaps the most significant "unresolved problem." From 2000 to October 2007, nuclear power plant construction costs—mainly materials, labor, and engineering—have risen by 185 percent.[2] That means a nuclear power plant that cost $4 billion to build in 2000, cost $11.4 billion to build last October.

The cost issues have reached such a high level for the industry that one of its trade magazines, *Nuclear Engineering International*, headlined a recent article, "How much? For some utilities, the capital costs of a new nuclear power plant are prohibitive."[3]

By mid-2007, a Keystone Center nuclear report funded in part by the nuclear industry and NEI estimated overnight costs at $3000/kW, which equals $3600 to $4000/kW with interest. The report notes, "the power isn't cheap: 8.3 to 11.1 cents per kilo-watt hour." In December 2007, retail electricity prices in this country averaged 8.9 cents per kwh.

At the end of August, 2007 *Tulsa World* reported that American Electric Power Co. CEO Michael Morris was not planning to build any new nuclear power plants. He was quoted as saying, "I'm not convinced we'll see a new nuclear station before probably the 2020 timeline," citing "realistic" costs of about $4,000/kW, he said. [4]

Nuclear is simply not a near-term, cost-effective solution to our climate problem—especially if the $4,000/kW cost last year was already starting to price it out of the marketplace. The prices utilities are quoting for nuclear have since soared 50 percent to 100 percent.

Florida Power & Light presented a detailed cost estimate for new nuclear plants to the Florida Public Service Commission in October of last year.[5] FPL is "a leader in nuclear power generation in the United States" with "one of the most active and current utility construction programs in the U.S." FPL concluded that two units totaling 2,200 megawatts would cost between $5,500 and $8100 per kW—$12 billion to $18 billion total—and that two units totaling 3,000 MW would cost $5,400 to $8,000 per kW—$16.5 billion to $24 billion total. [6] (These are the actual costs, not adjusted for inflation.)

Lew Hay, chairman and CEO of FPL, said, "If our cost estimates are even close to being right, the cost of a two-unit plant will be on the order of magnitude of $13 to $14 billion. That's bigger than the total market capitalization of many companies in the U.S. utility industry and 50 percent or more of the market capitalization of all companies in our industry with the exception of Exelon. ... This is a huge bet for any CEO to take to his or her board."

An October 2007 Moody's Investors Service report, "New Nuclear Generation in the United States," concluded, "Moody's believes the all-in cost of a nuclear generating facility could come in at between $5,000 - $6,000/kw."

In January 2008, MidAmerican Nuclear Energy Company—owned by famed investor Warren Buffet—said that prices were so high, it was ending its pursuit of a nuclear power plant in Payette County, Idaho, after spending $13 million researching its economic feasibility. Company President Bill Fehrman said in a letter, "Consumers expect reasonably priced energy, and the company's due diligence process has led to the conclusion that it does not make economic sense to pursue the project at this time."[7] When Buffet pulls the plug on a potential investment after spending $13 million analyzing the deal, it should give everyone pause.

In mid-March, Progress Energy informed state regulators that the twin 1,100 MW plants it intends to build in Florida would cost $14 billion, which "triples estimates the utility offered little more than a year ago." That would be more than $6400/kW. The whole cost is even higher; "The utility said its 200-mile, 10-county transmission project will cost $3-billion more." It looks like renewables are not the only source of electricity that requires new power lines. Factoring that cost in, the price would be $7,700/kW.[8]

The utility, however, won't stand behind the tripled- cost for the plant. In its filing with state regulators, Progress Energy warned that its new $17- billion estimate for its planned nuclear facility is "nonbinding" and "subject to change over time."

The picture for Florida ratepayers is a harsh one. As the *St. Petersburg Times* reported, Florida passed a law that allows utilities to recoup some costs while a nuclear plant is under construction.[9] In short, "customers will start paying for the plant years before it goes into service." How much? The current estimate is about $9 per month starting as early as next year. That means the customers of Progress Energy will each pay more than $100 per year for years and years before they get a single kilowatt-hour from these plants.

Georgia Power said in early May that it planned to spend $6.4 billion for a 46 percent interest in two new reactors proposed for the state's Vogtle nuclear plant site. The *Wall Street Journal* noted, "Utility officials declined to disclose total costs. A typical Georgia Power household could expect to see its power bill go up by $144 annually to pay for the plants after 2018."[10]

This would seem to be a case of history repeating itself. According to the same *Wall Street Journal* article, "The existing Vogtle plant, put into service in the late 1980s, cost more than 10 times its original estimate, roughly $4.5 billion for each of two reactors."

How expensive have nuclear plants become? Duke Power has been refusing to reveal cost estimates for a nuclear plant for the Carolinas, saying it would reveal trade secrets. [11]

In March, Peter Bradford, former Commissioner of the Nuclear Regulatory Commission, former president of National Association of Utility Regulatory Commissioners, and member of the Keystone Panel, testified to South Carolina Public Service Commission on yet another typically undisclosed cost of new nuclear plants—the storage of nuclear waste:

> Unless the law is changed to expand Yucca Mountain, that proposed repository will not be able to store all of the waste from the existing plants, to say nothing of new ones. Furthermore, the Department of Energy does not have the same obligation to take the waste from new plants, such as the unit proposed by Duke in this proceeding, that it has under the contracts with the existing plants. Therefore, the waste from this plant is not assured of a place in any repository. Indeed, there is no assurance that it can be moved off site at all.
>
> The only prudent assumption is that the waste from this plant may have to be stored on site for a long time. Dry cask storage makes this technically feasible, but Duke and its customers may be responsible for the costs of that indefinite storage because, unlike the existing spent fuel, it is not covered by a contract that subjects the U.S. government to an obligation to take it.[12]

Bradford notes that it is possible to reprocess the spent nuclear fuel—extract the plutonium and run it in special reactors. But that doesn't actually reduce the waste problem, and it adds another 1.5 cents to 3.0 cents per kilowatt hour, or kWh, or more to the price of the nuclear electricity.

A detailed discussion of reprocessing is beyond the scope of this testimony. Princeton nuclear physicist Frank N. von Hippel's writes in the recent *Scientific American*, "Nuclear Fuel Recycling: More Trouble Than It's Worth" of the three big flaws of reprocessing: "extraction and processing cost much more than the new fuel is worth"; "recycling plutonium reduces the waste problem only minimally; and separated plutonium can be used to make nuclear bombs if it gets into the wrong hands, which means that a lot of effort has to be expended to "keep it secure until it is once more a part of spent fuel."[13]

As an important aside, the recent troubles the industry is having are not limited to this country. The first of the advanced reactor designs to be built in the West has been under construction in Finland since mid-2005. It is already 25 percent over budget and two years behind schedule because of "flawed welds for the reactor's steel liner, unusable water-coolant pipes, and suspect concrete in the foundation."[14]

Bloomberg notes, "The June commercial startup of China's Tianwan project came more than two years later than planned. The Chinese regulator halted construction for almost a year on the first of two Russian-designed reactors while it examined welds in the steel liner for the reactor core.... ... In Taiwan, the Lungmen reactor project has fallen five years behind schedule. Difficulties include welds that failed inspections in 2002 and had to be redone."

By mid-May, the *Wall Street Journal* was reporting that after "months of tough negotiations between utility companies and key suppliers ... efforts to control costs are proving elusive." How elusive? According to the *Wall Street Journal*, "Estimates released in recent weeks by experienced nuclear operators—NRG Energy Inc., Progress Energy Inc., Exelon Corp., Southern Co. and FPL Group Inc.—'have blown by our highest estimate' of costs computed just eight months ago, said Jim Hempstead, a senior credit officer at Moody's Investors Service credit-rating agency in New York."

That is, Moody's is saying actual costs have "blown past" their earlier $6,000/kW estimate.

So what would be the cost of electricity from new nuclear plants today? Jim Harding, who was on the Keystone Center panel, was responsible for its economic analysis, and previously served as director of power planning and forecasting for Seattle City Light, emailed us in early May that his own "reasonable estimate for levelized cost range ... is 12-17 cents per kWhr lifetime, and 1.7x times that number [20 to 29 cents per kWh] in first year of commercial operation."

In a 2008 presentation to the Wisconsin public utility Institute seminar, he noted that Puget Sound Energy had quoted a capital price as high as $10,000/kW.

One very good source of apples-to-apples comparisons of different types of low- and zero-carbon electricity generation is the modeling work done for the California Public Utility Commission on how to comply with the AB32 law, California's Global Warming Solutions Act.[15] AB32 requires a reduction in statewide greenhouse gas emissions to 1990 levels by 2020, something the entire country will have to do if we are to get off the path toward catastrophic warming.

The research for the CPUC puts the cost of power from new nuclear plants at more than 15 cents per kWh before transmission and delivery costs. At the price, many large-scale alternative sources of carbon-free electricity are today either considerably cheaper or more competitive.

The Near-Term Competition to Nuclear

The three most plausible ways to reduce emissions from power plants today are efficiency, wind power, and solar power. By "plausible," we mean capable of delivering large amounts of power affordably and quickly, which means having no obvious production bottlenecks.

Efficiency: Energy efficiency is the cheapest alternative to nuclear by far. California has cut annual peak demand by 12 GW, and total demand by about 40,000 GWh, through a variety of energy-efficiency programs over the past three decades. Over their lifetime, the cost of efficiency programs has averaged 2-to-3 cents per kWh. If every American had the per capita electricity of California, we'd cut electricity use about 40 percent. If the next president aggressively pushes a nationwide effort to embrace efficiency and change regulations to encourage efficiency, then we could keep electricity demand close to flat through 2020.[16] That is particularly true if we include an aggressive effort on behalf of cogeneration, which is the simultaneous generation and use of electricity and heat, a very efficient process.

A May presentation of the California Public Utilities Commission modeling results shows that energy efficiency could reduce electricity consumption up to 36,000 GWh by 2020—that is the equivalent of more than 5 GW of baseload generation operating 80 percent of the time.[17] At the same time, the state could build 1.6 GW of cogeneration plants smaller than 5 MW and 2.8 GW of cogeneration plants larger than 5 MW. So that is nearly 10 GW of efficiency by 2020. If this were reproduced nationwide, efficiency would deliver more than 130 GW of efficiency by 2020, which is more than enough energy savings to avoid the need to build any new power plants through 2020 and beyond. This means any new renewable plants built could displace existing fossil fuel plants and begin to reduce U.S. carbon dioxide emissions from the utility sector.

Wind: A major new report issued in May by the Bush administration finds that for under 2 cents a day per household in total extra cost, Americans could get 300 GW of total wind capacity by 2030.[18] The report found that wind power should cost 6 to 8.5 cents per kWh, even without the current tax credit, including the cost of transmission to access existing power lines. And the cost of integrating the variable wind power into the U.S. grid would be under 0.5 cents/kWh.

The carbon dioxide savings alone would come to 7.6 billion metric tons cumulatively by 2030, at which point wind would be cutting annual emissions by 825 million metric tons a year. That is the equivalent in emissions reduction of taking two-thirds of all U.S. passenger vehicles off the road. That much wind would also reduce natural gas use by 11 percent.

The study notes that by 2030, wind would be cutting water consumption by 450 billion gallons a year, of which 150 billion gallons a year would be saved in the arid Western states, where water is relatively scarce—and poised to get even scarcer thanks to climate change. In addition, this wind effort would generate a half a million jobs, of which nearly a third would be high-wage workers directly employed in the industry.

To achieve this level of wind power, the industry only needs to continue growing for the next several years at the rate that the industry has seen in the past decade. From 2000 to 2007, the industry increased fivefold. Last year, $36 billion in wind investments were made around the

world, and a total of 20 GW of new capacity was installed—enough to power 6 million homes—with $9 billion invested in U.S.-based projects. In 10 years, the wind industry is expected to nearly quadruple in size. Since 2000, Europe has added 47 GW of new wind capacity, but only 9.6 GW of coal, and a mere 1.2 GW of nuclear.

Wind power is a variable resource, with new plants providing power only about 35 percent of the time, compared to perhaps 90 percent for a nuclear plant (so 300 GW of wind capacity only delivers as much electricity as about 120 GW of nuclear). Fortunately, several sources of flexible generation can complement wind's variability, such as hydropower, natural gas, demand response, and soon, a significant amount of concentrated solar thermal power. Many regions in Europe integrate well beyond 20 percent wind power successfully. Iowa, Minnesota, Colorado, and Oregon already get 5 to 8 percent of their power from wind. And as we electrify transportation over the next two decades with plug-in hybrids, the grid will be able to make use of far larger amounts of variable, largely nighttime low-carbon electricity from wind. So post-2030, wind power should be able to grow even further.[19]

Solar: Two forms of solar energy are ready to deliver large quantities of cost-effective electricity: solar photovoltaics, or solar PV, and concentrated solar power, or CSP. The best-known form of solar is PV, direct conversion of sunlight to electricity. PV has historically been quite expensive, but its costs have been coming down for decades, and sales have been growing at some 50 percent per year recently. Last year, global PV installations surpassed 2,800 MW of new capacity, which represents growth of more than 60 percent from 2006 levels.[20]

It is difficult to compare PV costs with nuclear because, on the one hand, PV delivers power only about 20 percent of the time. On the other hand, PV can be installed directly on the roofs of buildings. PV therefore avoids transmission and distribution costs and associated losses, while providing power directly to retail customers when it is typically most expensive—during the sunny days of the summer.

Because it is a modular, low-maintenance consumer product, PV can make use of innovative financing strategies whereby the customer does not own the equipment, but merely purchases the power. SunEdison company is a leader in providing such solar energy services with no upfront costs. In a recent interview, Jigar Shah, the company's chief strategy officer, explained that his company could deliver Florida more kilowatt-hours of power with PV—including energy storage so the power was not intermittent—for less money than Progress Energy has said its nuclear plants could cost. And PV would have no risk of price escalation in the face of construction delays or rising prices for uranium.[21]

Shah projects that by 2015, solar PV will be able to provide electricity directly to the customer for $.12 per kWh unsubsidized. PV could provide 100,000 MW of U.S. capacity in 2020, and 350,000 MW by 2030.

After more than a decade of neglect, concentrated solar power has begun rapid growth with more than a dozen providers building projects in two dozen countries. [22] In 2006, the Arizona Public Service Company dedicated the first new CSP plant in the United States in two decades—a 1 MW-concentrated solar trough system with an engine used for decades by the geothermal industry. In June 2007, Nevada Solar One, the state's first CSP plant, went online. On 275 acres near Boulder City, it provides 64 MW of electricity from 98 percent solar power and 2 percent natural gas. And in California, PG&E has created deals with three major CSP companies to

generate electricity for the Golden State. Another 10 plants are in the advanced planning stages in the Southwest, along with nine plants in countries that include Israel, Mexico, and China.

Utilities in the Southwest are already contracting for power at 14 to 15 cents per kWh. The modeling for the California Public Utilities Commission puts California solar thermal at 12.7 to 13.6 cents per kWh (including six hours of storage capacity), and at similar or lower costs in the rest of the West. A number of players are adding low-cost storage that will delivers peak power when demand actually peaks, rather than just delivering a constant amount of power around the clock. Thermal storage is far less expensive with a much higher round-trip efficiency than electric storage.

Equally important, CSP has barely begun dropping down the experience curve as costs drop steadily from economies of scale and the manufacturing learning curve.[23] The CPUC analysis foresees the possibility that CSP could drop 20 percent in cost by 2020.

A 2006 report by the Western Governors Association, "projects that, with a deployment of 4 GW, total nominal cost of CSP electricity would fall below 10¢/kWh."[24] It also asserts that deployment will likely occur before 2015. Indeed, the report noted that the industry could, "produce over 13 GW by 2015 if the market could absorb that much." The report also notes that 300 GW of CSP capacity can be located near existing transmission lines.

As an aside, wind power is a very good match with CSP in terms of their ability to share the same transmission lines, since a great deal of wind is at night, and since CSP, with storage, can be dispatched in a controllable manner.

A new report from Environment America, "Solar Thermal Power and the Fight Against Global Warming," explains how the United States could achieve 80 GW of CSP by 2030.[25] A number of industry and academic experts recently discussed the possibility of 10,000 solar GW globally by 2050 at an energy forum in Hanover, Germany.[26]

CSP plants can also operate with a very small annual water requirement because they can be air-cooled. CSP has some unique climate-friendly features. It can be used effectively for desalinating brackish water or seawater. That is useful for many developing countries today, and it's a must-have for tens, if not hundreds of millions, of people if we don't act in time to stop catastrophic global warming and, as a result, dry out much of the planet. Such desertification would, ironically, mean even more land ideal for CSP.

The technology has no obvious bottlenecks and uses mostly commodity materials—steel, concrete, and glass. The central component, a standard power system routinely used by the natural gas industry today, would create steam to turn a standard electric generator. Plants can be built in a few years—much faster than nuclear plants. It would be straightforward to build CSP systems at whatever rate industry and governments needed, ultimately 50 to 100 GW a year growth or more.

Nuclear Bottlenecks

Twenty years ago the United States had 400 major suppliers for the nuclear industry. Today there are about 80. Only two companies in the whole world can make heavy forgings for pressure vessels, steam generators, and pressurizers that are licensed for use in any OECD country: Japan Steel Works and Creusot Forge.

Japan Steel is "the only plant in the world ... capable of producing the central part of a nuclear reactor's containment vessel in a single piece, reducing the risk of a radiation leak."[27] In a single year, they can currently only make "four of the steel forgings that contain the radioactivity in a nuclear reactor." They may double capacity over the next two years, but that won't allow the huge ramp up in nuclear power that some are projecting for the industry.

According to Mycle Schneider, an independent nuclear industry consultant near Paris, the math just doesn't work given Japan Steel's limited capacity. Japan Steel caters to all nuclear reactor makers except in Russia, which makes its own heavy forgings. "I find it just amazing that so many people jumped on the bandwagon of this renaissance without ever looking at the industrial side of it," Schneider said.

At the same time, that capacity increase represents a gamble that the nuclear renaissance is here to stay, even in the face of rapidly escalating prices.

These supply bottlenecks, coupled with soaring commodity prices, have resulted in enormous price increases, even though new reactors have only been coming online at an average rate of about four to five per year in the past decade.[28]

Nuclear Pork

What should our federal policy be to get the needed technologies into the market as fast as possible? The United States seems likely to pass some sort of cap-and-trade system for greenhouse gas emissions in 2009 or 2010. That might establish a price for carbon dioxide by 2015, if not sooner. Such a price will benefit all carbon-free sources of power equally. Every $50 per ton of carbon ($14 per ton of CO2) would add 1.5 cents per kWh to a traditional coal plant without carbon capture and storage. Once the price exceeds about $100 a ton, most carbon-free generation options probably won't need more government subsidies, at least those with more than 1 percent of the market.

Until then, we should extend the production tax credit for wind power and the investment tax credit for solar power. But what should we do about nuclear? That mature source of power has benefited disproportionately from government support to date.

From 1948 to today, nuclear energy research and development exceeded $70 billion, whereas research and development for renewables was about $10 billion.[29] From 2002 to 2007, fossil fuels received almost $14 billion in electricity-related tax subsides, whereas renewables received under $3 billion.

The Price-Anderson Nuclear Industries Indemnity Act caps the liability for claims arising from nuclear incidents. It reduces the insurance nuclear power plants need to buy and requires taxpayers to cover all claims in excess of the cap. The benefit of this indirect subsidy has been estimated at between $237 million and $3.5 billion a year, which suggests that it has been worth many billions of dollars to the industry.[30] It could be argued that the value is considerably larger than that, since the industry might not have existed at all without it: "At the time of the Act's passing, it was considered necessary as an incentive for the private production of nuclear power ... because investors were unwilling to accept the then-unquantified risks of nuclear energy without some limitation on their liability.

One can make a case that such insurance was reasonable for a new, almost completely unknown technology in 1957. Extending it through 2025 is harder to justify. If investors aren't willing to accept the risks of nuclear energy now, without taxpayers liable for any major catastrophe, perhaps the technology no longer deserves government support.

Some argue that "As a result of Three Mile Island and Chernobyl, we set in place a regulatory process that sometimes means it takes 10 to 15 years before we're able to get a nuclear power plant in operation."[31] There are two flaws in that argument. First, as we've seen, nuclear power plants face delays in other countries, most often because of quality problems related to construction. Second, as long as a catastrophic failure of the nuclear plant would have such devastating consequences—costs that the American taxpayer is ultimately on the hook for—the government must enforce the strictest safety standards. If power plants continue to take 6 to10 years to build, that is most likely because the industry has failed to develop and standardize a limited set of simple, modular, failsafe reactor designs that could tap into economies of scale from mass production. In the American market alone there is now not one new design but at least five, undermining the prospect of significant cost savings from standardization and mass production, although presumably some of these savings could still materialize at the subsystem and component level, particularly for items that are shared between reactor types.

There are $13 billion in subsidies and tax breaks in the Energy Policy Act of 2005, not even counting the value of the Price-Anderson act extension. It includes "Unlimited taxpayer-backed loan guarantees for up to 80 percent of the cost of a project" and "Production tax credits of 1.8-cent for each kilowatt-hour of nuclear-generated electricity from new reactors during the first 8 years of operation for the nuclear industry"[32]—the same tax credit wind gets, even though wind provides one-twentieth of the power of nuclear.[33]

Conclusion

Nuclear power's many limitations—especially its escalating price—will constrain its growth in America, particularly in the near term. Merely maintaining the percentage of generation provided by nuclear through 2050 and beyond will require building on the order of 75 large replacement reactors, which itself is likely to pose challenges unless new nuclear plants can be built for under $4,000/kW total cost and provide electricity to the grid at $0.10 per kW or less.

As long as prices remain so high, we all need to focus on other, more consequential energy and climate efforts. The carbon-free power technologies that the nation should focus on deploying right now at large scale are efficiency, wind power, and solar power. They are the low-cost carbon-free strategies with minimal societal effects and the fewest production bottlenecks. They could easily provide the vast majority of new generation for the next quarter century and beyond, while at the same time providing enough generation for replacing some existing fossil fuel plants and supporting a reduction in overall greenhouse gas emissions. In the medium-term (post-2020), other technologies, such as coal with carbon capture and storage and advanced geothermal, could be big players, but only with a far greater development effort over the next decade.

Nuclear power is a mature technology, providing some 20 percent of U.S. power generation. It has been the beneficiary of nearly $100 billion in direct and indirect subsidies since 1948. Such a technology should be the focus of reduced subsidies, not increased ones. A U.S. cap-and-trade system with a rising price for carbon dioxide advantages all low-carbon energy resources, including nuclear. After 50 years of development and federal government support, if new-build nuclear can't compete in this new low carbon environment, then frankly it doesn't deserve to be

in it. Even if a rising carbon price ultimately rescues nuclear power financially, the nuclear fuel cycle has other environmental and international security drawbacks (not dealt with in this testimony) that strongly suggest we should turn to it only when we have exhausted the supply of energy services available at equal or lesser cost from truly sustainable sources, within the timeframe that the best science tells us is required to avert climate disruption. We are a very long way from having exhausted the potential of such resources today, beginning with massive potential electricity savings from least cost-energy efficiency. The present focus should be on accelerating sustainable emerging power generation technologies down the cost curve with a federal renewable electricity standard and multiyear tax credits that sunset by the end of the next decade. At the same time, the federal government should work closely with the states to adopt the best practices for utility regulations that promote energy efficiency.

END NOTES

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Responses by Joseph Romm to Additional Questions
from Senator Boxer

1. How would you respond to the arguments made at the hearing that dismissed the impact energy efficiency, wind and solar can have in the short term to reduce emission? What about in the long term?

A1a: It is nuclear power that can have little impact in the short term to reduce emissions. As I noted in my testimony, in August 2007 *Tulsa World* reported that American Electric Power Co. CEO Michael Morris was not planning to build any new nuclear power plants. He was quoted as saying, **"I'm not convinced we'll see a new nuclear station before probably the 2020 timeline."**

Energy efficiency, wind, solar baseload, and solar PV can all be deployed rapidly. My testimony details the tremendous amount of power that these sources could deliver in the next decade. Indeed, efficiency and PV have no transmission or siting issues whatsoever. The international consulting firm McKinsey & Co. has said that an aggressive energy efficiency strategy could eliminate 85% of new demand. T. Boone Pickens has said documented that the United States could build a 200,000 MW of wind by 2020.

A1b: Wind and efficiency are technologies that already have tremendous short-term and long-term potential. I testified that the cost of solar PV is projected to be $.12 per kWh unsubsidized by 2015, which ensures continued explosive growth. I think that the energy community now believes baseload solar -- often called concentrated solar power -- may have the greatest potential of all, ultimately delivering 50,000 MW a year by 2020.

2. Have subsidizes for nuclear power been a detriment to the further development of alternative energy sources? If so, please explain.

A2. **If every federal subsidy for nuclear power -- direct and indirect -- were removed, it is unlikely we would ever build another nuclear plant.** It is unprecedented that a mature (60-year-old) technology with 20% market share would continue to get multibillion-dollar subsidies. Clearly, when you tilt the playing field in the favor of entrenched, incumbent technologies, then the newly emerging technologies will have more difficulty competing. Imagine if the federal government had decided to provide mainframe computers $100 billion in subsidies -- it would have delayed the market entry of personal computers and laptops. If we ever put energy efficiency on a level playing field with new generation, again, we would never build another nuclear plant, since it costs some five times as much as efficiency.

Senator James' M. Inhofe
1. You state in your testimony that nuclear power,is "the beneficiary of some $100 billion in direct and indirect subsidies since 1948." According to a recent Congressional Research Service report (http://www.congress.gov/erp/rslhtmlIRS22858.html), the Department ofEnergy states that the cumulative funding total from 1948 to 2007 is $85.01 billion. How do you explain the discrepancy between the Department of Energy's total and yours?

A1: There is no "discrepancy." The study you refer to is "Renewable Energy R&D Funding History: A Comparison with Funding for Nuclear Energy, Fossil Energy, and Energy Efficiency R&D." That study clearly states that "This report provides a cumulative history of Department of Energy (DOE) funding for renewable energy compared with funding for the other energy technologies." It is a report on federal R&D. There have been many other direct and indirect subsidies direct toward nuclear power from 1948

through today, including tax credits, loan guarantees, and the Price Anderson Act, which, by itself, it a subsidy worth many tens of billions of dollars (see below).

2. Citing the questionable "Wikipedia" website as your source, you state:
"The Price-Anderson Nuclear Industry Indemnity Act caps the liability for claims arising from nuclear incidents. It reduces the insurance nuclear power plants need to buy and requires taxpayers to cover all claims in excess ofthe cap. The benefit of this indirect subsidy has been estimated at between $231 million and,$3.5 billion a year, which suggests that it has been worth many billions of dollars to the industry." However, a Congressional Research Service report states: "Under Price-Anderson, the owners of commercial reactors must assume all liability for nuclear damages awarded to the public by the court system, and they must waive most of their legal defenses following a severe radioactive release 'extraordinary nuclear occurrence.' (http://www.congress.gov/erp/rl/pdf/RL33558.pdf) Please explain this discrepancy by citing the language fom the Price-Anderson Nuclear Industry Indemnity Act that requires taxpayers to cover all claims in excess of the liability cap.

A2. Wikipedia is not considered a questionable source. Indeed, it has been found to be as accurate as the *Encyclopedia Britannica*. However, since you (partially) cite the CRS report, "Nuclear Energy Policy," let me cite the rest of it:

> To pay any such damages, each licensed reactor must carry financial protection in the amount of the maximum liability insurance available, currently $300 million. Any damages exceeding that amount are to be assessed equally against all covered commercial reactors, up to $95.8 million per reactor. Those assessments — called "retrospective premiums" — would be paid at an annual rate of no more than $15 million per reactor, to limit the potential financial burden on reactor owners following a major accident. According to NRC, 104 commercial reactors are currently covered by the Price-Anderson retrospective premium requirement.
>
> For each nuclear incident, the Price-Anderson liability system currently would provide up to $10.8 billion in public compensation. That total includes the $300 million in insurance coverage carried by the reactor that suffered the incident, plus the $95.8 million in retrospective premiums from each of the 104 currently covered reactors, totaling $10.3 billion. On top of those payments, a 5% surcharge may also be imposed, raising the total per-reactor retrospective premium to $100.6 million and the total available compensation to about $10.8 billion. Under Price-Anderson, the nuclear industry's liability for an incident is capped at that amount, which varies depending on the number of covered reactors, the amount of available insurance, and an inflation adjustment that is made every five years. Payment of any damages above that liability limit would require congressional approval under special procedures in the act.
>
> The Energy Policy Act of 2005 raised the limit on per-reactor annual payments to $15 million from the previous $10 million, and required the annual limit to be adjusted for inflation every five years. As under previous law, the total retrospective premium limit of $95.8 million is to be adjusted every five years as well. For the purposes of those payment limits, a nuclear plant consisting of multiple small reactors (100-300 megawatts, up to a total of 1,300 megawatts) would be considered a single reactor. Therefore, a power plant with six 120-megawatt pebble-bed modular reactors would be liable for retrospective premiums of up to $95.8 million, rather than $574.8 million (excluding the 5% surcharge).

Thus, each nuclear reactor has limited liability, and all of the reactors together have limited liability. That is why it is called *the Price-Anderson Nuclear Industry Indemnity Act*.

As the Cato Institute explained in a report titled, *Determining the Price of Price-Anderson*, "the credible estimates of the offsite damages imposed by a serious nuclear event in the United States range into the hundreds of billions of dollars," which is far larger than the liability cap. "The U.S. nuclear industry, then, is all but protected from being held responsible for any big nuclear accident that might happen." Cato goes on to say:

> Here is a fact: Capping the liability of nuclear operators (or others engaged in the nuclear sector) for accident damages confers a subsidy upon those operators. Capping liability — if there is any state of the world in which that cap can be binding, which is not disputed in the Price-Anderson context — helps operators financially. The act protects the industry from a substantial fraction of the costs associated with accident risk. In the absence of such a cap, there would be additional costs that the industry would have to pick up, either directly or through payment of additional insurance premiums."

A 1978 study by Pacific Northwest National Laboratory, *An Analysis of Federal Incentives Used to Stimulate Energy Production* found

> Without Price-Anderson, the utilities would have to purchase [full] liability insurance. They would also have to estimate a cost for the uncertainty that a potential loss might exceed the liability limits available on the private market. These costs would be passed on to the consumer in higher electricity prices. The price of nuclear power would therefore increase and the utilities would have to decide whether nuclear power could be competitive and profitable in relation to other energy sources.

A 1992 U.S. Energy Information Administration (EIA) analysis, *Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets*, calls Price-Anderson, "A Federal regulation that continues to have a cost-reducing effect on the nuclear power industry." According to the EIA analysis

> These [liability] limits provide a subsidy to the nuclear industry to the degree private insurance premiums paid by operators of individual plants are reduced. In a 1983 study, the NRC concluded that the liability limits were sufficiently significant to constitute a subsidy. However, a quantification of the amount of the subsidy was not attempted. At issue are the probability distributions for various kinds of accidents and valuations of the consequences of accidents, all done on a plant-by-plant basis. The amount of the subsidy would then be found by calculating the differential effect on the insurance premium of imposing the liability limits.

EIA determined that the value of the subsidy to the nuclear industry as a whole was roughly $30 million per reactor per year, or $3 billion annually ($1991). The full subsidy value of the Price Anderson Act from its inception through today thus likely exceeds a hundred billion dollars.

3. In your testimony, you state that:
"The carbon-free power technologies that the nation and the world should be deploying right now at large scale are efficiency, wind power, and solar power. They are the lowest-cost carbon-free strategies with minimal societal effects and the fewest production bottlenecks. They could easily meet all of the U.S. demand for the next quarter-century, while substituting for some existing fossil fuel plants."
Looking particularly at the realm of solar power, Congress has heard similar statements before. On March 8, 1994, John Triebe testified before the Senate Energy and Natural Resources Committee:
"We stand at a point in time when the vision of low-cost PV power is close to becoming a reality."
In February 21, 1995, Solar Energy Industries Association Executive Director Scott Sklar testified before the House Science Subcommittee on Energy and the Environment:

"We are nearing the threshold of market acceptance domestically and on the brink of a virtual explosion in international market penetration. Of note: at least five photovoltaic manufacturing facilities are planned for construction in the United States over the next several years."
Meanwhile, in 2007 alone, $202.6 million dollars in subsidies were given to the solar industry, which reached an installed capacity of only 1100 megawatts according to the EIA and produced only 0.6 MW-hours of electricity according to the GAO (http://www.gao.gov/new.items/d081 02.pdf), the Energy Information Administration projects that the total share of non-hydropower renewables, of which solar is merely a fraction, will only increase to 6:8% of total electricity by 2030. How you explain the discrepancy between your statement and the EIA's projections?

3A. Again, there is no discrepancy whatsoever. The EIA makes projections in a so-called no policy case, what might be called "stupid business-as-usual." My analysis is based on what could be achieved if Congress were to adopt intelligent laws. I should note that while the Energy Information Administration is excellent at analyzing historical data and reporting on current data, it has an abysmal track record at predicting the future. As recently as two years ago, EIA was projecting oil prices in the coming years of about $30 a barrel.

As an aside, the quotes that you cite from the mid-1990s were accurate. In 1995, we were "at the threshold of market acceptance domestically and on the brink of a virtual explosion in international market penetration." Indeed, ten years after that testimony, **the ten-year average annual growth rate for photovoltaic capacity was 30%.** Growth exceeded 40% in 2004 and 2005. Annual installations of PV in 2007 were nearly 3 GW worldwide, up nearly 500 percent from just four years earlier.

Obviously, the United States, with its extensively built-out electric grid and large subsidies for traditional power sources like nuclear is going to see less installation than other parts of the world that have more intelligent energy policies. That said, installed grid-tied solar PV grew about 50% in 2007 compared to 2006.

I would also note that probably the most important and affordable form of solar is solar baseload, also known as concentrated solar power. As noted in my testimony, it is currently being offered in this country at about the same price as new nuclear plants, and is projected to decline 20% or more over the next several years.

Senator CARPER. Dr. Romm, thank you very much. Thanks for being here and thank you for your testimony.

Mr. Gilbertson, please proceed.

STATEMENT OF H. JOHN GILBERTSON, JR., MANAGING DIRECTOR, GOLDMAN, SACHS AND COMPANY

Mr. GILBERTSON. Chairman Carper, Senator Voinovich, good afternoon. My name is John Gilbertson. I am a managing director of Goldman, Sachs. I want to thank you both and the Committee for the opportunity to discuss financial perspectives on nuclear power.

Our firm works as an advisor and provider of capital to integrated electric utilities and power generation companies, including most of those who have recently filed or intend to file a new COL application. We have also engaged in frequent discussions with Members of Congress, their staff, the Department of Energy, the Administration regarding implementation of the Title 17 loan guarantee program. In this work, we have studied the question of how to finance the new construction of nuclear units.

The capital markets today look favorably on the incumbent U.S. fleet of 104 units, and upon the companies who operate them. It is well understood by investors and lenders that the existing fleet is safe, reliable, low-cost, profitable and non-emitting. These characteristics have also translated into superior investment performance. The performance of the U.S. nuclear industry is, I believe, one of the great turnaround stories in business history. However, this turnaround did not occur by accident. Rather, it was the natural result of economic opportunity, competitive pressures, a natural learning curve, rigorous regulatory scrutiny with strict emphasis on safety, the systematic sharing of best practices, regular process improvements, and consolidation of fleet ownership, all of which have driven nuclear operators to achieve a noteworthy record of continuous improvement.

The financial markets also recognize that nuclear needs to become a larger portion of the U.S. fuel mix. Once they are built, new nuclear units are expected to supply reliable power at all-in hourly rates that are comparatively high by recent standards, but more than competitive against the expected cost of power in the next 10 to 15 years. This cost advantage is expected to widen further as the U.S. pursues climate protection through a cap and trade system which puts an explicit cost on emitted carbon.

This need for more nuclear power is also completely independent of the expected growth in energy conservation and in other sources of clean energy, such as wind or solar. Even in the most ambitious growth scenarios for conservation, wind and solar, the U.S. carbon footprint would be further reduced if there is also significant growth in nuclear share of the fuel mix. And this need would only be amplified when plug-in vehicles reach commercial scale, thus creating the opportunity to use domestically produced clean electricity as a substitute for imported oil.

However, the markets also recognize that the challenge of new construction is very difficult. Project sponsors must spend large amounts of capital for long lead-time procurement before the project has been licensed by the NRC and before the construction

schedule is set. They must do so at a time of steep commodity inflation, a smaller work force for nuclear construction, and sharply increased global demand for construction services. As a result, the project cost estimates have risen dramatically in the past year and are expected to continue rising. In the eyes of lenders and investors, these projects will face the potential risk of serious delay and cost overruns.

In the U.S., the companies who would undertake nuclear new build are under-sized in comparison to the size of each project. The fragmented structure of the U.S. power industry leaves these companies, even the largest ones, constrained to assume the risks in such a project. On their own, we expect very few of these companies would pursue nuclear new build, because their existing capital structures simply cannot withstand the construction risks.

In this regard, the Title 17 loan guarantee program is essential to restarting the nuclear build cycle in the United States. However, this program too is under-sized in relation to the need. The current $18.5 billion in guarantee authority will be enough to support possibly three new projects. There are quite a few credible and capable nuclear operators who are ready to pursue similar projects, but only if they qualify for a Title 17 guarantee.

The NRC is seen by investors and lenders as a significant contributor to this industry turnaround, especially to the notable improvements in safety and reliability of the existing fleet. In terms of new build, investors are encouraged by the streamlined nature of the COL process. However, this process has not yet been tested in the current build cycle, and markets are still wary of the potential for intervention and prolonged delay.

The best remedy for this concern will be an actual licensing experience that is both timely and rigorous. As new licenses are granted, investors will pay close attention to the length of time from start to finish. The markets will look for the NRC to meet current timing expectations and if possible, to shorten this time period in subsequent applications, while maintaining the rigor of its decisions with safety always being the highest priority.

Mr. Chairman, thank you again for the opportunity to speak here today. I look forward to your questions.

[The prepared statement of Mr. Gilbertson follows:]

"Nuclear Regulatory Commission's Licensing and Relicensing Processes for Nuclear Plants"

United States Senate
Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety

Dirksen Senate Office Building, Room 406
Tuesday, July 16th, 10:00 am,

H. John Gilbertson Jr.,
Managing Director
Goldman, Sachs & Co.

INTRODUCTION

Mr. Chairman and members of the Committee, Good morning. My name is John Gilbertson. I am a Managing Director of Goldman Sachs. I want to thank the Chairman, and each of the Committee members for making this matter a priority, and for the opportunity to discuss with you financial market perspectives on nuclear power.

Our firm works as an advisor, and a provider of capital, to integrated electric utilities and power generation companies, including most of those who have recently filed, or announced intentions to file, a new COL application. During the past two years, we have also engaged in frequent discussions with Members of Congress, Congressional Staff, the Department of Energy, and the Administration, regarding implementation of the Title 17 Loan Guarantee Program. In the course of this work we have studied the question of how to finance the new construction of nuclear units.

CURRENT U.S. FLEET PERFORMANCE

To begin with, we would observe that the capital markets today look favorably upon the incumbent U.S. nuclear fleet of 104 units now in operation, and upon the companies who operate them. It is well understood by investors and lenders that the existing fleet is safe, reliable, low cost, profitable, and non-emitting. These characteristics have also translated into superior investment performance. An index of the common stocks of nuclear-focused utilities and generators has consistently outperformed the non-nuclear peer group during the current decade.

The story of the U.S. nuclear fleet is one of consistent performance improvement over the past 25 years. There are two statistical measures which illustrate this point. The first is the so-called "capacity factor" which is the percent of generating capacity during a specified period of time that is actually used to generate power. Naturally, higher is better, and the primary causes of lost capacity are downtime required to replace spent fuel assemblies, as well as infrequent or unplanned outages due to a variety of factors including equipment damage or breakdown.

In the 1970s, an era when units in the U.S. fleet were mostly new and immature, the average capacity factor was barely above 50%. However, by the mid 1980s, this average rate began to improve, crossing over the 60% mark in 1988, the 70% mark in 1991, the 80% mark in 1999 and the 90% mark in 2002.

Another important measurement is the average number of days required to refuel each unit, which has followed a similar path of steady improvement. In 1990, the average refueling period was more than 100 days. By 1995 this average had declined to less than 70 days; by 2000, it had declined to less than 50 days, and by 2005, the average time to refuel was less than 40 days.

The performance of the U.S. nuclear industry is, I believe, one of the great turnaround stories in business history. However, this turnaround did not occur spontaneously or by accident. Rather, it was the natural and expected result of economic opportunity, competitive pressures, a natural learning curve, rigorous regulatory scrutiny with strict emphasis on safety requirements, the systematic sharing of best practices, regular process improvements, and consolidation of fleet ownership, all of which have driven the operators of the U.S. fleet to achieve a noteworthy record of continuous improvement.

FUTURE NEED FOR NUCLEAR POWER

For all of these reasons, participants in the financial markets recognize that nuclear needs to become a larger portion of the U.S. fuel mix in the decades ahead. Once they are built, new nuclear units are expected to supply reliable power at all-in, hourly rates that are comparatively high by recent standards, but more than competitive against the expected cost of power in the next 10-15 years. Moreover, this cost advantage is expected to widen during the next decade, as the U.S. implements a climate protection regime through a cap-and-trade system which would impose an explicit cost on emitted carbon.

This need for increased nuclear generation, as a comparatively inexpensive source of non-emitting power, is also completely independent of the expected growth in energy conservation, and in other sources of clean energy such as wind power or solar power. It is well understood in the financial markets that the U.S. will be seriously challenged to reduce its national carbon footprint back down to 20th Century levels, and that we will need every means available to meet this goal. Even in the most ambitious yet plausible growth scenarios for conservation, wind and solar, the U.S. carbon footprint would be further reduced to the extent there is significant growth in nuclear's share of the U.S. fuel mix. And this need would only be amplified to the extent that plug-in electric vehicles reach commercial scale, thus creating the opportunity to use domestically produced electricity as a substitute for imported petroleum. Hence, there is no trade-off between nuclear and wind or conservation. We need all of them to the fullest extent possible.

CONSTRUCTION RISK

The financial markets also recognize that the challenge of new construction is very difficult. The sponsors of new construction projects will be required to put up large amounts of capital for long lead-time procurement, before the project has been licensed by the NRC and before the construction schedule has been set. They must do so in an era when the cost of key components is escalating under the pressure of steep commodity inflation, when the workforce for nuclear construction is significantly smaller and also older than it once was, and when the global demand for construction services has multiplied, due to infrastructure growth in emerging economies such as China, India and the Arabian Gulf. As a result, the project cost estimates provided by suppliers and contractors have risen dramatically in the past year, and are expected to continue rising.

These projects will use technology designs which are clearly superior to earlier generations, but which have, largely, not yet been built. It is realistic to expect some disruptions along the way as sponsors, suppliers and contractors move back up the learning curve. Consequently, in the eyes of lenders and investors, these projects will face the potential risk of serious delay and cost overruns.

UNDERSIZED COMPANIES

In the U.S., the companies who would undertake nuclear new-build are undersized, in comparison to the total size of each project, in comparison to the leading electric utilities in other regions of the world, and in comparison to the leading global energy companies who undertake other, similar-sized projects such as large-scale exploration and development. The U.S. power industry is still highly fragmented, mainly along state and regional lines, which leaves these companies, even the largest ones, constrained to assume the magnitude of risk in such a project.

Left to their own devices, we expect very few of these sponsoring companies would elect to pursue nuclear new-build, because their existing capital structure simply cannot withstand the construction risk. Alternatively, if a sponsor attempted to capitalize such a construction project through a non-recourse structure, we believe that commercial lenders and investors would simply be unwilling to put up the money. In the future, we do expect the commercial markets to become more receptive to nuclear construction finance, but only after several new units have been constructed and begun to operate successfully.

RISK SHARING

In order to move forward today, we believe the construction risk of each project must be shared among several constituencies, including project sponsors, investors, lenders, suppliers, construction contractors, the rate-payers who would be served, and the federal government. In this regard, the Title 17 loan guarantee program is essential to restarting the nuclear build cycle in the United States. We want to commend the DOE staff for their work in launching this program, and adapting it to the complexities of the U.S. power industry. However, we note that this program, too, is undersized in relation to the need and the opportunity. The current size of $18.5 billion in guarantee authority will be enough to support, possibly, 3 new projects. There are quite a few very credible and capable nuclear operators, who are ready to pursue similar projects, but only if they qualify for a Title 17 guarantee.

LICENSING AND OVERSIGHT

Investors and lenders see the NRC as a significant contributor to the industry turnaround described above, especially to the notable improvements in the safety and reliability of the existing fleet. As it relates to new-build, they also see the licensing process as a potential source of timing uncertainty. It has been decades since the NRC has awarded a completely new license to construct and operate a nuclear generating station. Investors are encouraged by the streamlined nature of the COL process. However, this process has not yet been tested in the current new-build cycle, and markets are still wary of the potential for intervention and prolonged delay. The best remedy for this concern will be an actual review experience that is both timely and rigorous. As new licenses are granted, investors will pay close attention to the length of time from start to finish, and to how this timeline improves from one applicant to the next. The markets will expect the NRC to incorporate its own process improvements in order to meet current timing expectations, and if possible to shorten this time period in subsequent applications, while maintaining the rigor of its decisions, with safety as always being the highest priority.

Mr. Chairman, thank you again for the opportunity to participate in this hearing. I look forward to any comments or questions you may have.

Response by Joh n H. Gilbertson to an Additional Question
from Senator Boxer

In your testimony, you indicated that investors and lenders "see the licensing process as a potential source of timing uncertainty."

The National Academy of Science panel, the Committee on Review of DOE' s Nuclear Energy Research and Development Program, issued a report in October of 2007 that recommended the NRC issue a binding order with a hearing schedule when an application is docketed.

If the Commission issued such a firm schedule with detailed milestones that were tracked, well-known and well-understood, would that improve the financial community's ability to assess the risks of various new reactor projects?

REPLY

I expect the financial community would react favorably to such an approach, but this alone would not be sufficient to substantially reduce the perceived risk of project delay and cost overrun.
The proof to investors and lenders will be in the actual experience of a successfully completed license application, followed by the successful completion of plant construction, on time and on budget.
If this proposed approach results in the first such actual license being granted on time, according to the original "firm schedule," then it will go a good distance towards improving the financial markets' ability to assess such project risk.

Senator CARPER. Mr. Gilbertson, thank you.

Didn't you join us on a roundtable that we had a while ago?

Mr. GILBERTSON. Yes, about a month ago.

Senator CARPER. Thanks for coming that day, too.

Real good testimony and timely testimony. We are grateful for all of it. I am going to start off, Mr. Webster and Dr. Romm raised some serious concerns here. I don't know if, Mr. Christian, you or Mr. Pietrangelo want to respond to anything that they have said.

Mr. CHRISTIAN. Our company believes that what has worked well for us to achieve strength is diversity of supply. So we also believe that wind plays an important role, and we are engaged in deploying wind and other forms of electric power generation. We also strongly believe that Americans need to become more energy efficient and our energy intensity as a Country is improving. That is, GDP per kilowatt hour consumed. We have in our company and in our service territory nine programs to help people conserve and to stimulate demand-side management.

That said, I think some of the statistics that were cited with respect to the capabilities of wind or renewables in general to meet all baseload requirements frankly bring to mind the caveat that was inserted in some of the Civil War newspapers that said, important if true. I don't believe it to be true that renewables can supplant other baseload forms of electric power generation, and here is why. I think the answer kind of falls into two or three categories.

First, we will take reliability. Everyone knows that wind only blows some of the time. We have an obligation to serve, and State regulation comes into play as well. Our customers demand electricity all the time, when requested. Recently, in a heavily wind-supplied area in Texas, ERCOT, they went into a stage two emergency when the wind did not blow when it was needed on a peak summer day. This was as little as 2 months ago. It is pointed out that wind is typically anti-correlated to peak demand. That is to say, that when you need it the most, it is there the least, which requires regulated companies, who have an obligation to serve native load, to simultaneously install gas-fired generation. If you are going to install gas-fired generation to meet the requirement that we are under to meet and serve that load, then you begin to get into capital inefficiencies.

All that said, I also would like to make the point from an environmental standpoint that wind and nuclear happen to be roughly equivalent in terms of greenhouse gas intensity, when you take into account all of the energy that goes into making the device and all of the energy that comes out of it. Nuclear, there is much more energy that goes into it, but you get a lot more energy out of it over time.

So taking the long view, conservation plays an important role, extremely important role and this Country needs to become more efficient. Wind is going to play an important role, because it is a resource that actually requires no fuel.

But nuclear is going to be required, because even as the renewed licenses expire at the end of, say, 60 years of operation, that is 100 gigawatts that will begin to peel off of the U.S. grid. If we can meet all of our growth and demand presently with conservation and re-

newables, we can't replace that 20 percent baseload that is there and due to roll off as these plants age.

Senator CARPER. All right.

Mr. Pietrangelo, any comments at all?

Mr. PIETRANGELO. My only comment is that I thought Mr. Gilbertson answered the questions about cost. When you do rigorous financial analysis with a lot of sensitivity studies, at the end of the day, the cost will be competitive to the ratepayers. And it is too much comparing apples and oranges with the numbers that have been thrown around today about what those numbers include, what year they are looked at in. What is ultimately important is the price of electricity to be sold from those plants. The analysis that a bunch of companies have done, as well as some of the financial analysts that the costs from new nuclear will be competitive.

Mr. CHRISTIAN. State public utility commissions will demand that it be demonstrated to be in the customers' and ratepayers' interest.

Senator CARPER. Mr. Gilbertson, after I heard Dr. Romm testify, I was sitting here thinking, why would anybody, individuals or fund managers, want to invest money in nuclear energy, given the kind of picture that he painted. Again, why would they?

Mr. GILBERTSON. The issue really is, from a financial perspective, the cost per megawatt-hour over the life of the project. I think Dr. Romm made quite a few totally valid points that we wouldn't quarrel with at all. It is expensive on the front end, capital cost is very high.

What happens with nuclear is, the hourly amorized all-in cost of power will be a number that today seems high. But over the life of the project, the number will gradually go down by 5 to 10 percent. And this is notwithstanding what might happen in the uranium market, which is a sliver of the all-in cost of nuclear, it can double and it is really not going to change the hourly cost by much. The all-in hourly cost of nuclear will be essentially a flat number through the life of the plant. So if you can give me something that produces power at 20 percent above today's hourly cost, but tell me it will be flat for 30 years, that cost number is going to be "in the money" through the life of that project, by a lot.

So the issue is getting from today to post-construction. In my mind, that is what the loan guarantee program is really about: bridging construction finance, most of all. That is the problem we are facing right now.

So this is not to quarrel with the cost points: yes, the costs are rising; yes, it will be high in the front-end; but through the life of the plant, it will be much cheaper. And I am saying all of that, frankly, without an explicit cost to carbon. That would just make the nuclear cost advantage greater.

Senator CARPER. Is the cost of electricity, say, in a coal power, are new coal plants, the costs of them rising as well?

Mr. GILBERTSON. Definitely. Not as fast as nuclear, because of some of the bottlenecks in the supply chain. Again, I am sure Dr. Romm could speak to the same point. Some of the bottlenecks in the nuclear supply chain are a little more acute. But some of the bottlenecks are not. Some of the construction service companies are going to build coal plants the way they are going to build new

plants. As we all know, today, the "intervention" industry has made new coal plants, nearly impossible to get going. Although we will see, as hopefully clean coal becomes technologically more feasible. But that is a long way out.

Senator CARPER. My time has expired and we will come back for a second round.

Senator Voinovich.

Senator VOINOVICH. If I listen to you, Mr. Gilbertson, and then Mr. Christian is talking about going forward, and there are a lot of other people who are going forward, you just wonder why are they going forward with these expensive new reactors to deal with their baseload delivery of energy. And I think Senator Carper made some reference to it, you have to look out at the whole situation. If you have coal-fired facilities, and some of them may have to be, old ones may have to be closed down if you are uncertain about climate change and capturing carbon and sequestering it and so forth, that perhaps, as they look at their prediction for the future, that even though this is very expensive, that this may be the best opportunity that they have or option in order to take care of the baseload.

The other thing is that there is promotion of wind and solar to the extent that somehow people feel that we are going to be able to take care of the baseload delivery of energy in this Country with those. I think that is poppycock. Mr. Christian, would you like to comment? You are going to put a whole lot of money in this. Why are you doing it?

Mr. CHRISTIAN. Again, let me say what has been good for our company, which is strength through diversity, I believe strongly would be good for our Country. We need a diverse mix of energy supplies and we look at and evaluate a great many of them. As I said, we are into wind and biofuels and coal. We have the largest pumped storage operation in North America.

But what got us looking at nuclear early in the decade, in 2001, was a change in gas market dynamics, in that there had been a historic pattern in this Country where gas, which is a very precious fuel, natural gas, can be used for a great many things, from fertilizer production to support of industry to home heating, would have a peak demand in the winter time, especially when home heating kicked in. Then in the summer time, gas that is produced in the Gulf of Mexico and domestically would be pumped underground in storage facilities in the Northeastern United States, and then withdrawn later.

Early in this decade, gas plants were being built all over this Country. We saw those dynamics changing and a competition for peak and mid-merit electric power generation for the historic putting gas into storage. Eventually, this leads you to believe that you were going to need other sources of fuel. We continue to evaluate advanced coal, clean coal, carbon capture, compatible coal. But we believe nuclear is an important asset and can't be taken off the table.

As I said, taking the long view, we know were it not for license renewal, that beginning next year, these nuclear plants would be starting to come off the line and this 100 gigawatts would slowly trickle away over the course of about 15 or 20 years. That equiva-

lency in terms of natural gas is about 5 trillion cubic feet. And this Country is trying to drill and find natural gas to meet its growing demand now. Imagine trying to do that and also find an additional 5 TCF to replace nuclear, if it goes away.

The coal equivalency would be about 200 million tons a year of coal, with the attendant issues there.

So regardless, I think we are pursuing nuclear because we think it is going to make sense for the customer. We think it is economic. We think it offers good environmental benefits in terms of not emitting greenhouse gases on a greenhouse gas intensity basis, it is roughly the equivalent of wind power.

Senator VOINOVICH. And no NOx, SOx, mercury or the other ones.

Mr. CHRISTIAN. No NOx, SOx. Sure. So we think it is good for customers, good for shareholders and good for the environment.

Senator VOINOVICH. And so you have looked at it all? I think the point of natural gas, we as a Nation encouraged you to use natural gas. It is relatively cheap and in the process of doing that, we woke up 1 day and found out that our natural gas costs had skyrocketed. We have lost our chemical industry, at least our exporting from the chemical industry.

So you have to look at that and say, hey, this other is an option. And you are doing it with your eyes open, because I have looked at this. You have the loan guarantees that we are working on, and we are trying to get the cap removed. We had a meeting with some of your friends from Wall Street, and they said if you got rid of the cap, on this that this would help a great deal.

We know that we need the human capital. The Chairman and I have had meetings on human capital. We know we are looking at a manufacturing capacity that we are going to need to have, and the people to run them and so forth. So we do know there is a lot of challenges here. But from Mr. Christian's point of view and some others, this makes sense, and I am hoping that you guys on Wall Street will look at this as maybe something good to begin to help with.

Just one other thing, and I am not trying to take it, maybe I am in a way. Mr. Webster, I understand that the press reports that on Monday you appeared at a hearing to testify on the State of New Jersey's energy master plan, is that correct?

Mr. WEBSTER. That is correct, Senator.

Senator VOINOVICH. And is it true that you advocated for decommissioning all of the State's nuclear plants and rely entirely on energy efficiency to meet the growing demand for electricity?

Mr. WEBSTER. No, that is not quite true, actually. What I said was that Oyster Creek could go offline and we could meet the energy output through energy efficiency.

Senator VOINOVICH. And you specifically mentioned Oyster Creek, to take it off?

Mr. WEBSTER. That is right.

Senator VOINOVICH. And you think that the demand could be freer. Because 50 percent of the power in New Jersey comes from nuclear power.

Mr. WEBSTER. Yes, there are actually four, Senator, there are four nuclear plants in New Jersey. Oyster Creek is the smallest at

600 megawatts. The other three plants are about 1,000 megawatts each. We are talking about the need for energy for 2020. Two of those plants are not actually destined to go offline before 2020, the licenses, the current licenses don't expire before 2020. One of those plants expires in 2017. Only Oyster Creek, the license expires next year. So the discussion was primarily about Oyster Creek. I pointed out at that hearing, actually, that New York City has an initiative to lower New York City's overall energy demand by 30 percent by 2017, and that initiative will be self-funded. It will actually make more money back saved on energy than it costs by 2015. So we believe there is a very substantial amount of both taxpayer money to be saved and energy that can be saved with those kinds of measures.

Senator VOINOVICH. So are you opposed to nuclear?

Mr. WEBSTER. My background, I actually did physics in college. So I don't really think it makes sense to be for or against a specific technology. Technology done well is great and technology done badly is not so great. My objective here is to make sure that when we deploy nuclear technology, we deploy it in a manner that is safe and that will give us all the ability to rely on the safety standards that are applied. At the moment, unfortunately, I don't think that is true.

Senator VOINOVICH. Thank you.

Senator CARPER. Mr. Pietrangelo, let me go back to you. When Senator Sanders was here, he shared with us a large photograph of the collapsed cooling tower at Vermont Yankee. It was noted that while it was not a safety issue, that kind of thing doesn't build confidence in the nuclear industry.

There was a question as to whether or not on some shortcoming on the part of the operator, there would be a fine in order. Since it was maybe not a safety issue, there was not a fine that was going to be handed out by the NRC. What kind of economic penalty, and I think there was some discussion that said the plant, the output of the plant was reduced significantly. I presume there is some cost to the utility when they do that.

Mr. PIETRANGELO. Absolutely.

Senator CARPER. Could you just describe the economic penalty to the utility? Setting aside whether or not there is a fine by the industry, but just quantify, if you will, the economic penalty or loss the utility absorbs because of that kind of failure that we saw witnessed here.

Mr. PIETRANGELO. It is on the order of a half a million to a million dollars a day.

Senator CARPER. Say that again?

Mr. PIETRANGELO. It is on the order of a half a million to a million dollars per day that the unit is offline.

Senator CARPER. In this case, I don't think it was offline entirely. It sounded like because it was an environmental issue involving the release of water back into a body, a larger body of water, they reduced the output. I think that is what they were saying.

Mr. PIETRANGELO. The current situation is they reduced the output. I think with the prior situation it did shut down and then restarted at a lower output level.

Senator CARPER. All right.

Mr. PIETRANGELO. More broadly, Senator, the turbine and what we call the balance of plant at a nuclear energy facility is really the money side of the plant. If that is not running you are not producing electricity. It may not be safety-related, but it is certainly important to the reliability of the station and the generation of the station. That is their business, so there is a natural incentive to properly maintain that equipment.

Senator CARPER. All right.

Mr. Christian, in your testimony you mentioned that you are cooperating with General Electric Hitachi on nuclear energy for the design of the new North Anna reactor. This reactor is one of the new designs we have been talking about here, incorporating in this case gravity as a passive safety feature, rather than using pumps. I would like to know how that partnership is proceeding. Have you had any difficulties you could share with us?

Mr. CHRISTIAN. I think the partnership is proceeding well at this time. I would comment that as the industry, as I have observed the performance of various vendors in this business over the last decade, I have gotten a sense of the extreme atrophy that did occur in the previous two decades.

We are really trying to get this industry going from a point of very low capabilities, and those capabilities have been building for the last decade. But I will tell you at this time that we are pleased with our relationship with GE Hitachi. We believe Hitachi brings a lot to the table in the form of manufacturing and construction experience. GE certainly has a lot of base capabilities as well.

The reactor itself is an evolutionary design that incorporates a lot of passive safety features that make it a significant improvement over current generation.

Senator CARPER. Do you expect GE to start manufacturing parts for nuclear power plants in the U.S.?

Mr. CHRISTIAN. I would imagine that they will. The Nuclear Energy Institute also has actually taken a significant leadership role in stimulating U.S. manufacturing of nuclear quality components, holding regional workshops around the Country in which there has been tremendous interest, hundreds, literally, of vendors and suppliers that are interested in getting back into nuclear manufacturing and providing good jobs.

Senator CARPER. And when do you expect the NRC to approve this new GE Hitachi passive design?

Mr. CHRISTIAN. Their technical review will be completed in August 2010, then I believe there is some time after that for hearing, which would support, actually, our construction schedule, our overall project schedule, which has first safety-related concrete installation in January 2012. The NRC, although much has been made today of, are they doing things fast enough or is the process efficient enough, let me tell you, as a safe nuclear operator, one that has a profound respect for the safety of the reactor core, it is in everyone's interest that the technical reviewers be provided adequate time to do their jobs with utter probity. It does not concern me if the issues are done correctly and done one time. Because one of the overarching themes of Part 52 is to achieve issue preclusion and foreclosure, so that they don't come up later after large capex has been expended.

So the NRC schedule does support Dominion's project schedule, and under that current schedule we would begin construction in early 2012.

Senator CARPER. Thank you.

Mr. Bell, I don't want you to feel left out here. When you discussed future work in your written testimony, you outlined the audits that your staff will conduct during 2009 and beyond. I think the comment you used was, as resources permit. Do you have the resources needed to conduct those audits? And if not, how will you prioritize your workload?

Mr. BELL. Over the last 2 years, the agency's programs have grown significantly, along with additional resources. Unfortunately, my office has stayed the same. So unless I get additional resources, I am going to be hard pressed to do the mandatory work that we have, in addition to maintaining a focused approach enhanced coverage of NRC's Nuclear Safety programs. We have audits planned in the area of nuclear safety, security, information technology and corporate management. I will be happy to, for the record, give you a list of the audits that we have planned for the future.

Senator CARPER. We would appreciate that.

Mr. BELL. Yes, sir.

[The referenced information was not received at time of print.]

Senator CARPER. Maybe one more question, Mr. Pietrangelo, then one for Mr. Webster, and then we will call it a day.

Go back with us, you may have mentioned this in your testimony, I think you said that the generating capacity or capability, what is the term of art that you use? Operating efficiency?

Mr. PIETRANGELO. We generate about 20 percent of the——

Senator CARPER. No, but 91.5 percent is the——

Mr. PIETRANGELO. Capacity factor.

Senator CARPER. Capacity factor. And it is now 91.5 percent, which is, I think, quite high.

Mr. PIETRANGELO. The industry average.

Senator CARPER. Yes, by historical standards. My guess is in past years, you had some companies, some utilities who maintained fairly high capacity performance and others did not. But today, it seems to be the performance is more nearly even across the industry. Why is that?

Mr. PIETRANGELO. I think we have consolidated as an industry. There are many fewer operators, so we have small fleets within the fleet that share best practices, that benchmark each other. Senator Voinovich earlier mentioned the Institute of Nuclear Power Operations, which seeks excellence, not just compliance with safety regulations. They share a lot of the operating experience as well.

So it is really through a whole symbiotic set of activities from what INPO shares through the benchmarking that our members do of each other to get those best practices. I think your observation is absolutely correct, the whole fleet has come along to the point now where if you would have gone back 10 or 15 years ago, that 91.8 would have been the top quartile of the industry's performance.

Senator CARPER. If you had gone back how many years ago?

Mr. PIETRANGELO. Just a few years ago, you would have seen that. But when I started, back in 1989, at NEI, the industry aver-

age capacity factor was in the 60's, low 70's. So that amount of improvement in the reliability of the stations really is the equivalent of building about another 20 to 25 new plants over that course of time.

Senator CARPER. Talk if you will about economic factors and market forces compelling the industry to do better, setting aside the work of the NRC and our interest here in this Subcommittee in driving safety and commitment to efficiency, reliability.

Mr. PIETRANGELO. There was always a fear that with economic deregulation there would be some incentive to cut corners in nuclear operations. Well, the exact opposite has occurred. Because unless you are a safe generator, you are not going to generate anything at all. So that actually has made management, I think, focus even more heavily on the operation and the reliabilities, the efficiencies, the benchmarking we talked about earlier. I think the overall improvement has been stunning.

Senator CARPER. A question for Mr. Webster, this will probably be the end of it and we will go have lunch. If we are lucky.

In Chairman Klein's testimony, he discussed the proposed legislative change that would eliminate the requirement for the NRC to conduct uncontested hearings. We had a little discussion on that, as you recall. Let me ask, do you feel that such a change is appropriate? I think I know the answer, but go ahead and let us have it anyway.

Mr. WEBSTER. Well, I always hesitate to keep people from lunch too long, but I think the answer is absolutely not. We actually think that the relicensing hearings that have occurred so far have revealed deficiencies in the staff review of those applications and have certainly led to an improved safety situation. The Oyster Creek facility, the proposals for the safety management of that particular issue have changed five times. For the better, I mean, we still have a dispute about are they good enough. But they have changed five times for the better during that proceeding.

At Vermont Yankee, likewise, an issue that the NRC staff had missed was highlighted by petitioners. Now, sometimes petitioners have to come up with money for experts, petitioners have to find lawyers. It is not easy to be a participant in one of these NRC hearings, and that is certainly something that we think should be changed and it should be made a lot easier.

But it can't be expected all the time that the public should devote their time, their energy and their money to do what really the NRC should be doing itself. The mandatory hearings provide some element of check on the staff. In my testimony, I quote from some ASLB findings in the mandatory hearings where they say the technical portions of the staff documents in the record did not support a finding that the staff's review supported its decisions. And the ASLB went on to say the confidence in the staff's judgment would have been materially improved had the more important of these facts been checked. But it felt bound by the Commission, which said they should defer to the staff. Without that instruction, the ASLB would have conducted a much more probing review into the quality of the review and reporting.

Now, we think that a probing review of the NRC staff, the quality of their safety review and their reporting, is something the pub-

lic deserves. It should be done openly, it should be done transparently. I find it kind of hard to understand how all the members here could emphasize the need to build public confidence and the need for transparency and then in the same breath, start to eliminate one of the things, one of the few things left that actually helps in this regard. It should be enhanced, not reduced.

Senator CARPER. Thank you. Any other comments on this point before we move on? Yes, Mr. Pietrangelo.

Mr. PIETRANGELO. If there is no contention, you can have a hearing with yourself, I suppose. But the Commission's proposal was only when there were no admissible contentions for a hearing, and you were still required to have a mandatory hearing. There is no argument with having hearings when there is admissible contentions. It is when there are no admissible contentions, do you still have to have the hearing.

With regard to the technical review, what is forgotten often is that the Advisory Committee on Reactor Safeguards is an independent adjunct to the NRC that does a very thorough technical review of every major licensing action that the NRC takes, including license renewal, as well as new plants, design certifications, early site permits, et cetera. It is their statutory to do that. That is the real technical check on the staff's work, not the ASLB's that Mr. Webster is referring to.

Senator CARPER. Thank you.

I would like to wrap it up, if we could. Mr. Webster, if you have something just really, really quick.

Mr. WEBSTER. Very quickly, at nine reactors, neither the staff nor the ACRS found the problems with the metal fatigue that was found by petitioners. So there is a role for hearings. The quotes I gave were from a non-contested hearing. There are lots of issues to deal with, even at non-contested hearings. So it is simply untrue that these uncontested hearings are just pro forma.

Senator CARPER. Thank you all very, very much. This has run a bit longer than I anticipated, but it has been enormously helpful for me and I hope for others of my colleagues. Thank you for spending this time with us.

I will close with just a thought. I spent 23 years of my life as a Naval flight officer, and a lot of time in airplanes, and another 4 years before that as a midshipman. We have a big Air Force base in Delaware called Dover Air Force base. It is a big airlift base. We are a base where we have some of the largest airplanes in the world, called C–5s. We have a mix of aircraft called C–17s, which are somewhat smaller cargo aircraft.

C–5s, the oldest of the C–5s are probably close to 40 years old. We have had to go through a decisionmaking process within the Air Force and the Pentagon and the Congress to decide whether or not it makes sense to take 40-year old aircraft and to change their engines, change their hydraulic systems, change out all kinds of systems in the aircraft and to fly them for another 20 or 30 or 40 years. The Air Force actually took a number of the aircraft, one of them they literally tore apart, looking for fatigue and deterioration and all. Then a number of other aircraft they looked, they didn't did a complete tear-down but gave them a very close examination.

The Air Force ultimately concluded that they could probably fly these planes, with the wings and fuselages, for another 30 or 40 years. And the cost of fully modernizing a C–5 turned out to be about one-third the cost of buying a new C–17. And the capability, the cargo capability of the C–5 is roughly twice that of a C–17. And they fly further without being refueled. So it had the effect of about six times the airlift capability for a C–5 as opposed to a new C–17.

There are some people in the Air Force who want to get rid of the C–5s, send them off to the bone yard. They didn't call them rust buckets, but they said they were old, they were aging, they were older than the people who fly them and all. Sometimes, if we maintain an aircraft well, it can exceed our expectations. If we don't, and if they are poorly designed, they won't exceed our expectations or even meet our expectations.

So as we go forward, that may be an example for us to keep in mind. We are going to modernize the C–5s, at least the C–5Bs, and hopefully they will fly safely for another 30 or 40 years, and provide cost-effective airlift. And hopefully we will get that kind of use out of our nuclear power plants. God knows we have invested enough in them. It will be comforting to know that we are going to continue to benefit from them for some time to come.

Again, my thanks to each of you for your patience, for staying here today, for your preparation, for your responses to our questions. With that, this hearing is adjourned.

[Whereupon, at 1:32 p.m., the subcommittee was adjourned.]

STATEMENT OF HON. LAMAR ALEXANDER, U.S. SENATOR FROM THE STATE OF TENNESSEE

With gasoline rising above $4 per gallon and oil selling for more than $140 per barrel, I believe the best way for Congress to lower gasoline prices is a strategy based on these four words: "find more, use less." Congress already took two steps last year toward "using less" when it enacted the Energy Independence and Security Act (EISA) in 2007, which increased the average fuel efficiency standards for cars and light duty trucks to 35 miles per gallon by 2020 and increased the Renewable Fuel Standard to 36 billion gallons by 2022.

The Renewable Fuel Standard target of 36 billion gallons is the equivalent of 1.6 million barrels of oil per day. The Renewable Fuel Standard (RFS) included in EISA and tax incentives in the recently enacted farm bill have begun to accelerate our nation's transition from corn-based ethanol to cellulosic ethanol—in other words, shifting the focus from crops we eat to crops we don't eat.

Just as there were possible unintended impacts on food prices from the use of corn-based ethanol, EPA should be alert to any potential unintended consequences as the country shifts to cellulosic ethanol, particularly of the effect of the RFS's sustainability criteria on the use of woody biomass for cellulosic ethanol and on the paper industry that relies on woody biomass.

In Tennessee, Governor Bredesen has instituted a comprehensive program to encourage cellulosic ethanol production from switchgrass. With these types of initiatives to produce advanced ethanol from sources other than food stocks, I am hopeful that the RFS will continue to play an important role in diversifying the nation's transportation fuels and in putting downward pressure on gasoline prices. In the longer term, I support moving from a RFS to a Low Carbon Fuel Standard which is technology neutral and encourages more alternative fuels, such as electricity in plug-in electric cars and trucks and hydrogen.

Comments On Two Aspects Of The Draft New Jersey Energy Masterplan:

Public Sector Energy Efficiency And The Need To Fully Transition To Renewable Energy Sources

Introduction

The Eastern Environmental Law Center has prepared these comments on two aspects of the Draft New Jersey Energy Masterplan ("EMP") on behalf of Beyond Nuclear, Inc. and Grandmothers Mothers and More For Energy Safety (collectively, the "Clients"). The Clients reserve the right to submit comments on other aspects of the plan separately, and individual members of the Clients also reserve the right to comment on their own behalf.

These comments address the need to rapidly improve energy efficiency in the public sector and the need to fully transition to renewable generation technologies. On the first issue, the State can use the public sector to show that energy efficiency is not only good for the environment, it is also financially prudent and good for the economy as a whole. The EMP proposals fail to fully account for the present economic conditions and the need for an economic stimulus, particularly in the construction industry. Rapid investment in energy efficiency in the public sector could not only provide such a stimulus, it would also bring a host of long-term benefits, including lower taxes and an improved environment. The State should therefore invest heavily in energy efficiency at State and municipal facilities in the short-term.

On Monday, Mayor Bloomberg expressed similar sentiments by announcing New York City's plan to reduce greenhouse gases emitted from municipal buildings and operations by 30% below 2006 by 2017 using cost-effective measures.[1] The City will increase efficiency using a wide range of measures including improving air and heating systems, fixing methane leaks at water treatment plants and using that gas to run electric generation equipment, and using more fuel efficient vehicles. On a cash flow basis, the City will break even in 2013 and by 2015, it will have saved more on its energy bills that it will have spent by that time.

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1 http://www.nyc.gov:80/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2008b%2Fpr264-08.html&cc=unused1978&rc=1194&ndi=1

Moving on to the second issue, if the goals of the EMP concerning energy efficiency, renewable generation, and combined heat and power are met, there is no need for other additional generation capacity before 2020. Furthermore, after 2020, it is likely that solar power will be able to supply cost-competitive electricity without subsidy and local and imported wind-power may also be option. Therefore, there is no need for the State to promote nuclear power as a long-term option. Instead, the State should continue to foster the transition to renewable energy sources.

Issue 1: Rapid Investment In Public Sector Energy Efficiency Has Major Benefits

EELC has found that a number of states around the country have established mechanisms to borrow money to invest in energy efficiency measures that then save more money than the cost of borrowing. The idea behind this approach is that public entities should be encouraged to become as energy efficient as possible, but there is a danger that the current tight fiscal environment will lead to under-investment in energy efficiency retrofits for public buildings and other efficiency measures. Establishing an Energy Efficiency Fund to borrow money and then lend to public entities to allow such investments to occur would mitigate that danger. The Fund would provide an economic stimulus, including the development of green jobs, save taxpayers money, and improve the expertise in energy efficiency within the state government. By acting as a model for enlightened self-interest, this approach would also encourage cost effective energy efficiency in the private sector.

BACKGROUND

A number of states have successfully taken this approach. New Mexico's Energy Efficiency and Renewable Energy Bonding Act authorizes up to $20 million in bonds to finance energy efficiency and renewable energy improvements in state and school district buildings. See N.M. Stat. Ann. § 6-21D-2 et seq. (2008). The Bonding Act created a special "energy efficiency and renewable energy bonding fund" that pays the principal and interest on bonds issued pursuant to the act. N.M. Stat. Ann. § 6-21D-5(B). To repay the fund, the estimated energy cost that will annually be achieved as result of the efficiency measures is first calculated. N.M. Stat. Ann. § 6-21D-6(A). Ninety percent of that cost is then deducted by the Public Education Department, see N.M. Stat. Ann. § 6-21D-6(B) (school district buildings), or from the budget of the agency responsible for paying the utilities of a state building, see N.M. Stat. Ann. § 6-21D-6(E) (state buildings). The deductions stop when the cumulative deductions equal the amount necessary to service the bonds issued for the improvements. See N.M. Stat. Ann. § 6-21D-6(C) (school district buildings); N.M. Stat. Ann. § 6-21D-6(F) (state buildings).

Like New Mexico, Montana's program uses energy savings to repay bonds issued to fund a state projects used for state-owned buildings, structures, and facilities. See

Mont. Code Ann. § 90-4-602 et seq. (2007). The State Building Energy Conservation Bond Program requires that the total amount of energy costs saved as a result of the efficiency improvements be placed into an energy conservation payment account until the total cost of the project is paid off. Mont. Code Ann. § 90-4-615(2)(a). This account is also responsible for providing the funds necessary to issue the bonds. Mont. Code Ann. § 90-4-613.

Two other states, California and Texas have similar programs that are constructed around the issuance of loans, not bonds. Under California's statute, loans are provided to local jurisdictions for the purchase of energy efficient equipment or small power production systems, and to improve the operating efficiency of existing transportation systems, among others. See Cal. Pub. Res. Code § 25442 (2007). Similarly, Texas has enacted LoanSTAR (Loans to Save Taxes and Resources), a state energy efficiency demonstration program using a revolving loan mechanism. Loan recipients repay the principal and interest from the accrued value of energy savings realized as a result of the energy conservation measures implemented with the borrowed money. Tex. Gov't Code Ann. § 2305.032(d) (2007). Though the financing from these two programs is not achieved through bonds, the improvements soon pay for themselves, and save large amounts of money after that. Thus, energy savings are driving further efficiency.

CASE STUDY

Two examples from a recent energy audit conducted for a municipality in New Jersey show how a similar program would benefit the state. In one building, the audit estimated a replacement cost of $30,000 for an old air handling system that had poor duct insulation and poor temperature control. The energy savings from the more efficient replacement were estimated at $6,779 per year, quickly making up for the initial cost. In a second building owned by the municipality, retrofitting the lighting system would save a substantial amount of money. The audit estimated that replacing existing lights with T8 lamps and electronic ballasts, along with the installation of a lighting occupancy sensor, would have a total cost of $43,412 ($36,253 for the lights and $7,159 for the sensor). When looking at the total savings, including maintenance, from these retrofits the audit estimated a total savings of $15,768 per year at the second building.

Implementing these project not only saves money, it also reduces the demand for energy, benefiting the public as a whole through lower emissions and lower energy prices. Replacing the air handling system and patching up the leaks would reduce the energy consumption of the first building by an estimated 2,760 therms/yr (natural gas) and 24,800 kWh/yr. Likewise, replacing the lighting and installing the sensor in the second example would reduce electricity consumption by an estimated 143,071 kWh/yr. Thus, providing money upfront would provide not only an economic stimulus in the short run, but also reduce energy demand for the long term.

CURRENT SITUATION IN NEW JERSEY

Two programs in New Jersey encourage energy efficiency. In 2003, the New Jersey Board of Public Utilities (BPU) established the Clean Energy Council to administer the Clean Energy Program (CEP). Programs under the CEP include the Municipal Audit Program, which will pay for 75% of an energy audit for any qualifying municipality or government agency, and will pay the remaining balance of that audit if they complete all of the recommended projects. However, the State has earmarked only $800,000 for this program. Because this is insufficient to pay for audits of all municipal facilities, many municipalities will presumably be left out. In addition, to date, the program does not address implementation of the audit recommendations.

Furthermore, Governor Corzine created of the Office of Energy Savings on April 22nd, 2006 through Executive Order No. 11. This office oversees energy audits at State buildings, centers and facilities to analyze energy efficiency, Exec. Order No. 11(2)(a) (2006), and develops energy plans in conjunction with the Economic Department Authority. Exec. Order No. 11(2)(e) (2006). This demonstrates the State's recognition of its role in promoting energy efficiency.

This is further demonstrated in the EMP. The EMP included among its goals the need to redesign efficiency programs to emphasize a whole building approach and the need for a statewide building code to make construction at least 30% more efficient. Id. at 11. It did this because conservation and energy efficiency are the most economical methods of lowering New Jersey citizens' energy costs. Id. at 51. However, the majority of energy losses come from already constructed facilities, not from those to be constructed in the future. As the EMP recognizes, retrofitting these existing buildings is the best way to change the existing baseline. Id. at 52-54. In addition, the EMP recognizes that the state must lead by example. Id. at 75-79.

To enable state and municipal entities to fund cost-effective energy improvements, the EMP suggests that the law should be changed to allow long-term contracting for energy efficiency. Id. at 78-79. It is understood that a law enabling such contracting is awaiting the Governor's signature. However, while this is a reasonable approach, it is unlikely that this will be sufficient to provide the needed short term stimulus for a number of reasons. First, access to private capital is currently very tight. Second, performance contractors tend to favor large industrial-scale projects,that are seldom available because most of New Jersey's municipalities are relatively small. Moreover, public entities can generally borrow on more favorable terms than private entities making more energy saving measures cost effective.

IMPLEMENTATION METHODS

Bonds are issued with the idea that an improvement should be paid for by those who have the opportunity to benefit from it, not just those who are alive at the time the

process begins, and are often utilized in New Jersey to spread costs over time and pay for income producing assets. See N.J. Stat. Ann. § 40:11A-8 (2008) (parking authorities may issue bonds payable from income and revenues of parking projects). The State of New Jersey is not prohibited from guaranteeing bonds and obligations for a public purpose. See Behnke v. N.J. Highway Authority, 25 N.J. Super 149 (Ch. Div. 1953) (the State's guarantee of bonds was not a prohibited by the financial limitation clause, N.J. Const. art. VIII, §2, ¶ 1).

At least three options exist to create an Energy Efficiency Fund in New Jersey to promote the public purpose through bonds and obligations. One option is to create an office within an existing department to administer loans for energy efficiency projects funded directly by state debt. The main advantage of this method is the ability to centralize expertise within a state agency, which would lead to a transparent and more effective way of promoting energy efficiency in the public and private sectors. However, the State has expressed a desire not to borrow any more money in the current economic climate.

Another option is to create an independent state authority responsible for issuing bonds and maintaining the fund. The Environmental Infrastructure Trust (EIT), created in 1986, is an example of this. EIT works in partnership with DEP and combines interest-free loans from state revolving funds with market-rate loans from AAA-rated Trust bonds, granting a loan that is half of the market rate to municipalities and utility and sewerage authorities. This provides a way to distribute substantial amounts of capital for large projects in an arm's-length manner, while still enabling some centralization of expertize. Although this method avoids direct issuance of state debt, the use of independent authorities has sometimes led to a lack of accountability.

A third option is to encourage local governments to borrow to fund local improvements. Municipalities and counties in New Jersey have the authority to issue obligations up to the statutory limits of indebtedness to finance "any capital improvement…which it may lawfully make." N.J. Stat. Ann. § 40A:2-3(a) (2008). Thus, it should be possible for municipalities and counties to issue bonds for the purpose of promoting energy efficiency, with the principal and interest (if any) payable by the energy savings that accrue from the adopted energy conservation measure. Demonstating the practicality of this approach, we understand that the Bergen County Improvement Authority, has already funded energy efficiency projects. However, while this would encourage energy efficiency to a small degree, it would create a patchwork of expertise and implementation throughout the state, in place of the centralized knowledge in the previous two options. Thus, at minimum, this approach would have to be supported by technical assistance and co-ordination from the OES.

CONCLUSION

A state energy efficiency fund would have many benefits, including stimulating the state economy by creating construction activity, reducing local air pollution and greenhouse gas emissions, saving taxpayers money, and enabling the public sector to lead the private sector by example. There are a number of ways to accomplish this, but it would be ideal build upon the existing expertise in energy efficiency within the State. In our view, this would be best accomplished by establishing an Energy Efficiency Authority which would borrow wholesale and then lend to State and local entities, taking a small spread to fund its operations. In the short term, the people of New Jersey could benefit from public sector energy efficiency while conserving scarce public money. In the long term, the expertise gained by using the public sector as the first mover, would act as a model for the private sector and could be used as the basis for educational efforts.

Issue 2: The EMP Should Promote Renewable Energy, Not Nuclear Power

At present New Jersey consumes approximately 82,000 GWh of electricity each year, EMP at 17, of which approximately 75% is generated within the state. *Id.* at 35. The demand in 2020 is projected to be 80,000 GWh. *Id.* at 13. The plan calls for installing approximately 10,000 GWh of new combined heat and power before 2020. *Id.* In addition, the renewable portfolio standard increases from approximately 6% to 22.5% i.e. an increase from approximately 5,000 GWh to 18,500 GWh. *Id.* at 63. This is an increase in capacity of 13,500 GWh. Thus, state mandates will lead to an additional 23,500 GWh of generation capacity being installed, while overall demand is expected to be constant. The demand on the existing plants will therefore fall to 56,500 GWh by 2020.

It is unclear why the EMP suggests that existing plants will not be able to meet this demand prior to 2020. *Id.* at 13. Contrary to the EMP's assumption, age does not seem to be the main issue. More than half the existing capacity is under 30 years old, *id.* at 33, and power plants normally have a useful life of approximately 40 years. Indeed, some fossil fuel plants are over 50 years old. *Id.* In addition, merchant plant owners of old coal plants have shown a willingness to retrofit those plants to extend their life. Therefore, instead of planning for the retirement of old coal plants, it would make sense to encourage owners repower the plants to make them as efficient as possible, perhaps through the inclusion in air permits of standards for CO2 emissions per MWh generated and encouraging use of pipeline quality bio-methane. Because the clearing price in the system is generally set by efficient natural gas plants, this approach should not cause the price of electricity to change significantly.

Old nuclear plants present a different proposition, because their safety systems degrade over time and the current regulatory system is failing to properly address this issue. For the Oyster Creek plant (600 MW) there is currently no certainty that it meets

its safety requirements. Therefore, it should be retired before the next refueling outage in October. For other nuclear plants, the State should plan on them closing after 40 years or when they can no longer establish that they meet their safety requirements with a high degree of certainty. Currently, the license for Salem 1 (1100 MW) expires in 2015, Salem 2 (1100 MW) expires in 2020, and Hope Creek (1100 MW) expires in 2026. This shows that less than half of New Jersey's nuclear capacity is scheduled to go offline before 2020. Because nuclear plants run around 90% of the time, this amounts to around 4,700 Gwh retiring in 2008 or 2009, and another 8,700 Gwh retiring in 2015. Thus, if properly planned, short term demand reduction measures combined in the longer term with new renewable and combined heat and power capacity should replace the nuclear capacity that is scheduled to retire without incurring a major penalty in terms of greenhouse gas emissions.

Another possible cause of a generation shortage cited by the EMP is power export. *Id.* at 13. However, New Jersey's prices are already high. *Id.* at 35-36. Any generation shortage would send prices higher, curtailing exports. Thus, it is unlikely that power export will lead to a shortage of generation.

The situation after 2020 is considerably less certain, but is likely to be less constrained. Renewable energy, particularly solar power, is anticipated to become financially competitive with natural gas-fired baseload prices at around 2020.[2] McKinsey & Co., *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost*, 62-63 (December 2007). Thereafter, solar power could experience explosive growth, as seen in the electronics industry. *Id.* at 63. In addition, there are innovative storage technologies being developed, which should assist with the problem of intermittency and large scale investments in on-shore wind farms in other states are anticipated.

As the EMP acknowledges, using coal to produce baseload power is unacceptable for a host of reasons, including high emissions of many pollutants, including mercury, particulates, and greenhouse gases. *Id.* at 71. The EMP then gravitates towards the idea that a new nuclear power plant could help to lower the price of electricity. *Id.* at 71. This is incorrect, because the latest estimates are that nuclear power cannot compete with existing generation capacity in the short run, and cannot compete with the reducing cost of renewables in the long run.[3] Moody's Corporate Finance stated in its May 2008 report on nuclear power that "our concerns reside in the fact that nuclear generation has a fixed design where construction costs are rising rapidly, while other renewable technologies are

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[2] The Department of Energy has programs that aim to reach this point in 2015. http://www.energy.gov/news/4855.htm

[3] One low but somewhat realistic estimate is that nuclear power would have a cost of 8 to 11 cents/kWh delivered to the grid. http://www.keystone.org/spp/documents/FinalReport_NJFF6_12_2007(1).pdf ("Keystone Report") at 11. This compares to less than 7 cents/kWh for wind, and less than 6 cents/kWh for combined heat and power. In its May 2008 special comment Moody's Investors Service stated that the construction cost for a new nuclear plant potentially exceeds $7,000 per kW, which equates to a cost of 13 to 14 cents/kWh, after operating costs are added in. *See Keystone Report* at 42.

still experiencing significant advancements in terms of energy conversion efficiency and cost reductions." Moreover, because building a nuclear power plant would likely take more than 10 years, *id.* at 33, a new nuclear plant could only supply power after 2020, but would absorb a large amount of capital prior to that time.

As the proposal above illustrates, there are many more economically beneficial places to deploy that capital, particularly in energy conservation and development of renewable generation technologies. In addition, one major problem with nuclear power is that we would have to commit to build a plant at least 10 years before it could produce any energy. If nuclear power turns out to be more costly than renewables by the time any plants are built, as many anticipate, the State could not change course without incurring a huge penalty. On the other hand, if we stay flexible by avoiding committing large amounts of capital to nuclear power, at worst in 2020 we would be required to pay a modest premium for renewable energy compared to nuclear power. Given the major issues associated with nuclear power, such as the loss of State control over safety to a federal agency with a poor record, the inability to dispose of the nuclear waste generated, and the risk of proliferation of nuclear weapons, any small premium that may be required would be worth paying. In short, the high financial and environmental risk of building a nuclear power plant is simply not worth taking, when it is compared to the low risk alternative of transitioning to renewable energy sources.

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