WISCONSIN LEGISLATIVE COUNCIL

NUCLEAR POWER

411 South, State Capitol
Madison, Wisconsin

November 15, 2006
9:00 a.m. - 4:30 p.m.

[The following is a summary of the November 15, 2006 meeting of the Special Committee on Nuclear Power. The file copy of this summary has appended to it a copy of each document prepared for or submitted to the committee during the meeting. A digital recording of the meeting is available on our Web site at **http://www.legis.state.wi.us/lc**.]

Call to Order and Roll Call

Chair Montgomery called the meeting to order. The roll was called and it was determined that a quorum was present.

COMMITTEE MEMBERS PRESENT:	Rep. Phil Montgomery, Chair; Sen. Dave Hansen; Reps. Chuck Benedict, Mark Honadel, and Robin Vos; and Public Members Forest Ceel, Michael Corradini, Charles Higley, Katie Nekola, Terry Pickens, Brian Rude, Pat Schillinger, Richard Shaten, Susan Stratton, Bill Ward, and Jack Weissgerber.
COMMITTEE MEMBER EXCUSED:	Public Member John Orth.
COUNCIL STAFF PRESENT:	David Lovell, Senior Analyst, and John Stolzenberg, Chief of Research Services.
APPEARANCES:	Tom Hewson, Energy Ventures Analysis, Inc.; Julio Freidman, Lawrence Livermore National Laboratory; Mike Messenger, Conservation Bureau, Ontario Energy Authority; Eric Knox, Office of Civilian Radioactive Waste Management, U.S. Department of Energy; Steve Frishman, Agency for Nuclear Projects, Office of the Governor, State of Nevada; and Christopher Paine, Natural Resources Defense Council.

Approval of the Minutes of the Special Committee's September 29, 2006 Meeting

In response to David Lochbaum's remarks on nuclear power plant operation, Mr. Ceel distributed to the committee a set of charts and tables relating to Nuclear Regulatory Commission findings since 2000 at the Point Beach Nuclear Plant. He noted that this information puts the safety concerns on the operation of this plant reported by Mr. Lochbaum into context, as a great proportion of these findings were of "very little significance."

> *Mr. Schillinger moved, seconded by Sen. Hansen, to approve the minutes of the Special Committee's September 29, 2006 meeting. The motion was approved by unanimous consent.*

Description of Staff Materials Distributed

Mr. Stolzenberg provided a brief description of Memo No. 1, *Key Wisconsin Laws and Programs Relevant to the Work of the Committee*. Representative Honadel noted that he had distributed at the members' places an article from the October 2006 Council of State Government's Stateline publication, *States Wary of New Federal Proposals on Radioactive Waste*.

Invited Presentation: Coal Technologies

Tom Hewson, Principal, Energy Ventures Analysis, Arlington, Virginia, described advances in "clean" technologies for burning coal to make electricity. He began by noting that in Wisconsin approximately 63% of the electricity is generated from the combustion of coal and that between now and 2025 new coal-fired power plants will make up the largest portion of power plants being built.

Mr. Hewson described the advantages and disadvantages of various generation technologies, including subcritical and supercritical pulverized coal, and fluidized bed combustion, and integrated coal gasification combined cycle (IGCC) technologies. Mr. Hewson provided an overview of the following environmental control technologies: flue gas desulfurization (used to reduce sulfur dioxide emissions); selective catalytic reduction (used to reduce nitrogen oxides emissions); mercury control alternatives; and pre and post contribution carbon dioxide control alternatives.

Mr. Hewson observed that current economics favor the use of pulverized coal technology in new power plants, but that this technology does not effectively reduce carbon emissions from the plants. Instead, new technologies, such as IGCC technologies that produce hydrogen-rich synthetic gas and enable maximum carbon capture, will need to be developed to deal with any future constraints on carbon emissions. He also noted that much of Wisconsin's coal-fired base load power plants are old and that it is hard and expensive to retrofit these plants with modern pollution control equipment. Thus, while it will be more expensive, he observed it may be desirable to replace the plants in order to obtain desired reductions in pollutant emissions.

Invited Presentation: Carbon Sequestration

Julio Freidman, Carbon Management Program, Energy and Environment Directorate, Lawrence Livermore National Laboratory, Livermore, California, provided an overview of the science and

technology of geologic carbon sequestration. He stated that carbon dioxide capture and storage represents an attractive pathway to substantially reducing releases of greenhouse gases, as this technology appears to be a good bridging technology pending the development and deployment of other energy sources that do not produce carbon emissions. He noted that the technology is cost-competitive to other carbon-free options presently available, for example, wind and nuclear power, and has the advantage of using existing technology.

Mr. Freidman indicated that in geologic sequestration, high purity streams of carbon dioxide, over 90% carbon dioxide, are pumped in the super critical phase into wells at least 800 meters deep. The technology for injecting carbon dioxide has been developed by the oil and gas industry, which has used carbon dioxide injection for over 35 years to provide enhanced oil recovery in aging oil fields. Based on this experience, he noted that the carbon dioxide storage mechanisms are sufficiently well understood that one can be confident of their effectiveness.

Mr. Friedman indicated that the central priority of any decarbonized fossil fuel strategy should be the conduct of about 10 large scale carbon sequestration field experiments and demonstration projects worldwide in a suite of geologic settings, to resolve scientific uncertainties and demonstrate engineering practices for carbon sequestration. An additional policy need is for more complete surveys of the capacity of different types of basins for receiving carbon dioxide using consistent assessment methodologies.

Mr. Friedman reported that there has been no assessment of the potential for geologic sequestration in Wisconsin and Minnesota. If it is determined that Wisconsin does not have suitable geology for sequestration, it would be necessary to build a pipeline to suitable geologic basins, such as in Illinois or Michigan, for sources in Wisconsin, such as power plants, to use sequestration to store their carbon.

In response to questions from committee members, Mr. Freidman noted the following:

- At well-designed sites, carbon dioxide injections will not lead to geological instabilities. Injections at the Rocky Mountain Arsenal did induce earthquakes, but those injections were into the wrong types of rock.

- Five to 10 years of large scale testing should be an adequate period to validate the predictive models used to design sequestration projects, as much is already known about the underlying processes.

Invited Presentation: Energy Efficiency and Renewable Resources

Mike Messenger, Demand Side Management Planning and Evaluation Consultant, Ontario Power Authority (on leave from the California Energy Commission), addressed two aspects of energy efficiency in Wisconsin: how much of anticipated new demand for electricity can be met through energy efficiency? and what are the implications for nuclear policy of such an energy efficiency program? He began by discussing trends in per capita electricity usage for Idaho, Wisconsin, New York, and California, and the United States. He attributed roughly one-half of the differences between California's lower energy usage rate and Wisconsin's and the United States' rates (which were similar) to the effects of climate differences; he attributed the remainder to a number of state initiatives in

California that have cut the annual electric sales growth rate in California in half over the last 25 years, from 2.5% per year to 1.3% per year.

Looking forward, Mr. Messenger stated that it is feasible for California to reduce its forecasted growth in electricity consumption over the next 10 years by 55% using energy efficiency and renewables. He asserted that it is feasible for Wisconsin to meet 45% of its incremental demand this way, within 15 years, compared to its present rate of 10%. Citing examples of new technologies that, if utilized, could lead to a large reduction in future electricity demand, he explained that the limits on the state achieving these energy savings arise from funding constraints, low market acceptance rates, and low overall rates of innovation, and not from economic considerations.

Mr. Messenger recommended that Wisconsin establish a state level energy savings goal at 50% of incremental electricity growth. To accomplish this goal, the state should financially reward entities responsible for successful energy efficiency programs and should help motivate various sectors in the state to more aggressively pursue energy efficiency through education, competitions, and publicizing success stories.

With respect to the policy implications of global warming and the need to increase the amount of carbon free energy resources, Mr. Messenger opined that the risks and costs associated with global warming are much higher than the risk of catastrophic nuclear release. As a result, he recommended that the state's first priority should be to develop all energy efficiency resources. However, the development of these resources will not be enough to produce a real slow down in carbon emissions growth, and, thus, a second priority should be the development of nuclear and renewable resources. He suggested that a key opportunity for Wisconsin may be its ability to create carbon credits by closing or limiting the operation of its coal plants, and to then sell the credits and reinvest the proceeds in either making Wisconsin more competitive or developing new carbon free energy resources. He stated that a sound electricity portfolio policy suggests that Wisconsin use all of its electricity supply and demand options going forward.

Mr. Messenger recommended that the Wisconsin Legislature set a goal for meeting future growth in demand for electricity through carbon free resources. He provided an example of such a carbon free portfolio standard under which utilities would be required to use efficiency, renewables, or nuclear power to meet the following percentages of incremental demand: 50% by 2015; 75% by 2020; and 90% by 2025.

Mr. Messenger recommended that the state address the problem of what to do with spent nuclear fuel locally, rather than waiting for the federal government to develop the repository at Yucca Mountain, by encouraging local storage of the waste, and by providing incentives to dramatically reduce the risk of waste release and the amount generated, such as through reprocessing of these wastes. He also identified more "radical steps" to encourage energy innovation and productivity, including replacing 50% of the state income tax over the next decade with an increased energy tax and a royalty income from an air pollutant cap and trade system; and encouraging the younger generation to get involved with development of energy efficiency and renewable programs.

In response to questions from committee members, Mr. Messenger said the following:

- Additional funds for energy efficiency programs would yield the greatest savings if used in the commercial sector, but since energy efficiency programs are funded by residential, commercial, and industrial users, all three sectors should receive a portion of any increased funding of these programs.

- With regard to whether the state programs should favor utility demand side management or customer energy efficiency initiatives, he indicated that most California utilities are integrating these programs as they are finding that their customers only want one menu of program choices. In designing a combined program, it is important for customers to understand that the cost of producing the electricity they consume fluctuates over time. Public education and new metering technology can contribute to this understanding.

- Examples of policies encouraging the local storage of spent nuclear fuel are the current practices in France and Canada.

Invited Presentations: Spent Fuel and Yucca Mountain

Eric Knox, Associate Director for Systems and External Relations, Office of Civilian Radioactive Waste Management, U.S. Department of Energy (DOE), reported on the status of the Yucca Mountain repository program. He began by citing the federal laws enacted in the 1980s that led to the federal government focusing on determining the suitability of only the Yucca Mountain site as a repository and the basis for the Yucca Mountain site recommendation in 2002. Mr. Knox then described the transportation planning and related activities that the Department of Energy is presently engaged in, including assessment of two connecting rail routes to Yucca Mountain and the department's decision to implement a "Transport, Aging and Disposal" (TAD) canister system approach to the shipment and disposal of spent fuel.

Mr. Knox reported that the current repository program schedule, assuming passage of the Administration's legislative proposal on Yucca Mountain, calls for the completion of the following activities by the specified dates:

- Commencement of Nevada rail construction, October 2009.

- Nuclear Regulatory Commission authorization of repository construction, September 2011.

- Completion of initial rail access, June 2014.

- Completion of construction for initial repository operations, March 2016.

- Commencement of waste deliveries to the repository, March 2017.

Mr. Knox indicated that there are a number of potential obstacles to meeting this schedule but that Yucca Mountain is needed under any fuel cycle scenario. He also described the efforts of the DOE to integrate the Yucca Mountain program with other emerging initiatives such as the Global Nuclear Energy Partnership.

Mr. Knox stated that under a court ruling in 1997 the DOE is liable for damages incurred by utilities due to the missed 1998 deadline to pick up spent fuel. The federal government has settled with over 20% of the utility industry, and the department estimates that the total damages could be approximately $7 billion once all of the lawsuits are resolved.

Mr. Knox stated that the Nuclear Waste Policy Act, as amended, directs the Secretary of Energy to report to Congress between 2007 and 2010 on the need for a second repository. He indicated that the Administration's proposal to remove the statutory limit of 70,000 metric tons of spent fuel for Yucca Mountain will defer the need for a second repository.

In response to questions from committee members, Mr. Knox made the following points:

- Fees paid by electric utilities for the Yucca Mountain repository program are in a secure fund but Congress has to appropriate moneys in the fund to the Department of Energy before the department can spend them.

- The 70,000 metric ton cap on wastes going to Yucca Mountain is based upon the amount of spent fuel generated at the reactors; if the amount of spend fuel is reduced by reprocessing, it will be counted for purposes of the cap as the amount before reprocessing. Currently, there is about 55,000 metric tons of spent nuclear fuel and this amount increases by approximately 2,000 tons per year thus, if there are no changes in the cap, the 70,000 metric ton limit will be reached before Yucca Mountain receives any waste.

- The second repository study requirement in the Nuclear Policy Act does not specify any regional equity between Eastern and Western United States as a condition of recommending potential second repository sites. The Act does not prohibit interim storage of spent nuclear fuel in Nevada.

- The 2017 operational date for the Yucca Mountain repository is the best achievable schedule. Whether this date is met depends to a large degree on whether the program receives adequate funding. To date, the department has spent about $9 billion on the spent fuel repository program, of which $5 billion has been spent on Yucca Mountain. Over $320 million of the $9 billion has come from Wisconsin.

- There are presently 129 sites in 31 states that store spent nuclear fuel.

Steve Frishman, Technical Policy Coordinator, Nevada Agency for Nuclear Projects, presented Nevada's perspective on the development of Yucca Mountain as the nation's high-level radioactive waste repository. After reviewing the history of how Yucca Mountain was designated as the repository site, he shared the following points on the suitability of Yucca Mountain as a repository site from the viewpoint of the State of Nevada: (1) the site is unsafe – it cannot isolate the waste due to water infiltrating the fractionable volcanic rock, contacting and corroding metal waste containers, dissolving soluble radionuclides, and transporting them to the water table and surface waters; (2) the federal Nuclear Waste Fund will not support the cost of the repository; (3) the Nuclear Regulatory Commission (NRC) and Environmental Protection Agency (EPA) regulations are not final and may be subject to

further challenge; (4) "Fix Yucca" bills abound in Congress and compete; and (5) there has been consistent, strong opposition to the project by the State of Nevada over the last 19 years.

Mr. Frishman stated that the metal drip shields for the waste containers proposed by the Department of Energy delay corrosion of the containers but do not prevent the corrosion and ultimate release of radionuclides. He asserted the container failure rate is the largest uncertainty in the Yucca Mountain repository performance assessment.

Mr. Frishman also indicated that he would not be able to join the committee on its tour of Yucca Mountain in December, and he shared with the committee a set of visit notes on the exploratory studies facility at Yucca Mountain that summarizes points he would have raised if he had been on the tour.

In response to questions raised by committee members, Mr. Frishman said the following:

- There are other favorable geologic formations and settings for a repository if Yucca Mountain is not ultimately licensed as a repository. They may need more study to adequate characterize them.

- The fact that many persons and policymakers want the Yucca Mountain repository does not make it a better site than other locations.

- With respect to the cost to society of not proceeding with Yucca Mountain, dispersed on-site storage of spent nuclear fuel is the safest short-term approach for managing these wastes. Transportation of the spent fuel increases the risks to society. The only time the risk to society is decreased is when there are no operating nuclear power plants, no transportation of spent fuel, and the Yucca Mountain site is closed.

- Some communities in rural Nevada support the Yucca Mountain repository because local officials have decided that the repository will be built and operated there irrespective of what the state does and they would like their communities to receive some of the economic benefit from the repository's construction and operation.

Invited Presentation: Environmental Impact Comparison

Christopher Paine, Senior Nuclear Program Analyst, Nuclear Program, Natural Resources Defense Council, addressed the environmental impacts from the nuclear fuel cycle, and from the production and use of coal and natural gas to generate electricity. He began by posing the question: if nuclear power were assigned the responsibility to displace one gigaton of carbon per year worldwide in 2050, to help stabilize atmospheric carbon concentration at current levels, what would be the effect on global average temperature and how many nuclear power plants and related infrastructure would be necessary to achieve this level of carbon displacement? He responded that the world would have to almost triple global nuclear capacity within 40 years by adding 15 nuclear power plants per year between 2010 and 2050 and then maintaining approximately 1,100 gigawatts of nuclear power plant capacity from 2050 through 2100. While acknowledging numerous uncertainties, he asserted that this level of expansion in the nuclear power industry might possibly displace fossil fuel power plant emissions that would otherwise result in a 0.2 degree Celsius rise in average global surface temperature.

He contrasted those projections with current forecasts that predict a very modest growth in nuclear power in the United States.

Mr. Paine then presented his balance sheet for new nuclear power. On the plus side, he stated that new nuclear power plants offer: (1) low emissions of carbon and other air pollutants, though there is still some air pollution from other components in the nuclear fuel cycle; (2) copious, highly concentrated sources of base load power; (3) low fuel costs compared to fossil alternatives; and (4) if carbon emissions are effectively "taxed" at a sufficient rate, cost effective power compared to coal and gas fired power plants. On the negative side, he stated the following concerns on new nuclear power plants: (1) expense; (2) energy security concerns from infrequent but prolonged unplanned shutdowns of U.S. nuclear plants; (3) new nuclear power investments becoming hostage to accidents or near accidents at another individual reactor; (4) waste disposal; (5) security and proliferation concerns; and (6) non-carbon environmental impacts at all stages of the nuclear fuel cycle, including waste heat from power plants located on small interior lakes and rivers. Mr. Paine then provided specific examples to illustrate these environmental concerns.

Mr. Paine stated that both the burning and the mining of coal poses unacceptable, irreparable damage to natural environments, human health and communities, and the global climate. He showed examples of the impacts of mountain top mining in Eastern United States, including damage from breakage of coal slurry dams and valley fills, and the effects of strip mining in the Western United States.

Mr. Paine indicated that impacts from the production of natural gas include the "heavy-duty" industrialization of affected areas, with well fields that cover thousands of acres and encompass hundreds or even thousands of wells and well pads where each field is accompanied by a "dense web" of power lines, pipelines, roads, waste pits, compressors, processing plants and other production facilities. These facilities cause increased erosion and dust, pollution from diesel engines powering the equipment, depletion of underground aquifers, contaminated surface waters with toxic drilling materials, and severe water-related problems from coalbed methane development projects. He also noted that some renewable energy technologies can have significant environment impacts, though not on the same scale as coal, natural gas, and nuclear power.

Mr. Paine concluded his remarks by stating that the most economically efficient way to address the risks and environmental damage associated with nuclear-, coal-, and gas-generated electricity is to internalize all costs of avoiding or mitigating these harms in the retail price of electricity and fuels. He recommended that a level, environmentally sustainable energy playing field be created via a carbon cap and trade program accompanied by major regulatory and mining reforms. These reforms would allow competitive markets to deliver the lowest-cost technologies for energy services that meet minimum common criteria for environmental sustainability, public health, and energy security.

Mr. Paine indicated that, if nuclear power proves capable of meeting these criteria while becoming economically competitive without economic subsidies, then it could play a modest future role in countering global climate change. He preferred a climate-change strategy that focuses on rapid deployment of cleaner, more flexible, and totally sustainable energy technologies. Mr. Paine recommended that the state create five to 10 year gigawatt-scale investment "virtual power plant" packages of energy efficiency and distributed renewable energy generation. The state should ensure cost recovery of these packages in the regulated rate base for utilities, just as it would treat a

conventional base load plant, so that these investments could be financed through debt financing, as other regulated utility investments are.

[Note: PowerPoint presentations and other documents referred to by the speakers are posted on the committee's Web site.]

Discussion of Committee Assignment

The committee deferred discussion of its assignment until its next meeting in December.

Plans for Future Meetings

The next meeting of the committee is scheduled for Thursday, December 14, 2006, at 9:00 a.m., in Room 411 South, State Capitol.

Adjournment

The meeting was adjourned at 4:30 p.m.

JES:ksm