

MINUTES

Submitted by Keith Ammon

Commission to Investigate the Implementation of Next Generation Nuclear Reactor Technology in New Hampshire

May 12, 2023

Attendance:

Commission Members: Rep Keith Ammon, Cathy Beahm, Marc Brown (arrived 9:18 AM), Pradip Chattopadhyay (substitute for Golder), Bart Fromuth, Rep Michael Harrington, Christopher McLarnon, David Shulock

Absent: Alex Fries, Daniel Goldner (Chattopadhyay was substitute), Matthew Lavender, Sen Howard Pearl

Public In-Person: Hon Richard Barry, Rep Steven Bogert, Maily Douglas, Donald Kreis, Vikram Mansharamani, Rep Alvin See, Rep Doug Thomas

Public Remote: Craig Piercy - ANS, Gareth Thomas - Holtec, Tanya Donnelly, Guido, Paul Gunter, Jeremy Hitchcock, Pat O'Brien, Joy Russell, Timothy Smyth, Rep Carry Spier, Rep Walt Stapleton, John Starkey, John Tuthill

Meeting:

1. The New Hampshire Commission to Study Nuclear Technology meeting was called to order by Rep Keith Ammon at 9:05 am. The commission had a quorum present.
2. Rep Ammon introduce PUC Commissioner, Pradip Chattopadhyay, who filled in for Daniel Goldner.
3. Approval of the minutes from the March 6th meeting was moved by Rep Harrington, seconded by Bart Fromuth. The minutes were approved by unanimous voice vote.
4. Approval of the minutes from the April 7th meeting was moved by Cathy Beahm, seconded by Chris McLarnon. The minutes were approved by unanimous voice vote.
5. Craig Piercy, the Executive Director and CEO of the American Nuclear Society, presented before the New Hampshire Commission to Study Nuclear Energy Technology. He discussed the current state and prospects of nuclear energy, highlighting its relevance in the context of climate change and the need for decarbonization. Piercy provided insights into public opinion, investments, reactor designs, challenges, and the role of nuclear energy in a renewable energy grid.
 - A. American Nuclear Society (ANS):
 - ANS serves as the Technical and Professional Society for Applied Nuclear Science.
 - It supports its 10,000 members through meetings, publications, professional development, and engagement with policy and journalism.

- ANS is expanding its programs to improve K-12 education programs related to nuclear science.
- B. Growing Interest in Nuclear Energy:
- Piercy noted that nuclear energy is currently experiencing a surge in interest and popularity.
 - He mentioned examples of recent events, such as the premiere of the movie "Nuclear Now" and the support expressed by influential figures like Elon Musk.
- C. Nuclear Renaissance vs. Nuclear Enlightenment:
- Piercy differentiated between the previous "nuclear renaissance" era and the current "nuclear enlightenment" phase.
 - The nuclear enlightenment focuses on addressing the challenges of climate change, decarbonization, and maintaining a reliable grid with increased renewable energy penetration.
 - Nuclear energy is recognized as a proven source of clean, firm power in a carbon-constrained world.
- D. Historic Investments and Generation IV Technologies:
- Piercy highlighted the significant public investments in nuclear energy, particularly through the Inflation Reduction Act and the Infrastructure and Jobs Act.
 - These investments support the expansion and development of new nuclear technologies.
 - He discussed various reactor designs, including Generation III+ lightwater plants, high-temperature gas reactors, pebble bed reactors, heat pipe reactors, and fusion energy.
- E. Challenges and Focus Areas:
- Fuel Supply: Piercy discussed the challenges related to low enriched uranium (LEU) and high assay LEU (HALEU). He mentioned efforts to establish domestic supply chains and the development of enrichment technologies like laser enrichment.
 - Regulatory Readiness: Piercy acknowledged the challenges faced by the U.S. Nuclear Regulatory Commission (NRC) in adapting its regulatory framework for advanced reactors. He expressed confidence in the NRC's ability to handle future license applications.
 - Nuclear Waste: Piercy noted that nuclear waste management faces policy challenges, despite the safety of current storage methods. Private companies show interest in extracting usable uranium from spent fuel rods.
 - Skilled Workforce: The nuclear industry faces the challenge of attracting and retaining skilled professionals. ANS is working on expanding education programs and developing certification programs for professionals from adjacent industries.
- F. Nuclear Energy as a Grid Anchor:
- Piercy emphasized the importance of nuclear energy as a reliable and resilient source in a grid with high penetrations of intermittent renewable energy.
 - He encouraged the commission to consider the role of nuclear energy in creating a reliable and resilient grid and its feasibility in meeting clean energy goals.
- G. Conclusion: Piercy concluded by highlighting the need for timely action and strategic decision-making regarding the incorporation of new nuclear generation into energy plans. He emphasized the advantages of nuclear energy in terms of reliability, resilience, and its potential contribution to decarbonization efforts. Piercy expressed readiness to address any questions from the commission members.

6. Gareth Thomas, Senior Program Manager for Holtec, introduced himself and discussed the purpose of the speech. Holtec is a technology development company specializing in nuclear fuel storage.
 - A. Holtec's History and Core Business
 - Holtec was founded in 1986 by the current owner and CEO, initially focusing on heat exchanges and plant equipment.
 - The company transitioned to solving the storage issue of spent nuclear fuel, starting with underwater racks and high density racks, and later moving to dry gas storage.
 - Fuel storage became Holtec's core business for the past 15 to 20 years.
 - B. Expansion into Reactor Decommissioning and SMR Development
 - In the last five years, Holtec expanded its operations to include reactor decommissioning and small modular reactor (SMR) development.
 - The SMR 160 program began in 2010, aiming to design a fail-safe and walk-away-safe reactor using existing technology.
 - Holtec developed a 160-megawatt electrical pressurized water reactor (PWR) suitable for single or multiple units on one site.
 - C. Progress and Current Focus
 - Holtec completed the Canadian VDR phase one and received a DOE fund under the Advanced Reactor Demonstration Program.
 - They are working on developing the licensing documentation and preparing to submit a Construction Permit Application.
 - Engaging with the NRC for feedback and ensuring a smooth construction permit application process.
 - Identifying the location for the first commercial SMR project, with the Oyster Creek site in New Jersey as the primary candidate.
 - D. Commercial Project Challenges
 - Securing power purchase agreements and ensuring competitive electricity prices.
 - New Jersey's historically competitive and stable power market poses challenges in pricing the electricity.
 - Exploring other potential sites owned by Holtec and initiating discussions with utilities in the southern US.
 - E. Construction and Cost Considerations
 - Holtec is partnering with construction company Kiewit to refine the plant design and cost estimates.
 - Focusing on achieving an executable status for the design and ensuring high confidence in the project budget.
 - Striving to stay on budget and on schedule for the first plant, while aiming for competitiveness in construction costs.
 - F. Conclusion and Future Prospects
 - Holtec's goal is to obtain a Construction Permit Application and license the first SMR under the standard process.
 - The company is actively pursuing the Oyster Creek site for the first commercial SMR project.
 - Challenges include first-of-a-kind risks, keeping projects on time and on budget, and reducing costs over time.

- Holtec aims to bring their SMR technology to market efficiently, capitalize on cost reductions, and expand their project portfolio.

7. Holtec Q&A:

Rep Michael Harrington: Why did Holtec choose a two-part licensing approach instead of a combined license like Vogtle?

Gareth Thomas, Holtec: The combined construction and operating license can have its challenges. At Vogtle, they certified the design but encountered difficulties in making design changes during construction. They had to go back to the NRC for approval, which caused delays. So we opted for a two-part licensing approach to avoid such issues.

Rep Michael Harrington: Does Holtec take on the construction cost risks in the PPmodel? Would you bear the consequences of cost overruns or benefit from cost savings?

Gareth Thomas, Holtec: Yes, in the model we presented for the Oyster Creek project, we would be liable for the construction costs. We would negotiate power purchase agreements (PPAs) with a utility, and any cost overruns or savings would be our responsibility.

Rep Michael Harrington: This seems like a significant change in the way nuclear plants are built. Could you elaborate on that?

Gareth Thomas, Holtec: Indeed, it is a substantial change. Traditionally, nuclear plants have involved owner-operators and risk-sharing approaches. However, currently, there aren't many owner-operators in the US willing to build the first-of-a-kind SMRs. We are exploring options and engaging with potential partners. If those discussions don't progress, we have the Oyster Creek project as an option.

Rep Michael Harrington: Could you provide more information about the Oyster Creek project and its implications for the merchant plant model?

Gareth Thomas, Holtec: The Oyster Creek project follows a merchant plant model. It involves negotiating with utilities and assuming the risks associated with construction costs.

Rep Michael Harrington: New Hampshire is a merchant plan market as well and would have to explore a similar model for its nuclear projects.

Rep Keith Ammon: How is Holtec interfacing with recent federal programs like the Inflation Reduction Act?

Gareth Thomas, Holtec: We have been evaluating the impact of the Inflation Reduction Act and other federal programs on our projects. While I may not have all the details, it has allowed us to assess the potential financial benefits, such as the tax credit. The exact dollar amount per megawatt hour is something we have been analyzing, and it appears that with the Inflation Reduction Act and associated credits, the cost could increase from around \$45 to potentially \$80 or \$90 per megawatt hour. I recommend reaching out to me offline, and I can connect you with the relevant person at Holtec for a more detailed answer.

Rep Keith Ammon: Holtec has expertise in handling nuclear waste, as seen with the recent project in New Mexico for temporary storage. Could you share some insights on this aspect?

Gareth Thomas, Holtec: Our owner has been passionate about consolidating spent nuclear fuel at a central facility instead of storing it at multiple sites across the country. This approach allows for the decommissioning of sites and frees them up for redevelopment or other purposes. Licensing a central facility provides our existing clients, like those in California looking to exit nuclear, with the option to move their fuel to our facility in New Mexico. For the sites we acquire and decommission, it enables us to transfer the fuel to the central facility and release the site for other uses or SMR development. We have obtained the license, and the next step will be identifying the first customer, which will determine the construction timeline.

8. American Nuclear Society (ANS) Q&A:

Rep Doug Thomas: How does Holtec plan to introduce the nuclear science curriculum to schools across the states?

Craig Piercy, ANS: We have already developed a K-12 curriculum in partnership with the Department of Energy and Discovery Education. This curriculum, called Navigating Nuclear, is available on our website ans.org and covers elementary, middle, and high school levels. It aligns with the Next Generation Science Standards. While each state has its own specific education policies, our goal is to provide teachers with the necessary resources and materials to teach nuclear science effectively. We are working on expanding our resources, including physical materials like Geiger counters and cloud chambers, to support teachers in delivering the curriculum. Additionally, we have programs like nuclear ambassadors and the Pathways to Nuclear program to further engage students and provide them with additional resources for their interests in nuclear science.

Rep Keith Ammon: Does the curriculum implementation depend on individual state education policies?

Craig Piercy, ANS: Yes, the implementation of the curriculum can be influenced by state education policies. Our focus is on providing materials and training for teachers, but to ensure successful adoption, engagement at the state level is important. We need to work together to ensure that standards-aligned lessons can be taught and encouraged in classrooms as much as possible. While we are not currently at that stage as an organization, we are open to exploring opportunities and ideas to assist schools in New Hampshire or any other state.

Rep Keith Ammon: Are there programs available at the university level that address workforce development needs for nuclear plants?

Craig Piercy, ANS: Our curriculum development primarily focuses on the high school level. However, we are working on certification activities for professionals interested in transitioning into the nuclear field. This certification program aims to provide the necessary knowledge in nuclear science, regulatory systems, reactor operations, fuel cycle, radiation, and radioactivity. Our goal is to support professionals from related fields, like electrical engineers, who can bring their expertise to the nuclear industry with a solid understanding of its broader context. While universities play a significant role in nuclear education, including nuclear engineering programs, workforce development for tradespeople necessary for plant construction is also a priority. Programs supported by the Nuclear Energy Institute, Nuclear Regulatory Commission, and Department of Energy at two-year institutions are helping to increase the supply of qualified workers.

Rep Michael Harrington: Considering past challenges with projects like Vogtle, is this our last opportunity for non-government funded nuclear plants?

Craig Piercy, ANS: While it may be too stark to say it's the last chance, there is a recognition that we need to learn from past mistakes. We have to improve business practices and regulatory approaches to ensure projects are completed on time and within budget. Small modular reactors (SMRs), especially those built in a factory environment, offer opportunities for increased efficiency and cost competitiveness. However, industry must set realistic expectations and regulators must act in a timely manner. While it's challenging, the combination of lessons learned, improved practices, and factory production can provide a good opportunity for success.

Rep Michael Harrington: With safety-related components in SMRs, how do you see the qualification of these parts through part 21? Will there be a third party involved or will each designer and manufacturer need to qualify the parts themselves?

Craig Piercy, ANS: While not my area of expertise, I believe it will be a combination of both. There is an opportunity for companies within the industry to specialize in qualifying safety-related parts and providing those services. It may involve a mix of third-party qualifications and internal qualification efforts by designers and manufacturers like Westinghouse and Holtec.

Bart Fromuth: What can we do at a state level to promote nuclear technologies in New Hampshire, such as changes in our renewable portfolio standard?

Craig Piercy, ANS: State policies should be technology neutral and avoid barriers to nuclear development. Changes to the RPS/CES to support clean firm dispatchable energy in a technology-neutral manner would be beneficial. Engaging with interested entities and creating an environment that prioritizes clean firm dispatchable energy will foster competition and encourage nuclear technologies to be ready to compete.

Marc Brown: What contributes to South Korea's success in building economically viable nuclear plants?

Craig Piercy, ANS: South Korea's success cannot be solely attributed to nuclear technology itself. While projects like Vogtle in the US face challenges, it is not a fundamental issue with the technology. South Korea has shown efficient execution of projects, and similar plants in China are built on time and on budget. The US needs to address the execution of large-scale projects to improve outcomes and cost-effectiveness. The focus should be on project execution rather than inherent problems with nuclear technology.

Pradip Chattopadhyay: Can you provide more information about heat pipe reactors and nuclear batteries?

Craig Piercy, ANS: Heat pipe reactors are small, self-contained reactors with no moving parts that can be deployed in remote locations. They generate heat and can provide clean energy without operator intervention for several years. Nuclear batteries are a concept where small reactors are used to power individual homes or facilities for extended periods. These technologies are being developed by companies like Westinghouse and Oklo, although they are not yet commercially available.

Paul Gunter, Beyond Nuclear: What is the American Nuclear Society's position on consensus-based siting for high-level radioactive waste repositories, specifically in relation to the Cardigan Pluton site in New Hampshire?

Craig Piercy, ANS: The Department of Energy is pursuing a consent-based process for interim storage facilities rather than new repositories. The focus is on finding willing host communities for storage rather than selecting new sites. The American Nuclear Society emphasizes the importance of defining safety standards and engaging in discussions about repository options. At present, there is no active discussion within the DOE about selecting a new repository. The emphasis is on innovation and giving technology time to develop.

9. Discussion:

During the discussion, Rep Keith Ammon mentioned a question raised in the Zoom chat by Timothy Smyth about restarting the Seabrook Science Center. Rep Michael Harrington and Rep Keith Ammon reminisced about their past visits to the center. Rep Steven Bogert, a visitor from the Public Works Commission, shared his experience visiting a nuclear reactor in North Carolina and emphasized the importance of educating the public to alleviate fears and prevent legal complications.

Rep Michael Harrington highlighted the difference between vertically integrated utilities like Duke in North Carolina, which can pass on education costs to ratepayers, and merchant plant states like New Hampshire, where such costs come directly from profits. Marc Brown suggested exploring funding options for education, possibly through the Department of Energy.

Dick Barry clarified his question about spending on spent fuel reserves, mentioning a friend who served on nuclear-powered submarines without any issues from radiation. Rep Keith Ammon and Dick Barry discussed the safety of living near a nuclear reactor for extended periods in a submarine underwater.

Rep Michael Harrington brought up the analysis group report on Seabrook that highlighted potential cost savings for Massachusetts ratepayers through long-term contracts with Massachusetts utilities. Don Kreis, the State Consumer Advocate, expressed interest in the commission's work and emphasized the industry is expressing a need for government support to de-risk the advanced nuclear industry financially.

Rep Keith Ammon mentioned the possibility of adding nuclear power to the state's renewable portfolio standard, and Don Kreis expressed his duty to ensure that New Hampshire ratepayers are not burdened by the energy policies of other states. They discussed the importance of addressing ratepayer interests and securing clean, baseload power.

Rep Keith Ammon informed the attendees about the premiere of Oliver Stone's Nuclear Now movie, which explored the history and potential of nuclear power. He mentioned he will notify the group if when finds out the movie available for streaming.

Rep Keith Ammon provided an update on the vacant position in existing NH statutes related to the "peaceful use of atomic energy," stating that he will follow up further with the Executive Council and Governor's office for further information and report any updates.

10. A motion to adjourn was made by Rep Harrington and seconded by Bart Fromuth. The motion passed by voice vote and the meeting was adjourned at 11:10 AM.