

**ALASKA STATE LEGISLATURE
HOUSE SPECIAL COMMITTEE ON ENERGY**

February 10, 2022

10:17 a.m.

MEMBERS PRESENT

Representative Calvin Schrage, Chair
Representative Matt Claman
Representative Zack Fields
Representative George Rauscher
Representative James Kaufman

MEMBERS ABSENT

Representative Chris Tuck
Representative Tiffany Zulkosky

COMMITTEE CALENDAR

HOUSE BILL NO. 299
"An Act relating to microreactors."

- HEARD & HELD

PREVIOUS COMMITTEE ACTION

BILL: HB 299

SHORT TITLE: MICROREACTORS

SPONSOR(S): RULES BY REQUEST OF THE GOVERNOR

02/04/22	(H)	READ THE FIRST TIME - REFERRALS
02/04/22	(H)	ENE, RES
02/08/22	(H)	ENE AT 10:15 AM ADAMS 519
02/08/22	(H)	Heard & Held
02/08/22	(H)	MINUTE(ENE)
02/10/22	(H)	ENE AT 10:15 AM ADAMS 519

WITNESS REGISTER

MARCUS NICHOL, Senior Director, New Reactors
Nuclear Energy Institute
Washington, District of Columbia

POSITION STATEMENT: Provided a PowerPoint presentation, titled "State of Micro-Reactors" and answered questions.

ACTION NARRATIVE

[10:17:26 AM](#)

CHAIR CALVIN SCHRAGE called the House Special Committee on Energy meeting to order at 10:17 a.m. Representatives Rauscher and Schrage were present at the call to order. Representatives Kaufman, Fields, and Claman arrived as the meeting was in progress.

HB 299-MICROREACTORS

[10:17:44 AM](#)

CHAIR SCHRAGE announced that the only order of business would be HOUSE BILL NO. 299, "An Act relating to microreactors."

[10:18:37 AM](#)

MARCUS NICHOL, Senior Director, New Reactors, Nuclear Energy Institute (NEI), provided a PowerPoint presentation, titled "State of Micro-Reactors" [hard copy included in the committee packet]. He shared that NEI is the trade association for the nuclear energy industry, and, in his position, he leads industry efforts to deploy advanced nuclear reactors. He began on slide 2 of the presentation, stating that there are two types of microreactors, stationary and mobile. Primarily the presentation will deal with stationary reactors, which stay in the same location for their operating life. He stated that market opportunities in Alaska for microreactors are remote villages, mining operations, defense installations, and microgrids. He voiced the opinion that microreactors provide a great opportunity to have a clean and resilient energy source.

[10:20:27 AM](#)

MR. NICHOL pointed out that slide 3 provides a list of companies working on microreactor designs. He stated that these companies are engaged with potential customers, and they also work with the U.S. Nuclear Regulatory Commission (NRC) on licensing and design approval. He said that the Ultra Safe Nuclear Corporation (USNC) has recently announced a project in Alaska with Copper Valley Electric Association (CVEA). He continued that microreactors are generally 1 -to -10 megawatts of electric energy in size, but they can be as large as 50 megawatts of electric energy, as the legislation identifies.

[10:21:37 AM](#)

MR. NICHOL outlined the three concerns customers have when considering a microreactor: the timeline, the cost, and the regulatory process. He pointed out [on slide 4] the deployment timeline. The process begins when a customer makes the decision and enters into a contract with a provider. At this time, the licensing process would begin. He suggested some parallel work could be done during manufacturing, such as construction on the site. He stated that there would need to be NRC approval before the start up. He indicated that a conservative estimation for this process is seven years, but it could be as fast five as years. He said that over the past four years there have been time reductions concerning the licensing process and the supply chain, and the graph [on the slide] displays a five-year timeline. He offered that NEI is working to shorten the timeline to three years. He added that microreactors have a shorter deployment timeline than advanced nuclear reactors.

[10:24:28 AM](#)

MR. NICHOL, in response to Representative Kaufman, stated the timeline is built on the assumption that the technology would be mature enough to deploy. The technology would have to be mature when a contract is signed, as this is the point of [NRC] verification. He stated that currently there are several designs at a level of maturity which could be considered for a signed contract.

[10:26:13 AM](#)

MR. NICHOL resumed the presentation on slide 5, which detailed demonstrations in different states. All of the projects listed are commercial versions planned to be online between 2025 and 2027. He said that Oklo Inc. has plans to operate its first microreactor at the Idaho National Laboratory (INL). The company has been working with INL to get access to fuel and the operation site for the 1.5-megawatt reactor. He said that USNC has announced two demonstrations. The first demonstration is a government backed program at the Chalk River Laboratories in Canada. The second demonstration is with the University of Illinois. The university would use the microreactor to produce power and heat, but it would also be used for testing and research, as the university has a nuclear engineering program. The U.S. Department of Defense (DoD) is also working on two demonstrations. The first would be deployed in Alaska by 2027

at Eielson Air Force Base. The second DoD demonstration would be a mobile microreactor at INL.

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MR. NICHOL, in response to Representative Rauscher, stated that the purpose of the stationary microreactor at Eielson Air Force Base would be to demonstrate a form of resilient power that would allow the base to decouple from the grid, if needed. The project would also provide enhanced protection against security threats. He added that the mobile reactor developed by the Strategic Capabilities Office at DoD would demonstrate proof of technology, and it would be part of the U.S. military overseas program development.

[10:30:35 AM](#)

MR. NICHOL, in response to a follow-up question, stated that the stationary reactor for Eielson Air Force Base is scheduled for deployment in 2027. The mobile microreactor demonstration would be deployed at INL in Idaho in 2025.

[10:31:01 AM](#)

MR. NICHOL turned to slide 6 which overviewed the estimated cost of microreactors and cost competitiveness. He pointed out that the graph represents the current cost of generating electricity in various markets. He added that the overhead costs for businesses are not included on the graph. For example, he stated that the cost of using diesel in the remote arctic does not include the capital costs of the diesel generator or the generator's operation and maintenance. He said this comparison of costs includes the fuel and the transportation of the fuel to the location. The Alaska markets shown on the graph are as listed: arctic communities, remote defense installations, island communities and remote mining, the Alaska Railbelt, and the U.S. grid. He pointed out that the graph shows the variability of a microreactor's capital cost, along with the operation and maintenance costs. He explained that the initial cost point of the first reactor would be higher, with costs ranging from 15 - to -40 cents per kilowatt hour; from there, as a [company] deploys more reactors, the costs would go down. He explained this is a well-known phenomenon - every time the number of units produced is doubled, prices go down by a certain percentage. He continued that for a higher cost there is a lower learning rate, while a lower cost would have the best learning rate. He stated that these learning rates are not just supported by large

nuclear plants but also experienced in other manufacturing industries. He stated the graph demonstrates that microreactors could be competitive, even in the more expensive markets; for example, the high cost of transporting fuel would automatically be reduced in the arctic communities. He stated that a lower cost would be achieved at a higher learning rate, adding that a microreactor could be competitive in the Alaska Railbelt. He noted these costs do not reflect government support for first-of-its-kind technology. He said the larger reactors are more expensive, so federal support would be necessary. He stated that microreactors, even without government support, would reduce the cost of power. If the government were to help for first-time costs, this would spur adoption more quickly. He noted there is a private-only possibility of deploying microreactors.

[10:36:23 AM](#)

MR. NICHOL, in response to Representative Rauscher, related that the definition of "learning rate" would be how much the percentage cost decreases every time production is doubled. Responding to a follow-up question, he said the cost decreases for a number of reasons. He explained that with any new task a process becomes more efficient as it is learned. There would be a learning process for the initial setup, but the more times a process is done, the faster it can be done with more efficiency.

[10:38:14 AM](#)

REPRESENTATIVE RAUSCHER questioned whether the cost per kilowatt hour would be indefinite.

MR. NICHOL, in response, said this cost of electricity is the average cost over the lifetime of the plant. This levelized cost combines annual costs and capital costs. The annual cost is the operations and maintenance costs with fuel costs, while the capital cost is amortized over the life of the plant. He added that the day-one costs would include the financing of the capital, so it would be higher, but this would decrease after the capital cost has been paid off.

[10:39:14 AM](#)

REPRESENTATIVE RAUSCHER questioned the cost annually to run a 10-megawatt microreactor, for example. He questioned whether there would be an available formula [to determine costs].

MR. NICHOL, in response, gave the example that the upfront cost for a microreactor could be \$100 million to purchase, plus annual operating and maintenance costs. He said that he could follow up with the exact numbers to the committee after the hearing.

[10:40:34 AM](#)

MR. NICHOL outlined that the next two slides show the cost breakdown. He showed slide 7, which outlined ownership types of reactors. He stated that, because of interest rates and capital costs, investor owners pay a higher cost in financing than publicly owned utilities. He added that the federal government has a loan guarantee program available for nuclear projects, explaining if an investor owner utilizes a loan, the financing interest rate could be reduced to an amount very similar to a publicly owned utility. There are slight differences based on the ownership structure, but costs could be fairly close with a loan guarantee for a utility, publicly owned or not. If a utility does not want to own the microreactor, but pays a third party for the power through a power purchase agreement, it could still have about the same cost of power.

[10:42:34 AM](#)

MR. NICHOL, continuing to slide 8, explained the second factor for cost is whether the microreactor is used constantly, or cycled on and off. A microreactor has a high capital cost but low costs for operation, maintenance, and fuel. The more a reactor is used, the more the capital cost can be spread out, bringing down the levelized cost of electricity. He explained that using the reactor at 100 percent power would be the lowest cost. If used half the time, the cost [of the system] would almost double. He said that at 75 percent capacity, with the opportunity to cycle up and down to meet load demand, there would be a modest impact on the expense of electricity. He offered that the industry is investigating hybrid energy systems that would operate the microreactor at 100 percent power all the time using a cycle-based load to produce heat and electricity, switching between the two. He stated that a heat storage system could be added and charged when the amount of demand is less than the amount of production. When demand is higher than production, energy can be retrieved from the storage system. Aligning with the production of decarbonized [energy], he said there is the idea that hydrogen and other synthetic fuels could be produced [using microreactors].

10:45:08 AM

REPRESENTATIVE FIELDS shared his understanding that USNC's proposal for CVEA would provide about half the electricity at 20 cents per kilowatt hour. He stated that this is because hydropower would be used in the summer and the microreactor would be used in the winter. He expressed the understanding that this cost represents the low end [of the cost analysis in the presentation]. He questioned whether this is possible because the project would use "heat to heat the terminal." He questioned whether USNC has a good price point and whether Mr. Nichol is aware of this project in context of the broader price curve.

MR. NICHOL responded that he has not seen the details of the USNC cost analysis, so he cannot comment on the numbers. Regarding the presentation, he said the cost analysis was put together with estimates from developers. The analysis is conservative because NEI did not want to report low price estimates when the actual price could be much higher. He expressed the understanding that companies with specific design analysis could show less cost. He deferred other questions on this topic to USNC.

10:46:45 AM

MR. NICHOL resumed the presentation on slide 9. To help understand the use of microreactor heat, the slide showed hydrogen being used as a proxy. He cited a study by LucidCatalyst detailing the cost to produce hydrogen from various energy sources. He explained that solar, wind, and other clean electricity sources use electricity to create hydrogen. He added that nuclear can also produce hydrogen through electricity. He stated when hydrogen is produced with heat, or heat assisted electricity, the cost drops dramatically. In the clean-heat category on the graph, he pointed out that the lowest cost for producing hydrogen is nuclear technology-based. He said these would not be microreactors, but the cost would be comparable, adding, if the production of hydrogen is used as a proxy, it can be seen that nuclear offers a very competitive price for heat.

10:48:16 AM

MR. NICHOL continued to slide 10, which addressed the utility for microreactors and the interest in other states. He referenced policy changes made in several states that would help

support advanced reactors. He pointed out that moratoriums have been repealed in Montana and West Virginia, allowing projects to move forward with state agencies regulating environmental impacts and electricity costs. He stated that some states are studying the feasibility of nuclear advanced reactors, while others have put into place support mechanisms, such as tax incentives. He pointed out that NEI is studying the correlation between a state's interest and its policies. States with policies which discourage advanced reactors have little utility interest, while states with policies supporting advanced reactors have more interest. Concluding the presentation, he expressed appreciation for the committee's interest in microreactors and the proposed legislation.

[10:51:04 AM](#)

REPRESENTATIVE KAUFMAN, in relation to different energy security situations, referenced an article which reported that Germany has leaned towards renewable energy, like wind and solar, while France has anchored its power production in atomic energy. He expressed the understanding that Germany has energy insecurity because the base production capacity is not connected to a more durable form. He questioned the use of microreactors versus the use of other types of green energy.

MR. NICHOL responded that NEI sees itself in partnership with renewables and other clean energy sources, such as wind, solar, carbon capturing, and energy storage. He expressed the belief that the amount of new energy sources needed in the future would leave plenty of room for all. He said systems which include a diversified portfolio, including nuclear energy, have the lowest costs and best reliability of all systems. He stated that France, as an exporter of energy, would have more energy security than Germany, as an importer of energy. He argued that there is a direct correlation between having a healthy nuclear industry and forgoing the use of nuclear energy.

REPRESENTATIVE KAUFMAN expressed the belief that optimizing the selection from an array of solutions for a region, in relation to local conditions, would be best. He expressed interest, with respect to hydrogen, in the cogeneration potential of making power on one end and heat on the other. He stated there are solid state storage methods of hydrogen in fuel cells which can be loaded with cartridges. He speculated, if hydrogen is available, that would be an interesting way forward.

[10:54:25 AM](#)

REPRESENTATIVE SCHRAGE thanked Mr. Nichol.

[HB 299 was held over.]

[10:54:46 AM](#)

ADJOURNMENT

There being no further business before the committee, the House Special Committee on Energy meeting was adjourned at [10:55] a.m.