ALASKA STATE LEGISLATURE
HOUSE RESOURCES STANDING COMMITTEE
March 11, 2022
1:02 p.m.

MEMBERS PRESENT

Representative Josiah Patkotak, Chair
Representative Grier Hopkins, Vice Chair
Representative Calvin Schrage
Representative Sara Hannan
Representative George Rauscher
Representative Ronald Gillham
Representative Tom McKay (via teleconference)

MEMBERS ABSENT

Representative Zack Fields
Representative Mike Cronk

COMMITTEE CALENDAR

HOUSE JOINT RESOLUTION NO. 34
Supporting oil and gas leasing and development within the National Petroleum Reserve in Alaska.

- MOVED HJR 34 OUT OF COMMITTEE

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

- HEARD & HELD

PREVIOUS COMMITTEE ACTION

BILL: HJR 34
SHORT TITLE: NAT'L PETROLEUM RESERVE IN ALASKA
SPONSOR(s): REPRESENTATIVE(s) PATKOTAK

02/22/22	(H)	READ THE FIRST TIME - REFERRALS
02/22/22	(H)	RES
03/09/22	(H)	RES AT 1:00 PM BARNES 124
03/09/22	(H)	Heard & Held
03/09/22	(H)	MINUTE(RES)
03/11/22	(H)	RES AT 1:00 PM BARNES 124

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
02/10/22	(H)	Heard & Held
02/10/22	(H)	MINUTE(ENE)
02/15/22	(H)	ENE AT 10:15 AM ADAMS 519
02/15/22	(H)	Heard & Held
02/15/22	(H)	MINUTE(ENE)
03/01/22	(H)	ENE AT 10:15 AM ADAMS 519
03/01/22	(H)	Moved HB 299 Out of Committee
03/01/22	(H)	MINUTE(ENE)
03/02/22	(H)	ENE RPT 4DP 2NR
03/02/22	(H)	DP: KAUFMAN, TUCK, RAUSCHER, SCHRAGE
03/02/22	(H)	NR: ZULKOSKY, CLAMAN
03/11/22	(H)	RES AT 1:00 PM BARNES 124

WITNESS REGISTER

CHRISTINA CARPENTER, Director
Division of Environmental Health
Department of Environmental Conservation
Juneau, Alaska
POSITION STATEMENT: Introduced HB 299 on behalf of the sponsor, House Rules by request of the governor.

GWEN HOLDMANN, Director
Alaska Center for Energy and Power
University of Alaska Fairbanks
Fairbanks, Alaska
POSITION STATEMENT: During the hearing on HB 299, provided a PowerPoint presentation titled, "Small Scale Nuclear Power an option for Alaska?"

ASHLEY FINAN, PhD, Director
National Reactor Innovation Center
Idaho National Laboratory
Victor, Idaho
POSITION STATEMENT: During the hearing on HB 299, answered questions.

CARRIE HARRIS

Anchor Point, Alaska
POSITION STATEMENT: During the hearing on HB 299, expressed her concern about nuclear waste.

MICHAEL ROVITO, Deputy Director
Alaska Power Association
Anchorage, Alaska
POSITION STATEMENT: Testified in support of HB 299.

JEREMIAH HAMRICK
Wasilla, Alaska
POSITION STATEMENT: During the hearing on HB 299, expressed his concern about nuclear waste.

MARGARET TARRANT, Environmental Justice Organizer
Alaska Community Action on Toxics
Anchorage, Alaska
POSITION STATEMENT: Testified in opposition to HB 299.

LISA HOLLEN
Union of Concerned Scientists
Anchorage, Alaska
POSITION STATEMENT: During the hearing on HB 299, expressed her concerns with nuclear power.

ACTION NARRATIVE

1:02:25 PM

CHAIR JOSIAH PATKOTAK called the House Resources Standing Committee meeting to order at 1:02 p.m. Representatives Schrage, Gillham, Rauscher, Hopkins, and McKay (via teleconference), and Patkotak were present at the call to order. Representative Hannan arrived as the meeting was in progress.

HJR 34-NAT'L PETROLEUM RESERVE IN ALASKA

1:03:02 PM

CHAIR PATKOTAK announced that the first order of business would be HOUSE JOINT RESOLUTION NO. 34, Supporting oil and gas leasing and development within the National Petroleum Reserve in Alaska.

1:03:58 PM

REPRESENTATIVE RAUSCHER complimented the resolution's intent and offered his support for its passage.

1:04:26 PM

CHAIR PATKOTAK thanked everyone for their good discussion of the resolution.

1:05:01 PM

REPRESENTATIVE HOPKINS moved to report HJR 34 out of committee with individual recommendations and the accompanying [zero] fiscal note. There being no objection, HJR 34 was reported out of the House Resources Standing Committee.

1:05:25 PM

The committee took a brief at-ease.

HB 299-MICROREACTORS

1:07:36 PM

CHAIR PATKOTAK announced that the final order of business would be HOUSE BILL NO. 299, "An Act relating to microreactors." He noted that the bill is by request of the governor.

1:08:14 PM

CHRISTINA CARPENTER, Director, Division of Environmental Health, Department of Environmental Conservation (DEC), introduced HB 299 on behalf of the sponsor, House Rules by request of the governor. She explained that the bill defines a microreactor according to a federal definition contained in the Infrastructure Investment and Jobs Act. The bill also creates a carve-out from the ongoing study and legislative siting requirements that are currently in statute. The existing study requirement involves six state departments and was designed to analyze the operation of massive legacy reactors. She said [the administration] believes that the Alaska Center for Energy and Power (ACEP), along with the National Laboratories, is the appropriate place for these studies. This issue has been studied by ACEP for over 10 years and ACEP is committed to work with DEC on a microreactor road map for Alaska.

MS. CARPENTER noted that currently there are no microreactors in Alaska and the timeframe for microreactors coming to market is estimated at five to seven years. These [proposed] exemptions will allow microreactors to be situated without the necessity of

legislative approval for lands, reducing the burden on atomic industrial development. The existing legislative siting requirements reflect the statewide nature of a legacy reactor while a microreactor is really a local issue. A legacy reactor has a 50-mile emergency planning zone, whereas a microreactor's emergency planning zone ends at the reactor facility's door. The bill does not renew the requirement that municipalities must approve of the DEC siting permit.

MS. CARPENTER related that HB 299 is supported by the clean energy industry and a diverse group of stakeholders such as Copper Valley Electric Authority, clean energy nonprofits like Clear Path Action, and the Alaska Center for Energy and Power in Fairbanks. This list is expected to grow as Alaskans are engaged in the weeks ahead.

1:10:39 PM

MS. CARPENTER provided a sectional analysis of HB 299. She said Section 1 removes the requirement for microreactors to be situated on legislatively designated land. Section 2 exempts state departments and agencies from the requirement to conduct studies concerning changes in laws and regulation for microreactors only. Section 3 provides the definition of microreactor.

1:11:29 PM

GWEN HOLDMANN, Director, Alaska Center for Energy and Power (ACEP), University of Alaska Fairbanks (UAF), provided a PowerPoint presentation titled "Small Scale Nuclear Power an option for Alaska?" She turned to the second slide, "National Lab Technical Experts," and acknowledged the collaborators who have made themselves available to answer technical questions. She proceeded to the third slide, "Alaska Center for Energy & Power (ACEP)," and explained that ACEP is an applied energy research center that looks at the options for current and future energy solutions for Alaska communities and industries. Microreactors are an example of the technology and a topic that ACEP has been tracking for over 10 years at the request of the legislature.

MS. HOLDMANN moved to the fourth slide, "ACEP Small Nuclear Reports - 2011 & 2021 'Small Modular Nuclear Power: *an option for Alaska?*'" She recounted that ACEP was initially asked to look at this in 2010/2011, for which ACEP produced a report that included information on historically proposed projects. At that

time not many smaller reactors were available that would be suitable for use in Alaska. Today, however, many smaller reactors that would be better suited for the Alaskan environment are moving closer to commercialization.

MS. HOLDMANN displayed the fifth slide, "2021: Updated Report to Legislature 'Small Scale Nuclear Power: an option for Alaska?'" She said ACEP's 2021 report made very specific recommendations for moving forward in this area, one of which was to change state statutes. This bill closely follows the recommendations that ACEP made in its 2021 report, which was prepared at the request of the legislature.

1:14:44 PM

MS. HOLDMANN explained that HB 299 defines a microreactor in statute according to federal definitions consistent with the Infrastructure Investment and Jobs Act, which means a reactor that produces no more than 50 megawatts (MWe) of electric power and meets the standards of an advanced nuclear reactor as defined in federal code. Secondly, HB 299 creates an exemption for microreactors from the requirements of legislative siting approval for each individual project because this is more of a local issue than something that could impact the state. Thirdly, the bill creates an exemption for microreactors from the requirements of continuous [state] department studies for a project once initial permitting is completed.

MS. HOLDMANN discussed what HB 299 does not do. She said the bill does not exempt micro nuclear reactors (MNRs) from any normal permitting and licensing requirements at the state or national level. At the national level the lead federal agency is the Nuclear Regulatory Commission (NRC) which has a very robust licensing process on the technology side and site licensing for any individual reactor. At the state level the lead permitting agency is DEC. An NRC license is always going to be a prerequisite for any project that is completed in Alaska or anywhere in the US, but it's not the only requirement to build a nuclear power plant. A developer would also have to meet any state requirements and complete state environmental reviews before construction or operation. This bill does not in any way impact that process, it only removes the requirement for ongoing continuous studies after the project has been developed beyond those required for normal permitting compliance.

1:16:57 PM

REPRESENTATIVE RAUSCHER asked whether he is correct in understanding that HB 299 would get rid of some bureaucratic red tape that is not needed.

MS. HOLDMANN replied that that is correct.

REPRESENTATIVE RAUSCHER posed a scenario of purchasing a microreactor and putting it in Sutton. He asked how many permits would be left for him to "climb over" to make that happen.

MS. HOLDMANN responded that from the national perspective the NRC has a robust and extensive permitting process. She offered to provide a list of those national level permits to the committee if members would like. She said her understanding at the state level is that DEC is going to need to develop a process as part of a road map, which APEC hopes to work with DEC in developing, for exactly what all those permitting requirements will look like. She deferred to Ms. Carpenter to answer further.

MS. CARPENTER confirmed that in the future DEC will need to develop regulations specific to siting requirements. Since there are no microreactors in the state, she explained, DEC has not done that. In those regulations DEC would put requirements about minimum setbacks from water or other properties. If air or water permits were also required, DEC would have those requirements as well.

1:19:26 PM

CHAIR PATKOTAK inquired about the relevance of Project Chariot to today's discussion.

MS. CARPENTER answered that there is very little relevance. She said Project Chariot creates concerns about the safety of nuclear energy as an energy resource, especially in remote locations. However, she continued, the modern nuclear energy system or microreactor that is currently being discussed for future deployment is quite different from the legacy that is had in the state around nuclear testing and development.

CHAIR PATKOTAK stated that Project Chariot was a weapons-based test versus today's power generation through microreactors.

1:20:46 PM

MS. HOLDMANN resumed her presentation. She reviewed the sixth slide, "A few facts about nuclear energy...", which read as follows [original punctuation provided]:

- Nuclear energy supplies 20 [percent] of the U.S. electric power needs, more than all renewable resources combined (including hydro)
- The U.S. produces more nuclear energy than any other country in the world
- In the 60-year history of the nuclear power industry in 36 countries, there have only been 3 significant accidents at nuclear power plants.
- With the exception of Chernobyl, no nuclear workers or members of the public have ever died as a result of radiation exposure due to a commercial nuclear reactor accident (including Fukushima Daiichi)

MS. HOLDMANN added that ACEP strives to provide accurate information to Alaskans about different technologies. Because nuclear energy can be used as a weapon there is an additional concern about what the potential implications could be. However, nuclear energy has an excellent safety record, and this is just for conventional nuclear reactors not advanced or micro nuclear reactors.

MS. HOLDMANN continued to the seventh slide, "What are Microreactors?", which read as follows [original punctuation provided with some formatting changes]:

Microreactors are an emerging class of small advanced reactors with the following general attributes:

- Output of 1 to 10's of MWe
- Capable of load following and non-electric applications (e.g., process heat)
- Factory fabricated and transportable nearly fully assembled. Requires a small operational footprint.
- Employs passively safe operating and fuel designs
- Semi-autonomous control system/minimum on-site staff
- Long intervals without refueling (e.g., 10 years)

MS. HOLDMANN noted that the 50 MWe threshold in HB 299 is consistent with definitions at the federal level. The reason for that, she explained, is that it is an arbitrary threshold of which all the advanced reactors that are being developed in the micro category fall well below. Unlike legacy reactors,

microreactors are more like a thermal battery, a nuclear battery that would be deployed as a system that provides heat, and that heat is then used to drive conventional power generation systems, one example being steam turbines.

1:25:21 PM

REPRESENTATIVE SCHRAGE asked whether the 50 MWe limitation would prohibit microreactors from being placed in series with each other and combined to create a larger plant made up of several microreactors.

MS. HOLDMANN replied that that strategy is being considered very significantly for microreactors. These microreactor designs compliment a modular reactor, which is designed to replace many of the legacy nuclear plants in the US. They are deployed in parallel to one another within a single powerplant within a single footprint. The idea is that there is less nuclear material in any one place in a single reactor. For a site that requires more than, say, 5 or 10 MWe of electric power, microreactors could be installed in parallel and meet the overall load that is trying to be accomplished for that site.

1:26:46 PM

REPRESENTATIVE RAUSCHER asked how much distance is needed between the microreactor units.

MS. HOLDMANN responded that there is no precise answer. She explained that many of these reactors are designed to be in a large, containerized solution where they are installed close to one another. Some of the manufacturers envision having two bays next to each other so when the fuel in one of the reactors is expended it can be pulled out. Because the expended fuel needs to be cooled for 60 days, the second reactor can be brought on and there would be no interruption.

1:28:23 PM

MS. HOLDMANN displayed the eighth slide, "Small Nuclear Reactors (under development in U.S., <300 MWe)." She said the graphic shows the different reactor technologies that are currently under development for the US market. These are systems that are planning to, or are currently, working through the NRC licensing process. The cluster at the bottom left of the slide represents the microreactors that are under development for the US market. Modular reactors are shown on the top half of the graphic; they

are larger than 50 MWe which, in general, is a little bit too big for the loads in Alaska.

MS. HOLDMANN proceeded to slide 9, "Example MNRs under development." She related that Ultra Safe Nuclear Corporation is currently working on a feasibility study with the Copper Valley Electric Association. The design is around a 10 MWe electric threshold with the reactor installed below ground and the remaining equipment above ground. Westinghouse has expressed interest in the Alaska market with its eVinci reactor. This smaller, more compact design has a two-bay deployment strategy and would be deployed above ground in an oversized conex-type container along with three additional conex containers with the ancillary equipment required for power generation.

MS. HOLDMANN discussed the tenth slide, "What Does Passive Safety Mean?" The slide read as follows [original punctuation provided]:

> Fuel/fuel configuration
> New fuel configurations such as TRISO [tri-structural isotropic] particles **cannot melt in a reactor** and can withstand extreme temperatures and stresses that are well beyond the threshold of current nuclear fuels.
>
> Passive Cooling
> **Advanced reactors do not require active systems to cool the fuel in an emergency.** Instead they rely on passive safety features which require no active controls or operational intervention to avoid accidents in the event of malfunction, and instead rely on gravity, natural convection, or resistance to high temperatures (or a combination thereof)

1:33:41 PM

MS. HOLDMANN continued to the eleventh slide, "***Question:*** *What does TAPS [Trans Alaska Pipeline System] have in common with micro reactor technologies?*" She explained that the TAPS pipeline uses a heat pipe to remove or extract heat from the ground to keep the ground frozen, with ammonia used as the working fluid. It is a passive process that doesn't require any pumps or electric power to operate. It is a perfect example of the type of strategy that is being used by some of these

microreactor technologies to remove heat from the reactor core and then use that heat for various purposes.

MS. HOLDMANN moved to the twelfth and thirteenth slides, "***Question:*** *What do micro reactor technologies have in common with the automobile industry?*" She said the answer is that both are built to factory specifications and tolerances. The thirteenth slide depicts a NuScale Power Reactor where the reactors are installed in series, in parallel, with one another in a compact footprint. This is more of a modular reactor than a microreactor, she added, and a modular reactor would replace the legacy reactors that are in the rest of the US.

MS. HOLDMANN addressed the fourteenth and fifteenth slides, "***Question:*** *What do micro reactor technologies have in common [with] diesel generators?*" She explained that microreactors, unlike legacy reactors, can load to follow. Microreactors can complement renewables by following the output of a variable renewable energy system like wind or solar and firming up the output, or by following the load where there is daily or hourly variation in the load. Microreactors are better suited to be able to meet that changing demand than a legacy reactor. This is needed in Alaska because Alaska has such a small market and has challenges with integrating variable renewables and variable loads on grids.

1:36:57 PM

MS. HOLDMANN spoke to the sixteenth and seventeenth slides, "State Statutes Relates to Nuclear Energy," which read as follows [original punctuation provided]:

- Sec. 18.45.020 Requires an applicant to follow the NRC regulations;
- Sec. 18.45.025 Requires DEC to provide permission to a nuclear developer, the state assembly to designate by law any land that would be used, and DEC to promulgate regulations for this section. If a municipality has jurisdiction over the proposed site, its approval is also required.
- Sec. 18.45.027 Pertains to nuclear waste. If the fuel has been used for a period of time, this statute might restrict the reactor containing partially used fuel from being moved in state for further use.
- Sec. 18.45.030 is an authorization of exhaustive/ continuing studies of nuclear development related

risks by DH&SS, DOL, DOT, DCCED, DF&G, DNR and other State agencies.

- Sec. 18.45.040 relates to judicial enforcement of the law via governor required processes.
- Sec. 18.45.070 allows coordination with the federal government.
- Sec. 18.45.090 is an exemption related to mining uranium
- Sec. 18.45.900 is filled with definitions.

MS. HOLDMANN, speaking to the sixteenth slide, stated that ACEP has looked at all the Alaska statutes related to nuclear energy, some of which ACEP did not recommend changing. One of those statutes, for example, is AS 18.45.027 which currently provides that any radioactive material in the state can only be moved for the purpose of moving it outside of the state. She specified that no changes were recommended to this statute because ACEP doesn't foresee any possibility that that might become an issue in the near future.

MS. HOLDMANN, speaking to the seventeenth slide, said ACEP recommended making changes to three statutes [Sec. 18.45.025, Sec. 18.45.030, Sec. 18.45.900] and these are the statutes that are addressed in HB 299.

MS. HOLDMANN addressed the eighteenth slide, "Question: Do microreactors have a role in Alaska's future energy mix?" She said ACEP has continued to do studies and research on this, including looking at the economics. She added that ACEP has also worked closely with the University of Alaska Anchorage Center for Economic Development, which prepared a Use Case Analysis. She displayed the nineteenth slide and said the four photographs, labeled "Rural Hub Community," "Railbelt Application," "Military base (e.g., Eielson AFB)," and "Mining Operations (E.g., Red Dog Mine)," represent the four use cases that were looked at by the Center for Economic Development.

1:40:33 PM

MS. HOLDMANN moved to the twentieth slide and stated that the map depicts the Alaska communities that might be big enough to host a microreactor [Kotzebue (4 MW), Nome (9 MW), Galena (1 MW), Fairbanks (223 MW), Tok (2 MW), Bethel (7 MW), Dillingham (3 MW), Naknek (8 MW), Anchorage (662 MW)]. Galena was included, she explained, because about a decade ago it was considered as a host for a microreactor. Today, however, Galena would be too small to be considered a viable site.

MS. HOLDMANN discussed the twenty-first slide, "National Reactor Innovation Center (Idaho National Laboratory)." She shared that ACEP has been working with the National Reactor Innovation Center (NRIC) on developing a road map for the state of Alaska, along with DEC, Alaska Energy Authority (AEA), and others. She said a look is being taken at the questions that need to be answered and a pathway for deploying nuclear energy technologies in Alaska. At this point in time, no advanced microreactors have been deployed in situ, but several projects are expected to happen in the next five years, many of those taking place at the Idaho National Laboratory.

1:42:26 PM

MS. HOLDMANN reviewed the twenty-second and twenty-third slides, "Eielson AF Microreactor Pilot," which read as follows [original punctuation provided]:

- 2019 National Defense Authorization Act (NDAA) required the DoD [Department of Defense] to seek to develop a pilot program for the development of at least one micro-reactor by December 2027.
- Managed through the Office of the Deputy Assistant Secretary of the Air Force for Environment Safety and Infrastructure (SAF/IEE, Mark Correll)
- 1-5MWe
- Will not be grid connected onsite heat and power only
- Will be licensed by the NRC; subject to state regs
- Privately owned/operated through PPA [power purchase agreement] with USAF [US Air Force]

Proposed Timeline

- February/March 2022 RFP [request for proposals] released
- Vender selected late 2022
- 2022-23 Permitting and licensing
- 2025 begin construction
- 2027 Commercial operation

MS. HOLDMANN turned to the twenty-fourth slide, "Alaska Roadmap," and said the schematic depicts the way of thinking for deployment of nuclear energy. The first question is whether the technology exists. If the technology exists, the next question

is whether it is safe. If it is safe, the next question is whether it is a responsible technology to deploy in the Alaska environment. The last question is whether it is cost effective. She said ACEP believes that these four questions need to be answered in order to understand the possible landscape for deploying microreactors in Alaska.

1:44:42 PM

MS. HOLDMANN concluded her presentation with the twenty-fifth slide, "Why I am interested in small reactors:" which read as follows [original punctuation provided]:

- Provide baseload energy – heat and power
- Can load follow
- Carbon free
- Safer?
- Competitive Pricing?
- Better long-term certainty of energy costs?
- Reduced risk of environmental contamination?
- Possible complement to existing AK resource mix

MS. HOLDMANN added that her background is in mechanical engineering and physics. She said she doesn't have a specific background related to nuclear energy, but she has been involved with a lot of developments in the state of Alaska and has a real background in thermal energy systems. She has become personally interested in the potential that microreactors have for Alaska because she thinks they can provide baseload energy in the form of heat and power. She pointed out that while she thinks microreactors are safer it must be ensured that Alaskans understand what that means, which is something ACEP is hoping to do. When considering competitive pricing, she said ACEP is interested in understanding what the value of the thermal energy is, not just the electric power. Ms. Holdmann noted that better long-term certainty of energy costs mostly applies to rural areas that must import diesel fuel over long shipping routes and over which there is little control over market price. Regarding reduced risk of environmental contamination, she stated that while new technology can sometimes be scary, the environmental footprint of current technology must also be considered, such as the transportation of diesel fuel across Alaska and the contamination often related to that. She closed by stating that microreactors could complement the existing resource mix in Alaska, thereby allowing for more resilient and reliable energy systems in the state.

1:48:19 PM

REPRESENTATIVE HOPKINS inquired about how microreactors could work within mining opportunities as well as development on the North Slope to support a power supply with lower carbon and less environmental contamination.

MS. HOLDMANN replied that ACEP has talked with the oil and gas and the mining industries. Both industries are interested in how to reduce their carbon footprint and see microreactors as having a potential role there. Because microreactors have process heat potential they might be able to offer additional opportunities for refining and processing materials onsite so that a higher value product could be exported from Alaska. Mines come in all sizes, but many of them would need dozens of megawatts. A potential environmental impact related to mining is the importing of fuel and the potential impacts of fuel oil spills. Microreactors would be a good alternative because the chances of environmental contamination for the power generation side of a mining operation would be significantly lower than standard diesel generation technologies.

1:50:56 PM

REPRESENTATIVE SCHRAGE inquired about utilizing the heat coming from microreactors to create other energy sources. He offered his understanding that during times of less electrical demand, things could be scaled over to heat for use in hydrogen cracking or storage opportunities so as to not waste that energy.

MS. HOLDMANN confirmed that new opportunities are opened because microreactor systems provide high temperature process heat. This process heat could be used for industrial processes that currently use carbon intensive energies, including producing hydrogen or ammonia. The flexibility of these systems does allow switching from one application to another, and ACEP wants to work with its National Lab partners in understanding the economics of these different use cases, which many of the vendors say is technically feasible. In the context of Alaska use cases, ACEP would like to better understand the economics of toggling back and forth between different use cases and ramping up and down output of a reactor.

1:53:50 PM

REPRESENTATIVE HANNAN drew attention to the twenty-fourth slide, "Alaska Roadmap." She asked whether the vendors mentioned in previous slides have been licensed.

MS. HOLDMANN answered that to date no reactor vendors have gone completely through the NRC licensing process, and none have yet been deployed in the US. Several vendors are well along their way in planning deployments in the next few years and that would include going through the NRC licensing process.

REPRESENTATIVE HANNAN surmised the Alaska State Legislature is looking at this because of Eielson having a pilot project. She asked whether Eielson is the first project anywhere for the Department of Defense and whether the DoD would then be looking at the first vendor to get NRC approval.

MS. HOLDMANN replied that HB 299 has nothing to do with the Eielson project. "The Eielson project … has something to do with it," she continued, "but it wasn't … spurred by the fact that this Eielson project has been proposed. This is something that we think is important because … if Alaska wants to consider microreactors … this cleanup of state statute enables communities or industry to make decisions around considering nuclear reactors as part of their future energy mix." Changes to statutes were suggested by ACEP before the Eielson project was announced and before ACEP knew that that was potentially going to happen. Another project being done by DoD is through the US Army for a very small transportable reactor for advanced Army deployments. She offered her understanding that the Eielson project will be the first commercial project, the first power purchase agreement, engaged in by DoD for a microreactor. In that process, a funding opportunity announcement will be put out on the streets and bids for the project would include a plan for licensing. Most likely it will be a combined license that covers both the technology and site license requirements under NRC. That will happen in parallel to the process of final design, environmental impact assessments, and other permitting work that needs to be done before ground would be broken.

1:55:17 PM

REPRESENTATIVE HANNAN asked whether a bad actor could turn a microreactor's waste or operations into a dirty bomb.

MS. HOLDMANN responded that advanced fuel designs, like the TRISO fuel, make it hard to break apart or to recycle that fuel. It would be very difficult for someone to repurpose that fuel

for any purpose other than powering the reactor. She said she will get better answers and provide them to the committee.

2:00:04 PM

ASHLEY FINAN, PhD, Director, National Reactor Innovation Center, Idaho National Laboratory, replied that Ms. Holdmann answered the question accurately. It would be very difficult, she concurred, and the fuel would not be the most attractive target because there are many easier ways to [to make a dirty bomb]. She suggested there be follow-up to the committee with a more thorough response from the lab's experts.

CHAIR PATKOTAK said the committee looks forward to getting that information.

REPRESENTATIVE HANNAN concurred with having the experts weigh in. She remarked that Alaska could become attractive because it is a remote, isolated, unguarded, and unsecured location.

2:02:06 PM

CHAIR PATKOTAK, regarding the long-term certainty of energy costs for rural villages, related that many communities make a one-time purchase of diesel fuel that lasts for about 14 months. Much of the capital cost involved with that, he continued, is having storage tanks to fit sufficiently because the fuel is used for power generation as well as heating homes. He suggested that maybe instead of having four diesel tanks to provide for heat and power generation, villages could have a micro-nuclear reactor and then need only two diesel tanks. This would be another layer to helping with energy costs and capital costs for Alaska's smaller villages.

2:03:15 PM

REPRESENTATIVE HOPKINS asked whether district heat has been considered.

MS. HOLDMANN confirmed that district heat is being looked at. She said there could be a multi-stage approach of using the high temperature heat for industrial processes or for power generation, and then the heat that is expended there could be used for district heating purposes.

2:04:01 PM

REPRESENTATIVE GILLHAM inquired about the fuel particles being the size of a poppy seed.

MS. HOLDMANN answered that the individual fuel particles that are encased in the high temperature resistant ceramic materials are the size of a poppy seed, not all of the fuel for a reactor.

REPRESENTATIVE GILLHAM asked whether a neighborhood could buy a mobile reactor and a conex and then set up its own power.

MS. HOLDMANN replied that she can envision something in the future where microreactors could replace small rural power generation systems, but not in the near horizon because much additional work needs to be done and systems further downsized for that to happen. She deferred to Dr. Finan to provide further comment.

DR. FINAN responded that that could be possible in the future. Research and testing are ongoing to develop the technologies that would be needed to make that possible. Right now, nuclear reactors have human operators on site, so if a community wanted to purchase a reactor it would also need operators to run it. Some companies are developing both business models and technologies that will allow them to sell more directly to users who are not nuclear operators, instead users would purchase nuclear energy as a service. She concurred with Ms. Holdmann that much work needs to be done and said that that is probably not how the initial deployment will be done.

DR. FINAN addressed the earlier question about the diversion of materials. She clarified that these would not be unguarded or unsecured, and that currently there is lots of guarding and lots of security on nuclear power plants. Work is being done on advanced nuclear technology to incorporate more passive safety and to incorporate more passive security features that work better in remote locations, she continued, but they will also have active security features.

2:07:54 PM

REPRESENTATIVE GILLHAM, in relation to competitive pricing, asked what the cost would be for a unit that could power a city the size of Bethel.

MS. HOLDMANN answered that ACEP has been helping the vendors understand better the economics of deploying these systems in various Alaska contexts. The cost of power in rural Alaska is

very high, but not all that cost is fuel cost, some is operational cost and the aspects of running a utility in a rural setting. In a recent presentation a vendor talked about a price tag of around $50 million. While that sounds high, it must be remembered that that could also address the thermal energy needs of a community.

DR. FINAN added that right now there aren't specific numbers for specific technologies because the technologies will need to be demonstrated before there can be confidence in their cost. Some of the larger microreactors, like 50 MWe, are targeting to compete with natural gas generators and coal generators. Whether they will hit it remains uncertain until it is done, but the companies are working towards that price point. For much smaller microreactors, typically the companies are targeting being competitive with diesel and other generators. Whether that can be hit remains unknown until it is done, but that is their target and that is what their investment and their investors are placing their bets on.

2:11:32 PM

CHAIR PATKOTAK opened public testimony on HB 299.

2:12:09 PM

CARRIE HARRIS, agreed there is diesel contamination but pointed out that diesel contamination does not have a 708-million-year half-life like the fuel for nuclear reactors. She maintained that these reactors use waste fuel from the Lower 48. She asked how much waste fuel will be stored to fuel these reactors and whether there will be a limit. She further asked whether storage facilities for the waste fuel will be regulated or whether Alaska will be a nuclear waste dump for the Lower 48, which was tried before. She asked who will collect the fees for storing the Lower 48's nuclear waste. She surmised Alaska would be the first state to have this brand-new technology. She asked whether it is a red flag that it is being developed in Idaho, but Idaho wants to test it on Alaska.

MS. HARRIS disagreed that Project Chariot was a weapons testing system. Rather, it was about blowing [an artificial] harbor at [Cape] Thompson in 1958, she continued, and the project was stopped. Regulations on these [microreactors] are needed because radiation has massive spread through wind, water, and the water table. She asked why Idaho isn't saying it wants the

first project if this nuclear technology is perfect. She requested that answers be given to her questions.

2:15:42 PM

MICHAEL ROVITO, Deputy Director, Alaska Power Association (APA), testified in support of HB 299. He paraphrased from the following written statement [original punctuation provided]:

> Alaska Power Association (APA) supports House Bill 299, and we urge its passage this year so electric utilities considering Micro Modular Reactors (MMRs) can move forward with their projects confidently knowing a portion of the permitting process has been streamlined.
>
> APA is the statewide trade association for electric utilities in Alaska. Our members provide power for more than a half-million Alaskans from Utqiagvik to Unalaska, through the Interior and Southcentral, and down the Inside Passage.
>
> Our electric utility members are constantly innovating and integrating new technologies that support their mission of providing safe, reliable, and affordable power. MMRs are a viable source of power that have the potential to lower the cost of energy for Alaskans, decrease dependency on diesel, better position our state for economic development opportunities, and raise Alaska's profile as a hub of energy innovation and energy independence.
>
> It is important to point out that electric utilities seeking to permit MMRs will still have to satisfy state and federal permitting requirements before the projects can be constructed. HB 299 helps to streamline the process by exempting MMRs under 50MWe from legislative siting authority and from numerous required ongoing studies that could hamper development.
>
> Alaska's electric utilities provide power amid harsh conditions, vast distances, and a lack of interconnection to Lower 48 regional grids. By passing HB 299, the legislature will help our state's electric utilities more easily access a viable option for

providing reliable and affordable power and light in the Last Frontier.

2:17:48 PM

JEREMIAH HAMRICK, expressed his concern about the massive problems with nuclear waste. He said having nuclear waste every 10 years is going to be an issue for the state. While it is a smaller size, it is still nuclear power and the safety of that, and he doesn't foresee overcoming the nuclear waste problem. The people who are pushing nuclear energy are going to downplay the safety hazards and the nuclear waste, he charged; for example, there has been no discussion today about the nuclear waste and having to take care of that. Nuclear power is great until it isn't, of which Fukushima is an example. Nuclear waste can be disastrous even on a small scale. As well, Alaska has many earthquakes. The people pushing for this like to say it is carbon neutral, he continued, but they do not mention the nuclear waste that must be dealt with. He urged caution on this new technology and said he doesn't think the technology is for Alaska at this time.

2:21:00 PM

MARGARET TARRANT, Environmental Justice Organizer, Alaska Community Action on Toxics (ACAT), testified in opposition to HB 299. She paraphrased from the following written statement [original punctuation provided]:

> Alaska Community Action on Toxics (ACAT) is a statewide non-profit environmental health and justice research and advocacy organization based in Anchorage. We oppose HB 299 because it allows that so-called micronuclear reactors are not subject to certain nuclear reactor siting and permitting regulations in Alaska and may be constructed "on land that has not been designated by the legislature."
>
> There are serious health and safety concerns with micronuclear reactors, and they are a false solution for our energy needs and the climate crisis. Nuclear power is destructive throughout its life cycle from the mining of uranium which is done predominately on Indigenous lands through the enrichment process to the untenable problems of disposal of radioactive waste.

On Jan. 6, 2022 the Nuclear Regulatory Commission determined that Oklo failed to provide sufficient information on topics such as potential accidents and certain safety systems. Microreactor vendors are pushing to reduce (or even eliminate entirely) personnel such as operators and security officers. In a report about the safety of advanced nuclear reactors, the Union of Concerned Scientists (UCS) determined that leaving the microreactors without human guards is not safe. Even a very small reactor contains enough radioactive material to cause a big problem if it is sabotaged, and none of these reactors have demonstrated they are so safe that they can function without operators. A single Oklo micro-reactor core would contain about 10 nuclear weapons' worth of nuclear and radioactive material. According to the UCS report: "Nuclear technology has fundamental safety and security disadvantages compared with other low-carbon (renewable) sources. Nuclear reactors and their associated facilities for fuel production and waste handling are vulnerable to catastrophic accidents and sabotage, and they can be misused to produce materials for nuclear weapons."

It is disturbing that the primary proponents of this are representatives from the nuclear power industry who have a vested interest. Opening the door to nuclear power again in Alaska is unwise and dangerous. We are still addressing the radioactive legacy of massive radioactive contamination from the "experimental" SM1A nuclear reactor at Fort Greely that was a colossal failure. As the Union of Concerned Scientists noted in their recent report evaluating modern nuclear technologies, including micronuclear reactors: "Advanced" Isn't Always Better.

2:25:03 PM

LISA HOLLEN, Union of Concerned Scientists, expressed her concerns with nuclear power. She pointed to Fukushima and the lives lost 11 years ago as an example of safety failure in an earthquake zone. Given that in 1964 Alaska had the second largest earthquake in the world, 9.2, she asked how there can be any question of safety. She questioned where the nuclear radiation will be put given there isn't any regulation of the toxic chemicals being dumped in Alaska. For example, what the US Navy couldn't dump in the ocean was dumped on land in Alaska

and now the state is dealing with that. She asked whether Alaska wants to compound its contamination problem with more nuclear radiation. She pointed out the problem of safety caused by humans, an example being the person who shot the oil pipeline causing a major environmental disaster. No safety issue is addressed in the bill, she stated, and it is unviable to have [nuclear power] in Alaska. She urged that the committee talk with Dr. Edwin Lyman, Director of Nuclear Power Safety, Union of Concerned Scientists, who has been dealing with nuclear waste for 40 years.

2:27:33 PM

CHAIR PATKOTAK closed public testimony after ascertaining no one else wished to testify on HB 299.

2:28:12 PM

REPRESENTATIVE RAUSCHER inquired about the size of the radiation fallout area should an explosion occur involving a reactor.

MS. HOLDMANN invited the individuals who testified with questions about the safety or potential applications of nuclear energy or waste to join ACEP's working group. She said this can be done through ACEP's web site and that the working group is about getting good information to the people who have questions. She deferred to Dr. Finan to provide additional information.

2:29:57 PM

DR. FINAN addressed the question about explosions. She said explosions are characteristic of nuclear weapons, but not of nuclear power plants. Advanced nuclear power plants do not have the characteristics that are required to produce a nuclear explosion, she continued, and because it isn't physically realistic, she doesn't expect to see any fallout. She recalled Ms. Holdmann's description of a 10-mile radius evacuation area for large light-water reactors and of a facility site fence line area for advanced reactors. She said that the fence line area would be the expected impact of a major accident.

DR. FINAN, regarding the Fukushima accident, agreed there was enormous loss of life that day. She said 20,000 people were killed by the tsunami from the earthquake, not by a nuclear accident. The nuclear incident, she continued, caused very localized death among the workers, some from drowning, and there

was evacuation, but the destruction was the result of a tsunami, not a nuclear accident.

DR. FINAN discussed the comparison made between nuclear and diesel contamination. She agreed nuclear waste has a half-life, but said diesel lasts forever. She cautioned about getting too wrapped up in how long the half-life is and said most toxic wastes last forever. The key point, she specified, is that nuclear energy in the US is not causing contamination, most of the contamination being heard about comes from a time of weapons production. It needs to be distinguished between what is the legacy of weapons activities and what has been the record of nuclear energy, which has been very positive.

1:34:06 PM

DR. FINAN, regarding the concern expressed about nuclear waste, stated that nuclear energy is unique in managing its waste very, very closely and containing the waste onsite and packaging it in concrete and knowing exactly where it is, how much it is, monitoring it, and securing it. It's true that there isn't yet a final disposal solution in the US, she continued. At present, the Yucca Mountain designated disposal site has been caught up in delays and dispute. She said she has a lot of optimism because the Department of Energy is currently exploring consent-based siting, which is an approach to siting nuclear waste storage and disposal that relies on consensus communities, not the selection of a site by policymakers. She said she doesn't think that the disposal of nuclear waste from the Lower 48 is being proposed by anybody. This is about the potential to use advanced nuclear energy technologies to help Alaskans have clean, secure, and affordable energy, she stated, it is not about moving nuclear waste from the Lower 48 to Alaska. Moving nuclear waste outside of the US is not permitted, she advised, so nuclear waste could not be moved through Canada and therefore she does not think it is on the table.

DR. FINAN addressed the concern expressed about Idaho wanting Alaska to be the first. She said she is before the committee representing Idaho National Laboratory and she lives in Idaho, and she is not pushing personally for anything to happen in Alaska. She said Idaho does want this first and is working to host the first NuScale Power Plant. Idaho is also going to be the site of DoD's Pele Mobile Microreactor, which is scheduled for between 2023 and 2025, so before the Eielson project or any other potential project in Alaska. Several other projects are moving forward in Idaho, including two small reactors that are

in design and planning and one has some National Environmental Policy Act (NEPA) coverage already. Idaho is not looking to push this on Alaska, she added, it is up to Alaska to decide whether it is right for Alaska.

2:38:21 PM

CHAIR PATKOTAK recalled that another question was about the difference between the permitting requirements of a microreactor and a regular sized reactor, and the ambiguity that less stringent exceptions are being made for a microreactor.

DR. FINAN replied that the federal requirements, which include a safety analysis and a security analysis through the NRC, are the same for both microreactors and larger reactors. There is no difference between NRC's requirements for a microreactor and NRC's requirements for any larger reactors, she reiterated. The NRC has the gold standard of regulatory standards in the world for nuclear safety.

DR. FINAN, regarding the concern expressed about earthquakes in Alaska, stated that advanced reactor technologies, especially when they are much smaller, are being developed to be more compatible with seismic isolation. There is awareness about lots of earthquakes in Alaska, she advised. Earthquakes are something that the NRC looks at very carefully for the safety of the technology and that technology will fit on a given site, including the seismic characteristics of a site.

DR. FINAN added that the same safety standards are applied on the regulatory side; there is still the NEPA process. She deferred to Ms. Holdmann or Ms. Carpenter to speak further to the permitting requirements.

2:41:12 PM

CHAIR PATKOTAK requested that Ms. Holdmann or Ms. Carpenter also address the gold standard process that the NEPA process sets out and that [Alaska] cannot do anything below those standards.

MS. CARPENTER confirmed that any sort of microreactor sited in Alaska would be subject to NRC's permitting requirements. She said DEC has authority to permit the siting in addition to NRC's permitting.

CHAIR PATKOTAK requested Ms. Carpenter to elaborate from the state's aspect on the permitting difference between large reactors and microreactors.

MS. CARPENTER responded that when DEC's atomic energy authority was drafted in the 1970s it had large legacy reactors in mind. So, she continued, HB 299 is trying to carve out a few things for microreactors. First, HB 299 would remove legislative siting requirements for microreactors but microreactors would still be subject to local approval as well as DEC permitting and NRC permitting. Second, HB 299 would exempt these microreactors from the six state agency study requirements. The thought is that ACEP along with the National Labs is the place to do that study rather than the six state agencies.

2:43:55 PM

REPRESENTATIVE HANNAN addressed Ms. Carpenter's statement that, as drafted HB 299 allows local governments to have siting authority. She noted that much of Alaska is outside of local government and asked whether siting authority would remain with the legislature for unorganized boroughs. For example, whether a remote mine in an unorganized borough would have the siting authority to decide about placing a microreactor there or whether the legislature would have that authority.

MS. CARPENTER answered that in an unorganized borough that authority would remain with the legislature.

2:44:51 PM

REPRESENTATIVE SCHRAGE commented that HB 299 recognizes that nuclear technology has come a long way over the past seven decades. For example, he continued, there is now less reliance on active cooling management in nuclear power generation, and going to passive management with [microreactors], which dramatically mitigates the risk of meltdown or environmental contamination. It is important for the committee to explore and vet the technology that is encompassed in this bill, he opined, because it is no longer nuclear fuel rods with the risk of meltdown if there is a human error in the cooling management. With current technology that risk is greatly reduced, he added, and he is not sure that the legislature needs to approve every single mine or community that wants to put in a small-scale passive nuclear power plant.

MS. HOLDMANN responded that Representative Schrage did a good job of summarizing the day's presentation.

2:48:10 PM

REPRESENTATIVE RAUSCHER explained he is trying to get at the properties of the radiation within these reactors as it would relate to a reactor unit located in a community getting blown up by a terrorist act. He asked what the fallout area would be for the radiation within this type of reactor, and whether that could even happen.

CHAIR PATKOTAK posed an example of someone shooting a missile at a microreactor and blowing it up. He asked what sort of nuclear fallout or contamination would result.

MS. HOLDMANN replied that she and Dr. Finan will get together on this question and provide a written answer to the committee.

2:50:14 PM

CHAIR PATKOTAK announced that HB 299 was held over.

2:50:54 PM

ADJOURNMENT

There being no further business before the committee, the House Resources Standing Committee meeting was adjourned at 2:51 p.m.