

**ALASKA STATE LEGISLATURE
HOUSE RESOURCES STANDING COMMITTEE**

March 18, 2022

1:15 p.m.

MEMBERS PRESENT

Representative Josiah Patkotak, Chair
Representative Grier Hopkins, Vice Chair
Representative Zack Fields
Representative Calvin Schrage
Representative Sara Hannan
Representative George Rauscher
Representative Mike Cronk
Representative Ronald Gillham
Representative Tom McKay

MEMBERS ABSENT

All members present

COMMITTEE CALENDAR

HOUSE BILL NO. 304

"An Act modifying the boundary of Chugach State Park; directing the sale of land to the Eagle River Lions Club; and providing for an effective date."

- MOVED HB 304 OUT OF COMMITTEE

HOUSE BILL NO. 299

"An Act relating to microreactors."

- HEARD & HELD

PREVIOUS COMMITTEE ACTION

BILL: HB 304

SHORT TITLE: CHUGACH STATE PARK/EAGLE RIVER LIONS CLUB

SPONSOR(S): REPRESENTATIVE(S) MERRICK

02/04/22	(H)	READ THE FIRST TIME - REFERRALS
02/04/22	(H)	RES
03/16/22	(H)	RES AT 1:00 PM BARNES 124
03/16/22	(H)	Heard & Held
03/16/22	(H)	MINUTE(RES)
03/18/22	(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
03/11/22	(H)	Heard & Held
03/11/22	(H)	MINUTE(RES)
03/14/22	(H)	RES AT 1:00 PM BARNES 124
03/14/22	(H)	-- MEETING CANCELED --
03/18/22	(H)	RES AT 1:00 PM BARNES 124

WITNESS REGISTER

JAYME JONES, Staff
Representative Kelly Merrick
Alaska State Legislature
Juneau, Alaska

POSITION STATEMENT: During the hearing on HB 304, answered a question on behalf of Representative Merrick, prime sponsor of the bill.

REPRESENTATIVE KELLY MERRICK
Alaska State Legislature
Juneau, Alaska

POSITION STATEMENT: During the hearing on HB 304, provided final comments as prime sponsor of the bill.

MARCUS NICHOL, Senior Director
New Reactors

Nuclear Energy Institute (NEI)
Washington, D.C.

POSITION STATEMENT: During the hearing on HB 299, provided a PowerPoint titled "Microreactors Rural Use Considerations."

ACTION NARRATIVE

[1:15:54 PM](#)

CHAIR JOSIAH PATKOTAK called the House Resources Standing Committee meeting to order at 1:15 p.m. Representatives McKay, Fields, Cronk, Hopkins, Schrage, Rauscher, Gillham, and Patkotak were present at the call to order. Representatives Hannan arrived as the meeting was in progress.

HB 304-CHUGACH STATE PARK/EAGLE RIVER LIONS CLUB

[1:16:36 PM](#)

CHAIR PATKOTAK announced that the first order of business would be HOUSE BILL NO. 304, "An Act modifying the boundary of Chugach State Park; directing the sale of land to the Eagle River Lions Club; and providing for an effective date."

[1:16:52 PM](#)

REPRESENTATIVE GILLHAM offered his understanding that should the Eagle River Lions Club give up Lions Club Park it would revert to Chugach State Park. He asked where this is stated in the bill.

[1:17:20 PM](#)

JAYME JONES, Staff, Representative Kelly Merrick, Alaska State Legislature, on behalf of Representative Merrick, prime sponsor of HB 304, replied that it is stated in the memorandum of understanding (MOU) between the Eagle River Lions Club and the Department of Natural Resources (DNR).

[1:17:50 PM](#)

REPRESENTATIVE KELLY MERRICK, Alaska State Legislature, prime sponsor of HB 304, thanked the committee for hearing the bill. She said the people of Eagle River as well as all Alaskans will be excited to see this happen.

[1:18:04 PM](#)

REPRESENTATIVE HOPKINS moved to report HB 304 out of committee with individual recommendations and the accompanying [zero] fiscal note. There being no objection, HB 304 was moved out of the House Resources Standing Committee.

[1:18:34 PM](#)

The committee took an at-ease from 1:18 p.m. to 1:21 p.m.

HB 299-MICROREACTORS

[1:21:13 PM](#)

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

[1:21:35 PM](#)

MARCUS NICHOL, Senior Director, New Reactors, Nuclear Energy Institute (NEI), provided a PowerPoint presentation titled "Microreactors Rural Use Considerations." He said NEI is a trade association whose members include utilities that own nuclear power plants and technology companies that develop these microreactors.

MR. NICHOL said he will be discussing microreactors for rural use cases. He pointed out that the microreactor technology is designed upfront to replace diesel generators like those used in rural areas. He displayed slide 2, "Micro Reactor Technology," which read as follows [original punctuation provided with some formatting changes]:

- Very small size
 - Site as small as 0.1 acres, building ~size of a house
 - Reactor is road shippable, minimal site work
- Resilience - withstand, mitigate or quickly recover from
 - Extreme natural events
 - Man-made physical and cyber threats
- Operations
 - Automatic operations, island mode and black-start
 - Flexible - hybrid energy and renewables integration

Other Designs (not all inclusive)

- BWXT
- General Atomics
- HolosGen
- Hydromine
- NuGen
- NuScale
- X-energy

MR. NICHOL explained that the very small size of microreactors is what makes them suitable for replacing diesel generators. They must be the right size power output but take up a very small footprint to be able to fit into areas where diesel generators are located. They must be resilient whether alone or paired with renewables and energy storage systems. In operations they must perform like a diesel generator with automatic operations and flexible to match the demand and integrate with other sources.

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REPRESENTATIVE HANNAN noted that Alaska's remote, generator-dependent locations are not road connected. She asked whether microreactors have been shipped into locations using large aircraft or large water vessels.

MR. NICHOL replied that "road shippable" means the units are of a size and weight that can fit on the back of a semi-trailer or be shipped by barge. The Department of Defense (DoD) is working on demonstrating that microreactors can be shipped by aircraft, such as a C-40, so probably not the type of airfields that are in rural areas. If a diesel generator can be brought into a location, then a microreactor can be brought in because its size and weight are similar.

[1:26:02 PM](#)

MR. NICHOL moved to slide 3, "Market Opportunities." He related that the two types of market opportunities for microreactors are stationary and mobile. Mobile means that they can be used for rapid response and set up very quickly. Mobility is more of an interest to DoD which needs to stand them up within three days and remove them from site within seven days, which is the definition of mobility. Stationary microreactors are what are being considered in Alaska for remote villages, mining, defense installations, and microgrids in urban areas. Stationary means the microreactor is intended to remain there for the entirety of its life. Some microreactors will be refueled every 10 years

and some will be refueled every 20 years. When refueling, the building would be reusable; replacing one reactor vessel and fuel with another is almost like batteries - one is pulled out and another is put in.

MR. NICHOL displayed slide 4, "Topics," and stated he will be discussing four topics: costs and workforce, safety and security, used fuel and decommissioning, and deployment plans and policies.

MR. NICHOL skipped slide 5 and reviewed slide 6, "Cost Comparison," which included a graphic and which read as follows [original punctuation provided]:

Full cost of micro-reactor vs only diesel fuel cost

- Diesel generator costs
 - Primarily fuel costs
 - Fuel from \$2.86/gallon to \$4.89/gallon
- Micro-reactor costs
 - Include used fuel disposal and decommissioning
 - 10 year fuel life
 - 40 year plant life
 - 95% capacity factor

MR. NICHOL drew attention to the graphic depicting a comparison of electricity generation cost in dollars per kilowatt hour between microreactors and diesel generators. He specified that the cost depicted for diesel generators is primarily the fuel cost; a cost range was used of \$2.86/gallon to \$4.89/gallon, which includes the transportation surcharge. Because the focus is on fuel to see if microreactors are competitive, the graphic does not incorporate the capital cost nor the operation and maintenance (O&M) cost. The cost depicted for microreactors includes all the costs: used fuel, decommissioning cost, capital cost, operating cost, fuel cost. The assumptions used for microreactors include that the microreactor would be refueled once every 10 years, a 40-year plant life, and operation at a high-capacity factor. Mr. Nichol noted that if the microreactor needed to be flexible, then it would not produce 95 percent of the time. He further noted that the impact is a minimal increase when going down to 50-60 percent capacity factor.

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REPRESENTATIVE HANNAN inquired about the existence of commercial operators that handle the spent fuel. Given that the locations

in Alaska would be remote, she further asked whether there would be secured storage and transport of the spent fuel to a disposal location, where those are located, and whether the rate charged would be dependent on the market demand or included in the purchase price of a 40-year reactor.

MR. NICHOL responded that microreactors use a different model for addressing used fuel than current reactors. Until a final disposal repository is available, most of the microreactor companies he has talked to are planning to take back the used fuel. They would take it to a "refurbishment facility" because the reactor vessel can be re-used. The used fuel would be removed and stored on site at the refurbishment facility; it would not stay in the microreactor location. Used fuel management costs are very small compared to the other costs of a microreactor and the used fuel management costs would be included in this analysis.

[1:32:18 PM](#)

MR. NICHOL addressed the graph on slide 7, "Micro-Reactor Cost Competitiveness," subtitled, "Cost of generation is lower than cost to consumer." He explained that the graph shows the range of microreactor costs that were assumed for remote Arctic communities, remote defense installations, island communities and remote mining, the Alaska Railbelt, and the U.S. grid. The range includes higher, moderate, and lower costs, with the middle [moderate] cost being the best estimate and the lower cost being the most optimistic. Each of the ranges assumed a different amount of cost reduction as [the number of microreactors continued to be deployed]. The costs of energy generation in each of the five depicted markets do not include the transmission overhead and are primarily the fuel cost. The biggest takeaway is that even the first microreactor at the highest expected cost is cost competitive in some of the remote Arctic communities. At the most optimistic costs microreactors are competitive in almost all the markets, including the Alaska Railbelt. As reduction of costs continues, microreactors become more and more competitive in those markets.

MR. NICHOL noted that nuclear is a high capital cost technology with very low fuel and operating cost. He reviewed slide 8, "Financing Microreactors," which read as follows [original punctuation provided]:

Capital Costs of 5 MWe [megawatt electrical] plant =
\$50M to \$100M*

- Conventional business model
 - Local utility finances capital costs
 - Financing typically by debt at low rates, amortized

- New business models
 - Developer owns and operates plant, uses a Power Purchase Agreement
 - Local utility does not finance capital costs, only pays for power

- Similarities and differences
 - In both: customers only pay as levelized cost of capital
 - New business model: developer bears bulk of financial risk of project

MR. NICHOL said this new business model with microreactors is unique in that some of the developers are offering to bear the bulk of the financial risk of the project. This insulates the utility from risk since it is not financing the capital project.

MR. NICHOL addressed slide 9, "Micro-Reactor Workforce," which read as follows [original punctuation provided with some formatting changes]:

Target <10 employees to power rural areas

Technology enablers

Safety and simplicity in design
 Automatic operations
 Remote operations
 Security by design

NRC [Nuclear Regulatory Commission] considering for microreactors

Minimal worker training and qualifications
 Operators allowed additional duties (e.g., maintenance, administrative)
 No operator needed on site
 No armed security guards needed

- Hub areas: population sizes that can supply workers
 - Direct use of electricity and heat with existing grid and district heating

- Spoke areas: population sizes that cannot supply workers
 - Electric transmission from hub region (if close by); OR
 - Use hydrogen or ammonia from hub region (low-cost due to economics of microreactors and short transport distances)

MR. NICHOL noted that a nuclear power plant of today has many more [than 10 workers] and has workers on site 24 hours a day. He said it is likely that the first microreactors will have workers on site 24 hours a day with four or five shifts of two to three workers. Getting to these smaller workforce numbers is through technology enablers and the NRC, the regulator, will need to sign off on those. The safety and simplicity in design comes from using natural physics in the operations. The operations are automatic - gravity, natural circulation, and things of nature are built into the design to keep it in a safe condition should anything go wrong. This means human actions don't have to be relied upon to maintain safety, although there will always be a person watching it. This also reduces the training and qualification requirements for workers to high school level, unlike the nuclear power plants of today which require some workers to have college degrees. The automatic operations allow for operators to have additional duties because they don't have to be at the controls all the time. If approved by the NRC, remote operations will be possible with someone operating the microreactor from a central facility far away rather than having an operator on site. Someone in a central facility could operate many microreactors spread across the U.S. The security by design means no reliance on dedicated armed responders to protect the plant, or at least not as many. All of this means that locations can be a hub area which has a population size that can supply workers, or a spoke area which does not have a population size that can supply workers. A town with a population size of 1,000 people could easily supply 10 workers for a microreactor.

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REPRESENTATIVE HANNAN asked how microreactors produce hydrogen and ammonia, and what the distribution of this energy looks like to a spoke area.

MR. NICHOL answered that hydrogen is burned in a hydrogen burner as an alternative to diesel fuel and electricity or heat is produced from burning. Hydrogen can be made by electrolysis -

electricity is sent through water which makes the hydrogen and oxygen separate and the hydrogen is then captured. Hydrogen can also be made by heat-assisted electrolysis - the water is boiled and not as much electricity is needed to separate the hydrogen and oxygen. The captured hydrogen is then compressed into very small volumes for transportation in the same manner that any other goods would be transported.

REPRESENTATIVE HANNAN asked whether the microreactor is the source of the hydrogen.

MR. NICHOL replied that it is a secondary process. The microreactor provides the power and then the power is used in a separate process for the hydrogen, so the hydrogen generation piece would have to be built. Hydrogen can be made with a diesel generator, renewables, or natural gas.

[1:45:05 PM](#)

MR. NICHOL skipped slide 10 and discussed slide 11, "Micro-Reactor Safety," which read as follows [original punctuation provided with some formatting changes]:

Building upon a strong safety record

- Operating fleet: one of the safest industrial working environments
 - Strong-Independent Regulator, Built tough, Operational Performance
- Enhancing safety for advanced reactors*
 - Safety profile fundamentally differ from other power reactors

Inherent Safety Features

- Robust hardened structures
- Rely on physics
 - Natural circulation
 - Gravity
- Fail-safe, shuts itself off
- Operational simplicity: very few instruments and controls

Reduce Risks

- Much smaller radionuclide inventory
- Minimize potential for accidents
- Mitigate consequences
- Proliferation resistant fuel and enrichments below 20% U-235

Emergency Response

- No credible event that could result in unacceptable off-site doses
- Maintain safety without the need for
 - Power
 - Additional coolant
 - Human actions
- Emergency planning

MR. NICHOL stated that existing operating nuclear reactors have one of the lowest rates of working environment injuries and deaths. The zero radiological incidents in the U.S. are because the NRC has the highest standards in the world. The safety of microreactors is different than existing reactors because the designs are so different, especially the size. Regarding inherent safety features, Mr. Nichol pointed out the reliance on physics. Regarding reduced risks, he said micronuclear reactors are generally 1-10 megawatts in size whereas current reactors are 1,000 or more megawatts, meaning a microreactor has one one-thousandth of radioactive material than a current reactor. A benefit of this is that much less decayed heat is generated after shutdown; it is called decayed heat because as the material decays it produces radiation and heat. Regarding emergency response, he specified that safety can be maintained for a very long time or indefinitely without the need for power, additional coolant, or human actions, the three things needed but not had in Fukushima.

[1:51:27 PM](#)

MR. NICHOL presented slide 12, "U.S. Nuclear Regulatory Commission," which read as follows [original punctuation provided]:

Regulatory Reviews are Rigorous

- Information Reviewed¹
 - Applications are thousands of pages (NuScale was 12,000 pages)
 - NRC reviews and audits supporting information (NuScale was 2 million pages)
- NRC Resources Expended¹
 - Schedule for typical design review is 3 to 4 years
 - Fees for typical design review are \$45M to \$68M (~ 200,000 person-hours)
- Coordination with Other Agencies

- DHS [Department of Homeland Security] and other agencies involved in defining the design basis threat
 - FEMA [Federal Emergency Management Agency] involved in Emergency Planning²
 - Public Involvement
 - Public can file contentions on the application
 - Hearing opportunities before licenses are granted
- 1) These are historical for grid-scale reactors, microreactors are expected to be less due to enhanced safety and simplicity
- 2) NRC rulemaking is considering whether FEMA would be involved in review when the EPZ [emergency planning zone] does not extend beyond the site boundary

MR. NICHOL explained that the NRC must review and approve all these designs and must approve those designs to be used at a specific site. After that, the NRC continues to provide oversight and inspection. Regarding the review, he said the NRC looks at the design and its capabilities, the site, the site's features such as earthquakes or flooding, and does an environmental review. He qualified that slide 12 relates to a large reactor, so a microreactor is likely to be less than what is depicted on the slide. Mr. Nichol said NEI thinks there are opportunities for efficiency in these robust reviews and is working with the NRC in this regard. It is expected that the review for microreactors will be less than what is outlined on slide 12. Regarding coordination with other agencies, he stated that the design basis threat is the characteristics of the bad guys that might attack a nuclear power plant or try to steal material. He further noted that state agencies will be involved with the proposed projects.

[1:55:32 PM](#)

REPRESENTATIVE HANNAN inquired about the expected design review fees for microreactors, given the fee for current reactors is [\$45-\$68 million].

MR. NICHOL responded that it is unknown right now, but less than half of that seems reasonable. He pointed out that once the NRC approves the design, every time the NRC reviews the same design at a new site it will be a lot less cost, so this "overhead cost" will subsequently be made up for in volume.

REPRESENTATIVE HANNAN inquired about a ballpark figure on what the cost might be to bring a microreactor from design, through

the NRC process and permitting, and to deployment. Excluding remote mines, she speculated that few communities in Alaska would be able to amortize over 50 years a project that is in the \$100 million range.

MR. NICHOL answered that the NRC licensing fees were included in the capital cost projections that he provided earlier in the presentation. He said his best guess is that microreactors could get down to a two-year review and \$10 million. While that might not be the case for the first microreactor, once the NRC approves that design, called design certification, the NRC does not have to review the design over and over, and would then just look at the site characteristics. So, each site license application could be far less, plus the NRC is working on streamlining the processes.

[1:58:52 PM](#)

MR. NICHOL continued to slide 13, "U.S. Nuclear Regulatory Commission," which read as follows [original punctuation provided]:

What NRC Approval Means

- Safety
 - Risks from nuclear plant to public are much lower than other societal risks (less than 0.1%)
 - Dose to public is less than 100 mrem/yr¹ [milli roentgen equivalent man]
 - Security
 - Protected against radiological sabotage
 - Protected against theft and diversion
 - Emergency Planning
 - Worst case dose at Emergency Planning Zone expected to be less than 1 rem
 - Microreactors expected to have EPZ at site boundary
 - Environmental
 - Plant and site meet all NEPA [National Environmental Policy Act] and other Environmental Laws (e.g., Water, Air)
- ¹) Average dose from food and water (e.g., banana, beans, meat, carrots) is 30 mrem per year; from living near a nuclear plant is less than 1 mrem

MR. NICHOL said NRC approval means that the safety, security, emergency planning, and environmental standards have been met or exceeded. He noted that "other societal risks" are things like

cancer, car accidents, falling, or drowning. Regarding the chart on slide 13, he explained that millirem is the measurement unit for radiation dose to the body. Regarding security, including security during transportation of the material, he stated that the NRC looks at things like the [terrorist attacks of September 11, 2001], current terrorism capabilities, and other things. Regarding emergency planning, he specified that the site size and EPZ for a microreactor is about 1/4th an acre.

[2:05:40 PM](#)

MR. NICHOL displayed slide 14, "Used Fuel and Decommissioning." He then reviewed slide 15, "Addressing Waste," which read as follows [original punctuation provided]:

All Energy Sources Have Waste, and All Must Do Three Things to Address it

- Must be able to manage it safely
 - Used fuel is solid, compact and there is proven technology to store it safely
 - Over 1,300 used fuel shipments safely completed in U.S.
- Must be able to pay for it
 - U.S. law requires nuclear plants to fund used fuel management and decommissioning activities
 - Over \$40 billion in Nuclear Waste Fund
- Must have a place to put it
 - Department of Energy required dispose of used fuel
 - Most micro-reactor companies will take back used fuel soon after refueling

MR. NICHOL said the nuclear industry calls waste "used fuel" rather than "nuclear waste" because 95 percent of the potential energy is still in it, so it could be re-used in the future. Used fuel emits radiation and is radioactive material, so the technology to address that includes steel canisters or concrete for storage and safe transportation. Regarding a place to put nuclear waste, he related that Yucca Mountain was designated by law as the location. Yucca Mountain has been studied and found technically suitable for used fuel disposal, which has been confirmed by the NRC. There is discussion about whether Yucca Mountain should still be the location or whether a different location should be chosen using a consent-based process, which

means the community has decided it wants to be a location for used fuel. This discussion about location is why used fuel is still at reactor sites.

[2:09:54 PM](#)

REPRESENTATIVE CRONK asked where the spent fuel is stored.

MR. NICHOL replied that currently all used fuel is stored at the nuclear reactor where it was produced, which includes several places that have been shut down and decommissioned. Work is being done to develop a consolidated interim storage (CIS) facility, a central location to which the used fuel could be sent and stored, but it is not underway yet. There are some communities in New Mexico and Texas that are supporting of having a CIS facility.

REPRESENTATIVE CRONK asked how much fuel is in a spent micro-reactor.

MR. NICHOL responded that the fuel doesn't change in its physical characteristics, it is the same size and shape because it is solid, but there are changes in the atoms inside. So, it would be the same size as the reactor that it came in, which would fit on the back of a truck or other conveyance that was used to get it there. The fuel could be taken out and probably put into a smaller container because the reactor is built with other features in it, but most of the microreactor companies are planning to do that back in a refurbishing center.

[2:12:30 PM](#)

CHAIR PATKOTAK asked whether it is correct that the fuel cell itself is wrapped in a bigger ceramic [vessel] that is about the size of a big kitchen trash can.

MR. NICHOL confirmed that the size of a kitchen trash can is a fair assessment.

[2:13:10 PM](#)

MR. NICHOL discussed slide 16, "Final Disposal," which read as follows [original punctuation provided]:

- Nations making progress on spent nuclear fuel disposal

- Finland - repository licensed and under construction
- Sweden - repository approved for constructing
- France - site identified, in public consultation toward pilot phase
- Canada - List of 22 candidate sites narrowed down to 2, geologic investigations under way
- Switzerland - geologic investigations supporting siting process under way
- U.S. - Yucca Mountain designated by law, alternatives being considered
- Consolidated Interim Storage
 - France, Sweden, and Switzerland all have deployed CIS
 - U.S. companies pursuing CIS solutions

MR. NICHOL noted that nations are moving forward, and many are moving forward with consent-based siting processes, meaning that the communities being considered want to be selected. There are communities that would like to have a disposal facility, he stated, because it will be operated safely and has benefits.

[2:14:43 PM](#)

REPRESENTATIVE CRONK submitted it would be safe to say that most Alaskans would not want the [used] fuel stored in Alaska.

MR. NICHOL replied that having a microreactor in Alaska does not mean there would be a repository in the state or that Alaska would even be considered for a repository. A community would have to stand up and say it wants a repository, as would the state; without that the state would not be considered.

[2:15:36 PM](#)

MR. NICHOL reviewed slide 17, "Optimizing the value of nuclear feedstock," which read as follows [original punctuation provided]:

- Future reactors may economically recycle used nuclear fuel to extract even more energy from uranium already mined
 - Initial new reactor startups will be on new fuel
 - Between 6 and 9 advanced reactor suppliers may be able to power their machines with used fuel
 - Most envisioned recycling strategies would not separate out pure plutonium

MR. NICHOL reiterated that most of what remains in the used fuel still has potential energy value. Fuel is not recycled today largely because it is cheaper to mine new uranium than it is to recycle used fuel. Somewhere in the future it will be cheaper to recycle than it is to get new uranium, although some advanced reactor companies are pursuing recycling now.

MR. NICHOL displayed slide 18 and said he will next discuss Deployment Plans and Policies section of his presentation. He moved to slide 19, "Government Deployment Support," which read as follows [original punctuation provided]:

- Valuing all carbon-free sources of energy
- Federal Programs
 - Demonstrations
 - Tax Credits (e.g., Production)
 - Loan Guarantees
 - Federal Power Purchase Agreements
- State Programs
 - Tax incentives (e.g., property)
 - Advanced cost recovery
 - Infrastructure

MR. NICHOL pointed out the many policies for federal and state government support for getting advanced nuclear reactors into the market. Regarding state programs, he said some are looking at study bills and some are repealing moratoriums like what this committee is considering [in HB 299], which would repeal the requirement for legislative approval.

[2:18:50 PM](#)

REPRESENTATIVE RAUSCHER inquired about the size of a "chunk of uranium" that would be needed for a 20-25-megawatt reactor, a reactor representing a happy medium for today's discussion.

MR. NICHOL responded that he would get back to the committee with an answer, but said it is a small amount.

[2:19:35 PM](#)

MR. NICHOL addressed slide 20, "Advanced Nuclear Deployment Plans," which displayed a map highlighting the states that have passed state policies to support advanced reactors [Washington, Idaho, Montana, Wyoming, Nebraska, Wisconsin, Indiana, Kentucky, West Virginia, Virginia, and North Carolina]. He said 20

advanced nuclear projects in the U.S. and Canada, including microreactors, are being looked at and have been discussed in the public domain [depicted by black dots].

MR. NICHOL proceeded to slide 21, "Micro-Reactor Deployment Projects," which listed the 11 microreactor projects planned by various developers and that were included on the map on slide 20 and have been discussed in public. He said Oklo is looking at deploying a 1.5 megawatt (MW) microreactor at the Idaho National Laboratory with a target on-line date of [2025]. Also, Oklo has an agreement with Compass Mining for providing up to 150 MW in yet to be determined locations and target on-line dates. Ultra Safe Nuclear has projects in Canada [5 MW, target on-line date 2025], in Illinois [5 MW, target on-line target date 2027], and in Alaska with Copper Valley Electric Association (CVEA) [target on-line date yet to be determined]. He noted that Canada is interested in microreactors in rural areas for largely the same reason Alaska is interested - to replace diesel generators in remote locations that are difficult to get to except for a couple times a year. Westinghouse is doing work in the U.S. [5 MW, target on-line date 2027] and Canada [5 MW, target on-line date 2027]. Radiant has plans in Idaho [1.2 MW, target on-line date 2026]. The U.S. Air Force has interest in a microreactor at Eielson Air Force Base (AFB) [1-10 MW, target on-line date 2027]. The Department of Defense is working on a mobile version of microreactor [1.5 MW, target on-line date 2025], and more information is expected soon on DoD's technology selection.

[2:23:05 PM](#)

REPRESENTATIVE HANNAN said she is surprised to see a project in Copper Valley as her understanding was that Eielson AFB was the only active project in Alaska. She asked which of the two is closer to completion, decision-making, or needing approval.

MR. NICHOL replied that the Eielson AFB project is closer to making a decision. The plan is to issue a request for proposal soon, with the goal of selecting a vendor by the end of the year. About a month ago CVEA issued a press release that it had entered a memorandum of understanding (MOU) with Ultra Safe Nuclear to explore the feasibility, so it is not yet a decision to build, only an exploratory phase.

[2:25:27 PM](#)

REPRESENTATIVE MCKAY offered his understanding that in a microreactor the uranium in the cylinder creates enough heat to

make steam, which turns some type of turbine, which in turn turns the electric generator part that provides electricity. He asked how things are set up within the container and what is different than a diesel generator. He asked how the power is created from the cylinder of uranium.

MR. NICHOL drew attention to the farthest right photograph on slide 2 showing the inside of a Radiant Kaleidos container. He explained that the nuclear reactor core produces the fission, the fission produces lots of heat. Several different processes can be used to transport that heat from the source to the generator or other method of spinning to make electricity. One such process is heat pipes that can transfer lots of heat very quickly to the other side, and another process uses helium to transfer the heat. Some technologies may produce steam to drive the turbine, some may use the heat directly, or some might use carbon dioxide.

REPRESENTATIVE MCKAY pointed out that the moving parts in these processes can break and need repair. He observed on slide 21 that the design of the Eielson microreactor has not yet been determined. He asked which of the four brands depicted on slide 2 might be the one going to Eielson.

MR. NICHOL replied that it is unknown which one will go to Eielson as no selection has yet been made. A request for proposal is expected to be issued soon, he said, and if things go well the design may be chosen by year's end.

[2:30:26 PM](#)

REPRESENTATIVE CRONK inquired about the amount of excess heat that would be produced and available to use in addition to producing electricity.

MR. NICHOL responded that it depends on the heat process that is used. In a very high temperature intensive heat process like metal reforming or chemical processing, most of the heat may be needed for that so there couldn't be heat and electricity exactly at the same time. In a low heat requirement process like district heating, electricity could be produced and then the cooler gas that is coming out and returning to the heat source could still be at a high enough temperature to power district heating.

CHAIR PATKOTAK announced that HB 299 was held over.

2:32:36 PM

ADJOURNMENT

There being no further business before the committee, the House Resources Standing Committee meeting was adjourned at 2:32 p.m.