ALASKA STATE LEGISLATURE
HOUSE SPECIAL COMMITTEE ON ENERGY
March 6, 2025
1:32 p.m.

MEMBERS PRESENT

Representative Ky Holland, Co-Chair
Representative Donna Mears, Co-Chair
Representative George Rauscher
Representative Mia Costello

MEMBERS ABSENT

Representative Bryce Edgmon
Representative Chuck Kopp
Representative Cathy Tilton

COMMITTEE CALENDAR

PRESENTATION(S): RAILBELT GRID SCENARIOS FOR 2050

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

STEVE COLT, Research Professor
Alaska Center for Energy and Power
University of Alaska
Anchorage, Alaska
POSITION STATEMENT: Gave the Railbelt Decarbonization Project presentation.

ACTION NARRATIVE

1:32:03 PM

CO-CHAIR KY HOLLAND called the House Special Committee on Energy meeting to order at 1:32 p.m. Representatives Mears, Rauscher, Costello, and Holland were present at the call to order.

PRESENTATION(S): Railbelt Decarbonization Project

1:33:07 PM

CO-CHAIR HOLLAND announced that the only order of business would be the Railbelt Decarbonization Project presentation.

1:34:06 PM

STEVE COLT, Research Professor, Alaska Center for Energy and Power (ACEP), University of Alaska (UA), directed attention to a PowerPoint presentation, titled "Railbelt Grid Scenarios for 2050" [hard copy included in the committee packet]. He started on slide 2, which highlighted the Railbelt 2050 Scenarios Project that considers whether a much larger electricity demand could be met in the Railbelt in 2050 by using alternative generation sources while maintaining reliability and stability, and what this might cost. It also enumerated the partners involved in the project that ran from 2022 to 2023. He added that an update was done in mid-2024. Slide 3 outlined the multi-step analytical approach to the project, which required a large team of specialists and heavy involvement from electrical engineers. Slide 4 defined the project's challenge: meet the hourly 2050 projected electricity demand, which equaled twice the 2021 demand, and more winter-peaking while maintaining reliability.

1:41:08 PM

MR. COLT, in response to a series of committee questions, recalled that the doubling of the load could be associated with more than half the vehicles on the road being electric by 2050; however, it wouldn't take a lot of data centers to account of the Railbelt load. He confirmed that consideration had been given to the type of demand and how that characterizes the load on the grid, but the load dimension could not be fully explored due to lack of time and resources. He noted that the Alaska Center for Energy and Power treated a large portion of the electric vehicle (EV) load as if it were a pumped storage installation where energy could be put when available and taken out when needed. He shared his belief that the fall 2024 National Renewable Energy Laboratory (NREL) 2 study took an intermediate load growth, while NREL 1 assumed a flat load. He agreed that it is equally important to consider some kind of flat load scenario as a reality check. One thing about the Railbelt, he noted, is that there's adequate capacity to meet the current load if the state is willing to continue burning fossil fuels. In addition, the "business as usual" (BAU)

scenario meets the doubled load with a minimal additional investment in thermal generating capacity.

1:50:37 PM

MR. COLT continued to Slide 5, which outlined the following 5 scenarios:

> BAU: Build Dixon Diversion, 30 MW Little Mt. Su Wind, HVDC to Beluga, Upgrade Kenai intertie. Add thermal capacity as needed.
>
> Wind/Solar: Build wind, solar & storage. Upgrade both Kenai and Anchorage-Fairbanks transmission to 230 kV.
>
> Wind/Solar/Hydro: Build Susitna-Watana475-600 MW hydro, plus wind, solar & storage. Transmission upgrades same as W/S.
>
> Wind/Solar/Tidal: Build 400 MW tidal project in Lower Cook Inlet, plus wind, solar & storage. Transmission upgrades same as W/S.
>
> Wind/Solar/Nuclear: Build 2 small modular reactors (308+231 MW), plus wind, solar & storage. Transmission upgrades same as W/S.

MR. COLT highlighted the wind/solar scenario - a new addition based on the committee's prior feedback - that attempted to rely on wind and solar as core resources with additional resources as needed. In response to a follow up question, he said the production cost model assumed that gas was available at $14/mmbtu in 2050.

1:54:27 PM

MR. COLT continued to Slide 6, which assessed resource selection and sizing based on availability and cost. In response to a question from the co-chair, he replied that the load growth is proportional to the three existing load centers. He added that there was no attempt to collocate blocks of loads with potential supplies. Slide 7 showed a bar chart of installed capacity by resource. He reiterated that the modeling shows that the doubled load could be met with minimal additional investment in thermal capacity if the state wants to remain fuel dependent. Further, the wind needed for the wind/solar scenario is not much

more than the amount needed for the other scenarios that include big anchor resources.

2:02:28 PM

MR. COLT, in response to a series of committee questions, explained that the assumption on battery cost is quite conservative, and no new technology was assumed. The cost of existing lithium-ion technology was used, with no storage duration greater than six hours. He said every scenario modeled on slide 7 retains the need for significant thermal capacity, so batteries plus wind plus solar is not enough. He confirmed that if all existing thermal units were run 24/7, it would generate twice as much energy needed to meet the doubled load, which illustrates the capacity utilization of thermal. He added that a cost benefit analysis was not conducted on the upgrades and emphasized that the results depend on the availability of basic upgrades and a vastly increased use of transmission.

2:13:25 PM

MR COLT resumed the presentation on slide 8, which displayed a bar chart of annual generation in 2050 featuring an hour-by-hour analysis. He walked the committee through each scenario. In response to a question from the co-chair, he said reliability and stability are the reason that fossil fuel isn't entirely eliminated in the nuclear option. Slide 9 showed the cost of capacity, which would require billions in capital investment. Modeling showed that the double load could be run of a fossil fuel system in 2050 without the Northern upgrade. All other scenarios include the Northern and Southern upgrade. He further noted that the capital investment required for each scenario is after applying a 30 percent tax credit. Slide 10 addressed the cost of service to ratepayers. The essence of the tradeoff, he said, is whether to stick with fuel, or go with capital investment that get's the state away from fuel.

2:29:30 PM

MR. COLT, in response to committee questions, said the basic assumption on cost of capital is 5 percent interest and debt finance. He continued to slide 11 and discussed the generation and transmission (G&T) cost of service across 25 sensitivity cases, which produced remarkably similar results. He explained that by assuming fuel is 25 percent higher, wind/solar starts to look like the cheapest option, but uncertainty around the cost of wind construction in particular is phenomenal and much

greater than even four months ago. He concluded that the cost of electricity would be similar under all scenarios. He began a summary of transmission and stability on slide 12, noting that the Railbelt grid is very weak and would require a lot of "tender, love, and care" with the addition of renewables. He explained that wind and solar are intermittent and lack the inertia required for a stable grid. Slide 13 analyzed intertie utilization up 5-20-fold and highlighted the increase in both magnitude and direction of the flows. Slide 14 charted the "highest renewable week generation and operations" under various scenarios, highlighting periods with inverter-based resources (IBR) versus synchronous generation (GS). Slide 15 considered what it would take to make the grid work on renewables with less SG and whether IBRs could effectively replace SG. It showed that by sticking with thermal in the BAU scenario, there is a lot of SG, as well as with hydro, nuclear, and tidal due to the massive spinning turbines. There would be a lot less of it in the wind/solar scenario and more IBR. Slide 16 recapitulated the annual wind and solar generation as percentage of load. He pointed out that wind/solar would offer a lot of free energy if used correctly.

2:47:32 PM

MR. COLT, in response to committee questions, acknowledged that geographic diversity was taken into account. He noted that the first approximation was to put wind/solar into batteries. He summarized a transmission analysis on slide 17, and continued to slide 18, which listed the equipment needed for stability and reliability to ensure that inverter-based resources can achieve their intended purpose. Slide 19 considered operational mitigation options. He reported that it was more cost effective to put in new transmission compared to burning more fuel. Slide 20 provided graphics of grid-forming inverters from an engineering perspective and highlighted certain scenarios that produced system collapse. Ultimately, they determined that grid-forming inverters in conjunction with batteries would stabilize the system under difficult conditions, such as loss of the biggest intertie.

2:58:01 PM

MR. COLT, in response to a series of committee questions, said the analysis was pre-artificial intelligence (AI). He said strategic thinking begins with considering optionality and which projects foreclose it versus create it. With regard to uncertainty around demand, he recommended more flexibility to

follow it, adding that creating new loads is within the purview of public policy.

3:06:02 PM

ADJOURNMENT

There being no further business before the committee, the House Special Committee on Energy meeting was adjourned at 3:06 p.m.