ALASKA STATE LEGISLATURE
HOUSE SPECIAL COMMITTEE ON ENERGY
January 30, 2024
10:15 a.m.

MEMBERS PRESENT

Representative George Rauscher, Chair
Representative Tom McKay
Representative Thomas Baker
Representative Stanley Wright
Representative Mike Prax
Representative Calvin Schrage
Representative Jennie Armstrong

MEMBERS ABSENT

All members present

COMMITTEE CALENDAR

PRESENTATION(S): RAILBELT DECARBONIZATION PROJECT RESULTS

- HEARD

PRESENTATION(S): WHAT ALASKA CAN LEARN FROM ICELAND'S ENERGY TRANSITION

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

STEVE COLT, PhD, Research Professor
Alaska Center for Energy and Power
University of Alaska, Fairbanks
Anchorage, Alaska
POSITION STATEMENT: Presented during the Railbelt Decarbonization Project Results presentation.

JEREMY VANDERMEER, Research Assistant Professor
Alaska for Energy and Power
Fairbanks, Alaska

POSITION STATEMENT: Presented during the Railbelt Decarbonization Project Results presentation.

DEREK STENCLIK, Founding Partner
Telos Energy, Inc.
Schenectady, New York
POSITION STATEMENT: Presented during the Railbelt Decarbonization Project Results presentation.

MATT RICHWINE, Founding Partner
Telos Energy, Inc.
Albany, New York
POSITION STATEMENT: Presented during the Railbelt Decarbonization Project Results presentation.

ERLINGUR GUDLEIFSSON, Research Faculty
Alaska Center for Energy and Power
University of Alaska, Fairbanks
Iceland
POSITION STATEMENT: Presented during the What Can Alaska Learn from Iceland's Energy Transition presentation.

ACTION NARRATIVE

10:15:28 AM

CHAIR RAUSCHER called the House Special Committee on Energy meeting to order at 10:15 a.m. Representatives Armstrong, Schrage, McKay, Wright, Baker, and Rauscher were present at the call to order. Representative Prax arrived as the meeting was in progress.

PRESENTATION(S): RAILBELT DECARBONIZATION PROJECT RESULTS

10:17:13 AM

CHAIR RAUSCHER announced that the first order of business would be the Railbelt Decarbonization Project Results presentation.

10:20:08 AM

The committee took an at-ease from 10:20 a.m. to 10:21 a.m.

10:21:21 AM

STEVE COLT, PhD, Research Professor, Alaska Center for Energy and Power, University of Alaska Fairbanks, provided a PowerPoint

presentation, titled "ACEP Railbelt Decarbonization Project Results, and Lessons from Iceland" [hard copy included in the committee packet]. He stated that the mission for the Alaska Center for Energy and Power (ACEP) is to "develop and disseminate practical, cost-effective, and innovative energy solutions for Alaska and beyond." He said ACEP is an applied research group. He described the Railbelt decarbonization scenarios project, the goal of which was to explore and quantify the scenarios that aim for Railbelt electric grid decarbonization by 2050. He said ACEP sought to address the economic and reliability implications of decarbonization scenarios and create information for Railbelt planning discussions.

10:26:03 AM

DR. COLT listed the industry partners that assisted with the study including: ACEP, Alaska Microgrid Group, Telos Energy, and Information Insights. Electric Utilities from around the state were also involved in the process to provide technical feedback. Funding support came through the Office of Naval Research, Hawai'i Natural Energy Institute, and capital funding from the State of Alaska.

DR. COLT described the electric grid as the "world's biggest machine." He described the varying steps involved that lead to economic analysis including scenario development, load forecast, resource selection and sizing, generation analysis, and transmission analysis. Scenarios that were studied included: business as usual or fossil fuel, wind/solar/hydro, wind/solar/tidal, and wind/solar/nuclear. He explained that the focus of the research was on the implications to stability and system cost of energy sources in a clean energy standard.

10:32:45 AM

DR. COLT, in response to committee questions, explained that there was a lack of a candidate geothermal project that would have been sufficient for Alaska. He explained that even with renewable energy ("renewables"), fossil fuels are still needed with carbon capture. At the outset of the project the goal was to aim for 100 percent decarbonization, which includes carbon capture and sequestration. He noted the difficulty of reaching 100 percent decarbonization.

10:37:17 AM

DR. COLT discussed the electric load forecast, which projected nearly double the load through electrification. He emphasized that the doubling is not specifically due to electric vehicles and could occur through major industrial loads. All decarbonization efforts are tasked with handling larger electric loads by 2050.

10:40:24 AM

The committee took an at-ease from 10:40 a.m. to 10:49 a.m.

10:49:33 AM

JEREMY VANDERMEER, Research Assistant Professor, Alaska for Energy and Power, discussed resource selection and provided a list of existing and proposed projects for different resource types. Resource sizing involved creating a partial optimization to determine the sizing of certain projects based on cost. Generation from wind and solar was cheapest based on the analysis; however, the cost-effective amount of energy was limited by the installed capacity. Additional stability costs were identified in the transmission analysis.

MR. VANDERMEER explained that firm sources of power were needed including hydro, nuclear, fossil fuel, and batteries. Nuclear was not competitive with liquified natural gas (LNG) imports based on cost projections. He made note that projections for nuclear and tidal are especially uncertain.

10:58:00 AM

MR. VANDERMEER, in response to committee questions, confirmed that the study exclusively examined small modular reactors. He explained that new coal was not considered for any of the scenarios that were studied. Nuclear and coal had similar characteristics in that they are both low-cost, base-load technologies.

11:00:26 AM

DEREK STENCLIK, Founding Partner, Telos Energy, Inc., explained that the costs associated with carbon capture technology are difficult to calculate. He discussed energy storage technologies. He described generation analysis which involves the simulation of grid operations across the Railbelt across all hours of the year, considering changing load, wind and solar availability, reliability needs, and operating constraints. The

analysis sought to understand how resources can be scheduled to meet load needs while keeping costs low. The analysis also attempted to determine how grid operators can manage variability and uncertainty of wind and solar generation to maintain reliability using batteries.

MR. STENCLIK discussed plant and system details to understand load profiles, wild and solar profiles, hydro budgets, plant characteristics, operating reserve requirements, and transmission constraints. Those inputs are utilized in modeling software called "Plexos," which is used by grid planners around the world to provide production cost simulations. Cost simulations can be used to inform economic analysis and stability analysis.

MR. STENCLIK provided a chart that demonstrated the net generation of each of the resource types being examined in three different portfolios. He stated that wind and solar offer the lowest cost energy and have the potential to take over about 50 percent of the load in each of the decarbonization portfolios. Each portfolio still uses a relatively small amount of natural gas.

MR. STENCLIK provided a chart that shows how resource operations change over the course of a typical winter day. Different colors represent different sources of energy. System operations change considerably in decarbonization portfolios that feature wind and solar. He explained that variability can be managed and reliability can be maintained.

MR. STENCLIK demonstrated how dispatch conditions are evaluated further in the transmission analysis. Challenging conditions are evaluated further for stability. He showed a similar chart to demonstrate energy needs for one week in December. He explained that the timing of wind and solar generation will vary significantly across the year. He explained that some days wind and solar could generate 100 percent of the total load and other days those may generate no power. Periods of high penetration must be evaluated in further detail for transmission reliability. The location of energy generation will change, and transmission network utilization increases across all scenarios. Regardless of which decarbonization portfolio is selected, the transmission grid is key to enabling flow across the network.

11:14:26 AM

MR. STENCLIK, in response to Chair Rauscher, explained that no one region will run exclusively on solar power, rather, certain areas were selected as candidates where solar power may be installed to generate power. He made note of the variability of the weather. Locations were chosen based on analysis.

11:17:11 AM

MATT RICHWINE, Founding Partner, Telos Energy, Inc., defined steady-state analysis as whether the grid can sustain operations in all credible grid conditions. He defined dynamic analysis as whether the grid can recover from the "shock" of a sudden disturbance. Transmission analysis is performed on snapshots in time. Stability must be satisfied at every moment.

MR. RICHWINE explained challenges with steady state and dynamics and said that successful recovery is a matter of sufficiency and timeliness or response from the remaining resource. He described resource technologies such as synchronous machines, which have been used for fossil fuel, nuclear, and hydro-powered grids. These technologies are advancing to inverter-based resources which utilize wind, solar, battery, and tidal plants. Newer technologies may have more flexibility and potential for enhanced performance when compared with traditional machinery.

MR. RICHWINE explained that the study analyzed periods where both energy generation is dominated by inverter-based resources, and the highest tie-line loading to test and analyze stability and reliability.

11:24:47 AM

MR. RICHWINE outlined that during challenging hours, it was ensured that the grid can meet the Alaska transmission planning requirements through modeling and simulation while following industry best practices. Grid-forming technology was identified as instrumental to integrate technologies and is commercially available for battery-based resources.

MR. RICHWINE emphasized that finding shortfalls could necessitate a revision to the resource makeup. He showed a comparison of installed capacity at each study phase and showed how adjustments in the energy portfolio can be accomplished to optimize resource usage and investments.

11:31:31 AM

MR. RICHWINE, in response to Representative Prax, commented that load shedding is an important operational scheme used by all Railbelt utilities and was represented in models in the simulation analysis. Load shedding may occur to save the system as a whole. Instances of load shedding were greatly reduced in instances where grids utilized grid-forming and inverter-based technologies.

11:34:38 AM

DR. COLT provided a graph that showed the capital expenditures that would be required to implement the proposed resource portfolios. He made note that the bulk of the capital expenditures are involved with "anchor" projects involving hydro, tidal, and nuclear power. These capital costs include a 30 percent investment tax credit reduction for Susitna Hydro, Cook Inlet Tidal, and small modular reactors. Alaska may be eligible for a 50 percent investment tax credit. He emphasized that the projects are measured in billions of dollars.

DR. COLT explained that batteries and associated equipment for grid support are needed to provide reserves for the system when wind and solar are not producing enough energy to keep the grid stable and reliable.

11:39:16 AM

DR. COLT, in response to Chair Rauscher, explained that storage and stabilizing resources are required for the entire system to function effectively by providing reserves.

MR. RICHWINE, in response to Chair Raucher, offered to follow up about the total cost of batteries and grid support for wind and solar.

11:45:29 AM

DR. COLT said that the initial capital investment would be between $10-12 billion. He showed a graph that demonstrated the base case generation and transmission costs of service. He stated that "business as usual" costs about $120 per megawatt hour, while decarbonization portfolios cost a little more. Renewable resources and nuclear energy require fixed operation and maintenance, which can be labor intensive and translates to more jobs for Alaskans.

11:48:13 AM

DR. COLT, in response to Representative Prax, affirmed that depreciation expenses and interest are included in the capital costs.

DR. COLT stated that costs for various scenarios projected out to 2050 are all in the same ballpark. He noted the tremendous uncertainty involved in the economic calculations.

11:51:01 AM

DR. COLT, in response to Chair Raucher, said that his organization is not trying to make recommendations. For scenarios to be successful in accomplishing 2050 load requirements and goals, upgrades to the transmission system were expected and required. Assumed upgrades were included in the cost analysis. He offered to follow up about what options are most realistic.

PRESENTATION(S): WHAT ALASKA CAN LEARN FROM ICELAND'S ENERGY TRANSITION

11:54:50 AM

CHAIR RAUSCHER announced that the final order of business would be the What Alaska Can Learn from Iceland's Energy Transition presentation.

11:55:02 AM

ERLINGUR GUDLEIFSSON, Research Faculty, Alaska Center for Energy and Power, University of Alaska Fairbanks, provided a PowerPoint presentation, titled "ACEP Railbelt Decarbonization Project Results, and Lessons from Iceland" [hard copy included in the committee packet]. He listed three steppingstones: the establishment of heavy industry in Iceland, infrastructure investment, and lost opportunities due to lack of development.

MR. GUDLEIFSSON explained that aluminum smelters and alloys represent the load intensive industrial sector in Iceland. There has been infrastructure investment in geothermal energy in Iceland. Iceland generates approximately six times more energy per capita of electrical energy than Alaska. The length of the Railbelt grid is similar to the Icelandic "ring grid." The Railbelt population is approximately the same as Iceland. Previously, Iceland's energy was produced via fossil fuels and, after the oil crisis, policies were implemented to connect

energy "islands" throughout the country. This investment eliminated the dependency on fossil fuel generated energy.

MR. GUDLEIFSSON showed a comparison of Iceland's ring grid to the Railbelt grid of Alaska. Iceland represents a good case study to refer to as Alaska transforms its grid. He made note of how Iceland is similarly isolated.

12:01:41 PM

MR. GUDLEIFSSON, in response to Chair Rauscher, explained that projects were funded by international funding for industry. Currently, almost all transmission assets for energy generation are owned by the Government of Iceland. There were no private investors.

12:03:46 PM

CHAIR RAUSCHER provided closing remarks.

12:04:25 PM

ADJOURNMENT

There being no further business before the committee, the House Special Committee on Energy meeting was adjourned at 12:04 p.m.