

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

Fairbanks, Alaska  
August 14, 2020  
9:00 a.m.

**MEMBERS PRESENT**

Representative Grier Hopkins, Chair

**MEMBERS ABSENT**

Representative Ivy Spohnholz, Vice Chair  
Representative John Lincoln  
Representative Zack Fields  
Representative Tiffany Zulkosky  
Representative George Rauscher  
Representative Mike Prax

**OTHER LEGISLATORS PRESENT**

Senator Elvi Gray-Jackson (via teleconference)  
Representative Chris Tuck (via teleconference)

**COMMITTEE CALENDAR**

PRESENTATION(S): SB 123 IMPLEMENTATION BY THE RCA

- HEARD

**PREVIOUS COMMITTEE ACTION**

No previous action to record

**WITNESS REGISTER**

STEVE COLT, Ph.D., Research Professor of Energy Economics and Policy  
Alaska Center for Energy and Power (ACEP)  
University of Alaska Fairbanks (UAF)  
Fairbanks, Alaska

**POSITION STATEMENT:** Provided a PowerPoint presentation titled "SB 123 Opportunities for Alaska," updated for 8/14/20.

SENATOR CATHY GIESSEL  
Alaska State Legislature  
Juneau, Alaska

**POSITION STATEMENT:** Offered comments regarding the presentation provided by Dr. Steve Colt.

MICHAEL HOGAN, Senior Advisor  
Regulatory Assistance Project (RAP)  
Sunapee, New Hampshire

**POSITION STATEMENT:** Provided a PowerPoint presentation titled "Reliability in Wholesale Power Systems," dated 8/7/20.

DAVID FARNSWORTH, Principal  
Regulatory Assistance Project (RAP)  
Montpelier, Vermont

**POSITION STATEMENT:** Provided a PowerPoint presentation titled "Integrated Resource Planning: An Introduction," dated 8/14/20.

#### **ACTION NARRATIVE**

[9:00:17 AM](#)

**CHAIR GRIER HOPKINS** called the House Special Committee on Energy meeting back to order at 9:00 a.m. [The meeting was recessed on 8/7/20]. Representative Hopkins was present at the call back to order. Other legislators present were Representative Tuck and Senator Gray-Jackson.

#### **PRESENTATION(S): SB 123 Implementation by the RCA**

[9:02:21 AM](#)

CHAIR HOPKINS announced that the only order of business would be the continuation of presentations on implementation of SB 123 by the Regulatory Commission of Alaska (RCA).

CHAIR HOPKINS said today's presenters would be talking about integrated resource planning (IRP) and reliability standards. He pointed out that the presentations are for informational purposes only but may be helpful to any committee member wishing to submit comments to the RCA as it continues its implementation process of SB 123.

[9:03:50 AM](#)

CHAIR HOPKINS introduced the first witness, Dr. Steve Colt of the Alaska Center for Energy and Power (ACEP). He related that Dr. Colt is a research professor of energy, economics, and policy at the University of Alaska Fairbanks. Dr. Colt is working primarily on the roles of prices, incentives, and energy

policy in supporting and accelerating a shift toward sustainable and resilient micro-grid and energy systems across Alaska. Prior to joining ACEP, Dr. Colt spent 34 years as an economist at the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage, where he served as director from 2007-2010. Dr. Colt has also worked for the public utility commissions in Maine and California.

[9:04:34 AM](#)

STEVE COLT, Ph.D., Research Professor of Energy Economics and Policy, Alaska Center for Energy and Power (ACEP), University of Alaska Fairbanks (UAF), provided a PowerPoint presentation titled "SB 123 Opportunities for Alaska," dated 8/14/20. Dr. Colt showed slide 2 and said ACEP is a team of more than 30 people that includes undergraduate and graduate students on several campuses throughout the University of Alaska (UA) system. He displayed slide 3 and noted that ACEP also has a tremendous network of partners in that ACEP likes to know what it doesn't know and brings in people who do know what ACEP doesn't know. In that spirit, ACEP has reached out to the Regulatory Assistance Project (RAP).

DR. COLT explained that slide 4 "sets the table" for RAP with four questions that tee up the issues that he thinks the RCA should be considering as it writes the rules for IRPs and considers reliability standards. He moved to slide 5 and said he looks forward to hearing the wisdom from RAP regarding the question, "How should Alaska's reliability standards address resilience?"

[9:06:55 AM](#)

DR. COLT turned to slide 6, "What should RCA consider when setting rules for IRP?" He explained he has teed up three questions in relation to this. He brought attention to slide 7 and his first question, "What is a resource?" He said that in the Twentieth Century the IRP process was very much about generation. It brought in new kinds of resources to the mix, getting to a more diverse set of generation resources, which did happen in Alaska.

DR. COLT moved to slide 8 and said the Twenty-first Century IRP process has evolved to specifically include transmission, distribution, and storage as a resource. He turned to slide 9 and stated that flexible loads, such as electric vehicles and heat pumps, have now taken center stage. Flexible loads are

coming on strong because they can serve as resources that regulate renewables, can feed power back to the grid, and can be somewhat graceful about when they draw power from the generation resources. He emphasized that to be used as resources flexible loads must be networked and must be somehow controllable by the system. The control doesn't have to be ironclad and direct, he continued, it could be indirect using price signals and even just the provision of information to those who are on the grid. He displayed slide 10 and said the IRP process should emphasize the interconnection between the resources - the network.

DR. COLT continued to slide 11 and stated that people are the most important resource that can be brought to bear in this process. He recounted that he was asked last week to elaborate on this assertion and qualified that his statements today in this regard are his own opinion. He said people can bear risk and they have always made decisions that create and shape loads. People can choose to consume electricity and they can also choose to produce electricity. People can choose to supply investment capital, which has always been a scarce resource for the Railbelt grid. People can also help each other get through emergencies and ride out rough spots. People are a critical resource in any integrated resource planning process.

[9:10:54 AM](#)

DR. COLT moved to slide 12 and discussed his second question, "How can we integrate resources?" He said the Twentieth Century IRP was focused on a distinction that economists like to make between quantities and prices and was focused on quantities: What to build? When? Where? How to finance it? He turned to slide 13 and pointed out that to make progress, great attention must be paid to the prices side of prices versus quantities. There must be focus on incentives, markets, and mechanisms, he said. For example, Dominion Energy South Carolina has filed a proposal with that state's Public Service Commission for a tariff that will apply to storage-plus-renewables, with an eye toward better integrating intermittent solar into its system.

DR. COLT drew attention to slides 14-15 and discussed his third question, "What is Planning?" He submitted that in the Twentieth Century, and even into the Twenty-first Century, what was ended up with were plans. An Alaska commissioner, he related, referred to one recent plan as "a real good doorstopper." Planning was mostly about plans, but things must get beyond that mentality. Shared data is a critical part of good planning, he advised, and he hopes the RCA will emphasize

some means for having platforms where everyone can participate using a common shared set of data.

DR. COLT displayed slide 16 and concluded his presentation. He noted that RAP professional David Farnsworth was a lead author of "Sustainable Energy Solutions for Rural Alaska," an excellent and current summary of the challenges faced off the road system. He added that Mr. Farnsworth and his colleague Mark LeBel recently gave talks at the Virtual Alaska Electric Vehicle Workshop co-hosted by ACEP and the U.S. Arctic Research Commission, a workshop that is available on the ACEP website.

[9:15:24 AM](#)

CHAIR HOPKINS recalled Dr. Colt's statement regarding load management and the importance that it includes informational provisions to different utilities and the public. He requested Dr. Colt elaborate on how that works with IRP and what type of information should be provided from this planning.

DR. COLT replied that there are two levels at which this could occur. First, to have good integrated resource planning there must be common and widely available information about the system, how it works, and what the possibilities are. The big power markets in the Lower 48 have beautiful data platforms that make it transparent to everybody what's going on in the system and what the opportunities are for joining the system. But Alaska doesn't have well-developed wholesale markets like the Lower 48, so Alaska must put that transparency and openness to collaboration into its planning process. Second, it's possible to manage the loads in Alaska without necessarily having to control them with an iron fist. It's possible to get people into the process just by sharing information with them real time, such as providing messaging about when a big peak load is coming, or when the grid might be having a problem, or when it is particularly good to charge an electric vehicle (EV) in combination with an incentive to make it worth people's while to pay attention and follow the information.

[9:18:06 AM](#)

CHAIR HOPKINS surmised that the [Dominion Energy] South Carolina process is a living document that the company is updating.

DR. COLT clarified that the South Carolina example is just a run-of-the-mill/business-as-usual tariff filing as opposed to being part of an IRP. The IRP, he said, needs to line out,

articulate, and put in place the openness and the willingness of the ongoing ratemaking and regulation process to be receptive to proposals like this. It's unknown what the technologies are going to be in 10 or 20 years, so what the IRP can do is make sure that the doors are open for proposals like this one and that they won't be precluded by some kind of exclusive plan that isn't going to be open to new proposals like this.

[9:19:53 AM](#)

SENATOR GIESSEL commented that Dr. Colt made an important statement when he referred to a plan being a good doorstop. She remarked that this calls to mind General Eisenhower's statement that plans are worthless, but planning is everything. She stated her appreciation for Dr. Colt's emphasis on the importance of a dynamic process of planning and remarked that energy innovations are happening so rapidly and beyond expectations that [Alaska] cannot get married to a static written-in-cement plan.

CHAIR HOPKINS agreed it is critical for Alaska to have the flexibility to allow for the ever-changing world and technology that is yet unknown.

[9:21:22 AM](#)

CHAIR HOPKINS introduced the next presenter, Michael Hogan of the Regulatory Assistance Project (RAP). He explained that RAP is an independent, nonpartisan, nongovernmental organization composed of former utility and regulators, industry executives, system operators, and other officials with extensive experience in the power sector. The RAP team focuses on the world's four largest power markets responsible for half of the global power generation - China, Europe, India, and the U.S.

CHAIR HOPKINS related that since 2010 Mr. Hogan has been a senior advisor to RAP on the power industry's decarbonization in the areas of wholesale market design, demand response, and system integration of intermittent supply. Mr. Hogan previously directed the European Climate Foundation's landmark roadmap 2050 decarbonization study. During 18 years in the private power industry Mr. Hogan was responsible for development, financing, acquisition, and operations for tens of thousands of megawatts of generation from independent powerplants on four continents. Mr. Hogan began his career in power systems marketing with General Electric and earned degrees in business, engineering,

and management from Harvard, Massachusetts Institute of Technology, and University of Notre Dame.

CHAIR HOPKINS stated Mr. Hogan would provide a presentation on wholesale power system reliability, metrics that are appropriate for assessing system readiness, and mechanisms for ensuring delivery at lowest reasonable cost. He said Mr. Hogan would also provide a brief description of best practices in the use of integrated resource planning (IRP) to assist in delivering reliability with integration of variable renewables.

[9:23:07 AM](#)

MICHAEL HOGAN, Senior Advisor, Regulatory Assistance Project (RAP), provided a PowerPoint presentation, titled "Reliability in Wholesale Power Systems," dated 8/7/20. He displayed slide 2 and addressed current best practice and power system reliability. He said reliability is the idea that the value of continuous good supply of electricity to various consumer segments can be quantified, and that the loss of value or societal welfare through involuntary interruption of that supply can likewise be quantified, and the design, construction, and operation of modern power systems should be calibrated to a standard that is consistent with that value.

MR. HOGAN stated that different metrics have been developed to assess the reliability of different parts of the system. For the generation sector there are determinant target reserve margins and probabilistic loss of (indisc.) energy metrics. For delivered reliability (indisc.) or system average interruption duration index and system average interruption frequency index to the duration and frequency of customer service interruptions. Less common but increasingly important are attempts to recap the metrics for different layers of the power system in a common context so that the tidal wave of new investment needed to transport an energy system can be properly prioritized based on value to consumers. Underlying every recognized reliability metric is that while reliability is a paramount objective, consumers are best served by balancing measures to add an increment for reliability against the cost of those measures to consumers. It is inescapably true, and always has been, that there is some level of expected deliberate load curtailment due to the feature of a reliable prudently managed power system, not a failure. The details matter, he continued. One should never (indisc.) short-lived, controlled power interruptions that result from a rare shortfall in generating capacity or the uncontrolled but localized interruption that is typically caused

by distribution system problems, such as a squirrel in a transformer, with cascading system collapse and system-wide blackouts that are almost exclusively the result of transition system failures.

MR. HOGAN pointed out that electric system planning today faces a lot of uncertainty from rapidly evolving technology like transportation and heating that hasn't been seen since the days when Edison and Westinghouse were fighting it out over AC versus DC transmission. The good news is that investment cycles today are far shorter than they were 30 years ago. The leading generation of technology has become more modular and most leading technologies can be added quickly and in smaller increments to meet need. He stated that never in his career has it been less clear what technology options will be available in 10 years from now or what demand for energy services due to technology options will need to be met. But much can be done to ensure there are ways to adapt to put the interests of consumers first. It's never been more important to balance the need to ensure readiness against the need to protect consumers from being saddled with decades of paying for wasted or imprudent investments. In this new reality, best practice is to shift focus from "how much" to a focus on "how flexible" (indisc.). The capacity of the system still matters, but the system's capabilities matter more. The more operationally adaptable the resource portfolio the less capacity will be required.

[9:28:20 AM](#)

MR. HOGAN stressed the importance that "reliability need no longer be a one-way street, nor can we afford for it to be so." He said a significant share of electricity demand has always been controllable to some extent even if there was historically little value in exercising that controllability. But, as the resource portfolio shifts and as uses like transportation and heating proceed to be electrified, exploiting the potential and controllable demand will become a critical success factor. Planning, regulatory processes, and market arrangements will need to embrace this potential in ways that few have yet contemplated, right down to the question of integrated retail rate designs.

MR. HOGAN moved to slide 3 depicting a graph dealing with standards for resource adequacy. He explained it's a classic graph of the relationship between a common reliability metric used to determine the quantity of investment in generating capacity. The X-axis is the loss of load expectation or loss of

load hours, and the Y-axis is what the chosen standard implies about the value to consumers of avoiding service interruptions.

MR. HOGAN said the graph offers two key insights. First, as more generating capacity is added, lowering the expected average number of hours during which the amount of available generating capacity is expected to fall short of demand, beyond a certain point the implied value of adding that extra megawatt of generation begins to rise exponentially. In other words, the value of adding a megawatt of generation to go from two hours per year to one hour per year needs to be much, much higher than it would need to be to go from six hours per year to five hours per year in order to justify adding that megawatt capacity. Second, the graph illustrates the chasm that exists between the standard [green line] reflecting what dozens of economic studies over the years have found to be the upper end of the value that residential and small commercial customers place on avoiding a service interruption, which is about \$25,000 per megawatt hour. The value implied by the conventional standard employed by operators like the Southwest Power Pool have one day in ten years [gold line], which equates to about \$50,000 per megawatt hour. The value assumed by the standard employed by operators like the PJM system operator has one event in ten years [red line], which can amount to \$250,000 per megawatt or more, which is 25,000 cents a kilowatt hour. He said he will leave it to legislative members to think about what they might happily do for a tiny fraction of 25,000 cents per kilowatt hour in order to help keep their and everyone else's lights on for the next couple of hours.

[9:31:38 AM](#)

MR. HOGAN turned to slide 4 and said the disconnect illustrated in slide 3 comes into sharper relief when these commonly cited generation resource adequacy standards are presented alongside, and on the same terms, as the delivered standard performance consumers have come to expect. He explained the left side of the graph presents the statistics [for Western Europe] for what is heard about how much service disruption the average consumer experiences from all causes - the system average interruption duration index (SAIDI). The numbers for the U.S. are about twice as high - the average U.S. customer experiences about two hours per year cumulative service interruptions from various causes. He said the right side of the graph is the resource adequacy standard typically adopted in Western Europe, which is less than (indisc.) system operators - 3 hours per year compared to 2.4 hours or less per year. He stated that the two standards

of performance reflect wildly different conceptions of what reliability is worth to consumers.

MR. HOGAN specified slide 5 is another way of looking at it but using U.S. data. He said interruptions due to a shortfall in available generating capacity overall represent less than .009 percent of the service interruption hours consumers experience. Even after excluding unusual [weather] events, 99.773 percent of customer service interruption hours are the result of transmission and distribution problems. The bottom line, he advised, is that nearly everywhere in the developed world today investment in generating capacity is vastly overvalued, and investment in transmission, distribution, and non-(indisc.) alternatives, such as demand response and energy efficiency as options for meeting consumers demand for reliability, is undervalued. This tendency is especially strong in (indisc.) planning processes and some extra caution is warranted. He qualified that he isn't an expert on Alaska or the Railbelt in particular but said that a quick look at the characteristics of the Railbelt system suggests to him that if the question is what the highest priority should be for improving system reliability, then adding large central station generating capacity that must be connected to distant load centers by high voltage transmission lines strung across a challenging landscape in a harsh environment may not be the first choice. Higher priorities might include achieving a coordinated economic dispatch with system balancing resources, improving the ability to move power around the system from the existing generation portfolio, incentivizing the participation of large, controlled loads in line with the value of doing so, and otherwise improving the ability of the various load centers to ride through reliability events occurring elsewhere in the system.

[9:34:50 AM](#)

MR. HOGAN explained slide 6 is a conceptual representation that the Irish system operator EirGrid uses to portray the challenges facing the system planners in a run up to 2050, in an islanded system with a peak load of about 12.5 gigawatts and with the share of energy coming from wind production reaching as high as 65 percent of energy into the system in some hours. While the system is expected to become increasingly capital intensive, as seen by the bar graph on the left, the righthand columns indicate that the reliability challenge going forward will be far less a question of how much generated capacity is on the system and far more a question of the range and scope of the

operational capabilities of the system's resources to provide system services both on the supply side and on the demand side.

MR. HOGAN stated that slide 7 presents a similar trend that is emerging in the Ercot system in Texas, which is another islanded system with very high penetration from (indisc.) resources and at the highest load growth of any region in the U.S. He said Ercot has consistently met an extremely stringent resource adequacy standard while maintaining a reserve margin of about 11 percent, which is less than one-third as large as the 35 percent reserve margin on the much larger and much better interconnected PJM system, and PJM claims to observe the identical resource adequacy standard that Ercot asserts. Ercot's focus has shifted strongly to 1) increasing the amount and range of flexibility services available to system operators as illustrated in the slide; 2) strengthening the transition network making the changing resource portfolio to their major load centers; and 3) developing new ways to tap into the inherent flexibility of many of their customers largest electricity loads.

[9:37:03 AM](#)

MR. HOGAN displayed slide 8 and said that the value of equitably incentivizing and enabling the inherent controllability of many electricity loads, especially new ones like electric vehicle charging, is one that is still poorly understood and [under]appreciated by too many energy regulators and policy makers. He noted the graphic is from one of the leading decarbonization studies and depicts the typical summer week in a future system with about 35 percent of annual energy coming from intermittent resources. The dotted black line on the graph shows the historical load profile in the system over the course of a week in the summer, while the solid black line shows the load profile after shifting only 10 percent of the daily energy consumption within the day from when the supply is tight to when it is plentiful. The difference in investment and operating costs between the two scenarios is dramatic. As much as 40 percent less investment is required for the scenario where policy and market design enable the deployment of a modest share of the inherent flexibility in electrical demand. In the interest of meeting consumers' demand for cost-effective reliability, policy, and regulation, including the all-important issue of retail tariff design, "they must adapt themselves to move from a world where we forecasted load and scheduled generation, to one where increasingly we are going to forecast generation and schedule load." An essential enabler for this will be the ability of third-party aggregators to enter the

market with innovative new products and services for a wide range of consumers.

MR. HOGAN moved to slide 9 and advised that traditional avenues for the participation of load and maintaining system reliability, to the extent that they existed at all, are woefully inadequate to meet this challenge. He said the graphic is from a massive study of the range of low cost, easily deployed options for electricity demands in California to adapt and to respond to para-market conditions. The red boxes depict the scope of this potential, traditionally captured by traditional (indisc.) demand response, scheduled peak shedding and under-frequency load shedding programs. Both were based on inconveniencing the relevant consumers and, as a result, were tightly limited in how and how often they could be used. Demand flexibility that meets the needs of the previous slide can no longer be about paying a few consumers to be inconvenienced once in a blue moon. It will be about delivering the reliable energy services consumers want day to day in ways that are easy to understand, convenient, and beneficial to the family budget. In conclusion, he stated that automation and ready access for third-party service providers will certainly be two, among many, critical success factors in achieving this.

[9:41:00 AM](#)

CHAIR HOPKINS returned attention to slide 6 and requested the definitions of capacity, ramping, stability, reactive, and reserve.

MR. HOGAN advised that utility service terminology varies significantly from one system to another. He defined capacity as the instantaneous capability of a resource to feed power into the system if required. He specified that ramping is an old concept that has acquired new importance with the growing penetration of intermittent resources. Ramping refers to the ability of a resource to change its output over different time scales in order to follow changes in demand on the system. Typically, ramping refers to longer time scales of, say, 30 minutes to several hours as opposed to the much shorter time scale of changing the output that is required to do things like manage frequency (indisc.) system. Ramping will be acquiring more and more importance as more and more intermittent resources come on to the system.

MR. HOGAN pointed out that stability tends to refer to a more arcane service but one that is going to become extremely

important. On a system that relies on a lot of very large, very heavy spinning machineries, he explained, an upset such as a transmission line going off or a powerplant tripping offline can cause instantaneous disturbance in system frequency. If the system has a lot of inertia it tends to resist for some period, for seconds or even approximately a minute, changes in frequency until other resources can be brought into play to bring the frequency back to 60 hertz, or in the case of Europe 50 hertz. As these large heavy spinning machines are replaced with asynchronous connective resources like wind power, the level of inertia and the system's inherent resistance to changes in frequency tends to decline. So, there is going to be growing demand for a way to replace the role that big heavy spinning pieces of machinery used to play in the system, and there are several options for doing that. The Irish system operator has been on the forefront of trying to develop those because with 65 percent or more of energy coming from asynchronous resources, they have begun to confront the question of how to continue to operate the system in a stable fashion from a frequency perspective. The Ercot system in Texas is approaching a similar frontier.

MR. HOGAN defined reactive power on the system as the amount of the total alternating current electricity that is available to do work on the system. If the three phases of built-in current get out of sync with each other for various reasons, then the effectiveness of some of the power that is generated at the powerplant is lost before it gets to end users. So, reactive power services are different ways that the system compensates for problems, reductions, in reactive power. On a system with more and more asynchronous resources connected there is likely to be a greater demand for reactive power services.

MR. HOGAN specified that conventional reserves are reserves that the system operator maintains to provide frequency regulation as quickly as possible if there is an upset in the system. Given the amount of inertia of the system, one wants to bring in reserves standing by that can respond in milliseconds to seconds to a few minutes to bring the frequency back up to 50 or 60 hertz. Secondary, or operating, reserves are reserves that can be available to respond very quickly to boost frequency but can only operate for a few minutes. Therefore, other kinds of reserves are needed that can be brought in to replace those and can operate longer - some can operate for as long 15-30 minutes. Then, those must be replaced by tertiary reserves, which are reserves that can be brought in and operate on a steady state to bring the system back into stable operation. All of these are

different kinds of services. As more and more intermittent resources become part of the system, it is going to become increasingly important that the resources that are available can provide some or all these services regardless of the capacity of resources. The more capacity that lacks these capabilities the more expensive it's going to become to operate the system reliably.

[9:48:49 AM](#)

CHAIR HOPKINS introduced the next presenter, David Farnsworth of the Regulatory Assistance Project. He said Mr. Farnsworth advises regulators and advocates on clean energy and environmental policy and regulation. Prior to working with RAP, Mr. Farnsworth served as hearing officer and staff attorney for the Vermont Public Service Board from 1995-2008. He has also worked internationally as a regulatory consultant providing training on legal and policy issues to relevant ministries and regulatory commissions in Slovakia, Romania, Mozambique, Swaziland, and Tanzania. Mr. Farnsworth earned degrees from Colby College and the Vermont Law School.

[9:49:37 AM](#)

DAVID FARNSWORTH, Principal, Regulatory Assistance Project (RAP), provided a PowerPoint presentation, titled "Integrated Resource Planning: An Introduction," dated 8/14/20. He turned to slide 1 and said his goal for this presentation is to provide committee members with enough understanding of integrated resource planning (IRP) so members know where they are in subsequent IRP discussions and so members can ask where the discussion is going and have a sense of where that is. He displayed slide 2 and noted that IRP is very complex. He then showed slide 3 and said his goal isn't that members will understand everything there is to know about this topic, but to provide a general outline and sense of the big picture.

MR. FARNSWORTH moved to slide 4 and explained the origin of IRP. He said several states started IRP processes and adopted laws requiring this because they were experiencing backlashes from large utility projects that for various reasons weren't working out as had been planned. Most important, states realized they didn't have the information, and the public didn't have the information, to make decisions when expectations about the future and how things were supposed to happen weren't really paying off. A plan helps in understanding where things are and what needs to be done.

MR. FARNSWORTH showed slide 5 and related that about 30 states have some form of regular integrated planning on the books. He said it's important to notice that integrated planning also happens in other contexts and can provide similar benefits.

MR. FARNSWORTH turned to slide 6 and pointed out that utility regulators have a very complex job. Historically, he explained, traditional regulatory goals meant ensuring safety, reliability, and rates that were just, reasonable, and nondiscriminatory. But today their workload and the things they need to know and stay on top of have increased significantly, such as new technologies with different capabilities. Resources are not just a supply of energy from a powerplant. Resources can be many things: the ability to interconnect one's micro-grid; the accessibility of good, easy charging; the ability to ensure that the quality of the power on a system is what is needed; the creation of new technologies; different capabilities; and building and transportation electrification that involves both thermal and electric storage. Renewable energy is becoming less expensive and competitive in many ways with traditional resources. Their capabilities are slightly different, but the pricing is going to result in them putting a lot of pressure on traditional resources. There are more efficient technologies. For example, natural gas plants are way more efficient today than they were in, say, 1990. There is the ability to manage load as a result due to the flexibility of some of these resources, the digital capabilities to manage power grids, and the ability to coordinate supply and consumer demand for that on these grids. Add in environmental compliance costs: Will there be climate change legislation at some point that will require fossil fuel-fired electricity to pay more to account for the effects it's having on the environment? Air quality compliance costs as well? Mr. Farnsworth advised that when the complexity and inter-relatedness of all these factors are added up, it makes comprehensive planning for utility regulators quite a challenge. That's partially why integrated resource planning is being talked about today.

[9:55:22 AM](#)

MR. FARNSWORTH drew attention to slide 7 and specified that IRP is a plan to meet the public's need for energy services. It looks at supply-side and demand-side resources, he explained, and it does not arbitrarily favor one over the other but considers the capabilities of each. It considers various likely futures for meeting the public's need for energy. If an

integrated resource plan were a set of headlights, then they would shine 20 years down the road - it looks at the very long term.

MR. FARNSWORTH displayed slide 8 and reiterated that his goal for committee members is to understand the structure so members know where they are and where they are going.

MR. FARNSWORTH said he put together the graphic on slide 9 using information from Portland General Electric. He explained that reading from left to right and looking at the green arrows gives a sense of the steps in the IRP process: identify needs, develop portfolios, [optimize and evaluate options, and preferred portfolio]. He further explained that the rectangles above and below generally suggest some of the major topics that feed into this process. As indicated by the red circle, an IRP puts together and analyzes a portfolio of resources. He said the company, the regulator, and the public look at this and ask, "What are we going to need in the way of resources over the next 20 years?" What needs to be considered includes the load - what the utility will have to provide - what resources are already available on both the supply and demand side, and what will be the future resource options.

MR. FARNSWORTH addressed slide 10 [mistakenly numbered as 9]. He explained that each option - whether it is energy efficiency, demand response, renewable energy, a powerplant upgrade, or a brand new powerplant - is analyzed with respect to meeting reliability needs over the horizon of the plan and doing that in a least-cost manner.

[9:57:52 AM](#)

MR. FARNSWORTH moved to slide 11 and specified that some new technologies will work like load in that they will be drawing energy off the system. Some new technologies will be able to work like supply. For example, electric vehicles are electric storage or batteries on wheels, and electric water heaters are thermal energy stored in batteries, so to speak. An IRP inquiry asks questions like, "Will electrification double utility sales by 2050?" He urged members to look at the paper written by The Brattle Group.

MR. FARNSWORTH brought attention to the graphic on slide 12 and stated that as things move along beyond developing portfolios, the process comes to optimization, the comparing of different collections of resources and their suitability under different

future scenarios. He said this isn't a matter of simply looking at one or more crystal balls but an effort to tease out probable futures. All sorts of obvious questions get asked as well as other questions that may not be so obvious. Will there continue to be wars in the Mideast that affect world energy prices? Will there be more than one war? Will world natural gas prices go up or will they go down? What effects will that have on liquefied natural gas (LNG) export and import? Will battery technology costs continue to drop, making electric vehicles and other resources more possible? Will renewable energy costs continue to drop? Questions like these get asked and answered as the process tries to optimize and evaluate options. The process tries to winnow out scenarios that are determined to be "a little bit far out" and focus on more plausible future scenarios and to determine what sort of resource choices should be made given those future scenarios.

10:00:30 AM

MR. FARNSWORTH turned to slide 13 and specified that modeling helps this work by creating a sense of possible ways for a utility to respond to these possible futures.

MR. FARNSWORTH showed slide 14 and discussed the important topic of risk. Risk can mean many things, he noted, such as financial risk, regulatory risk, risks associated with construction costs, and risks associated with weather. As an IRP looks at potential futures, it helps to understand the strengths and weaknesses of various approaches and responses to different futures, and one thing it does is to help sort out risk. It gathers information about risk and characterizes it in as useful a way as possible to inform decision-making.

MR. FARNSWORTH moved to slide 15 and pointed out the importance of the public being part of the effort at each step of the way. He said this goes to the question that was asked of Dr. Colt about access to information. He advised that incorporating stakeholder point of view means that the state's energy future is considered through the eyes of citizens, through industry, and through local and tribal government, as well as other members of society. Practices may vary as to how much the public participates or at what point the public participates, but IRP is generally understood as a public process that goes to informing the public's need for energy services. In Colorado, for instance, there is a great deal of public participation and engagement in the first two or three of the arrows [shown on the graphic] and less public engagement later. He continued to

slide 16 and pointed out that regardless of whether the public is meeting in a large group or virtually, public participation is important to educate people and to build constituencies and support for a cohesive vision of the state's energy future.

MR. FARNSWORTH brought attention to the graphic on slide 17 and explained that due to space constraints, the action plan is shown in the blue box rather than in a green arrow. He moved to slide 18 and said he is emphasizing this because the bulk of the work that is done on an IRP is looking at 20-plus year horizons for planning, but still every good IRP has a vision for the next two to five years and that is called the action plan. The action plan answers the question of what things need to happen as soon as leaving the starting gate. Every IRP, despite being a long-term effort, has a short-term action plan appended to it.

[10:04:10 AM](#)

MR. FARNSWORTH addressed slides 19-21 to summarize. Addressing slide 19, he said an IRP is good for creating a vision. It's an illustration of a state's future energy needs and its resources. The bulk of the work is based on long-term horizon but still there must be a short-term vision with an action plan at the end of it. Integrated resource plans are relevant for big systems as seen in the Lower 48, but also perfectly suited to Alaska's circumstances where there needs to be coordination across multiple systems. Addressing slide 20, he advised that IRP helps in understanding where large investment might work or where numerous small-scale investments might work better. Addressing slide 21, he said that engaging in this planning effectively requires: that the regulator be enabled, that there's very clear institutional process, that there's recognition of all the public policy goals that are relevant, that the data is accessible and timely, and that stakeholders engage so there is support for the effort. It's a technical undertaking as well as a political undertaking, as anybody at a utility commission knows. Utility commissions are created by legislatures. They are quasi-judicial as well as quasi-legislative, so it is very important to include the public in this effort. Displaying slide 22 he concluded by saying that plans are what they are, but it's the undertaking, it's the planning that is everything.

[10:06:32 AM](#)

CHAIR HOPKINS recalled that at last week's hearing the Regulatory Commission of Alaska (RCA) described the cross-

utility integration of this IRP as being somewhat unique or rare. He requested Mr. Farnsworth or Mr. Hogan to describe what that cross-utility integration could look like in Alaska and why it's rare in other parts of the U.S.

MR. FARNSWORTH replied that "typically we often find ourselves in silos and IRP is no different." He said integrated resource planning statutes were passed and the requirements were placed on utility companies. When a state has multiple utility companies it often ends up being the case that an IRP for "Company A" occurs and an IRP for "Company B" occurs. In practice over the last few years folks have found that somewhat limiting because, after all, a resource can be that utility's powerplant or it can be a contract that "Utility A" got from "Utility B" and those resources are available, not to mention any other resource that can be gotten across a system. These systems are interconnected and highly flexible. So, when it comes to planning, ideally what one would do is have a utility plan for the resources available or have a state and all its utilities plan for those resources that are available, and make sure that everything is put on the table so there can truly be an integrated look at the resources out there.

[10:08:47 AM](#)

MR HOGAN elaborated about cross-utility planning. He related that in Europe where he does a little more than half of his work, and which is a place that would be more in love with central planning than most parts of the U.S., the hot topic of the last few years is what is referred to as sector coupling. Sector coupling may be another way of describing cross-utility planning and it may be a bit more comprehensive than cross-utility planning. It refers to the power sector transformation that's taking place and the role of decarbonized electricity that is going to play in reducing greenhouse gas emissions from the transportation and heating sectors and the effects that both of those things have on the shape and size of demand for natural gas and the ways that natural gas is going to be used in the system. It is frankly crazy, he said, "to have a plan to do an electricity sector that is in any way independent of your plan for the transportation sector and is in any way independent from your plan for oil imports and exports that is in any way independent of your plan for building technologies that is in any way independent of your plan for your gas transportation and distribution system." He said these are all now intimately linked in terms of what's going to drive cost-effective, low-cost, affordable, reliable delivery of energy services to

customers because, in the end, customers don't buy gas, electricity, or oil - they buy services. What is going to be seen is a level of interdependent linkage among the various formerly independent prior energy sources that has never been seen before.

[10:11:39 AM](#)

CHAIR HOPKINS noted that in the past an outside contractor did the large "doorstop" plan that was referenced earlier. He asked who, in Mr. Farnsworth's experience, usually does the IRP planning.

MR FARNSWORTH responded that the first steps associated with IRP are convening all the appropriate stakeholders and making sure that the information that's being brought forward is as complete as possible. It's engineering information and all the other information that can inform the process, as stated by Mr. Hogan. It's important to get information about buildings if it's known that buildings are poorly insulated and so more fossil fuel or wood will be burned, or more electricity used, to keep those buildings warm. It's important to get information about the transportation system. It's important to get a sense of what the Railbelt communities are thinking as well as more distant communities, as everybody has different needs and perspectives. It is a bit overwhelming when thinking about that initial inquiry and the need to include public input into the effort, but all this goes to emphasize the point that to the degree that that information is included and a contractor is helping to put this together, it really doesn't matter where the contractor is if the contractor is enabling the basic tenets of participation and access to all information. If all those things are observed, he continued, it doesn't really matter whether [Alaska] has a contractor. Some fairly involved modeling often goes on, and that expertise may be found at the utility commission, but oftentimes many of these specialties are not, and the most cost-effective thing to do is to engage somebody to provide those resources. If the commission were to oversee a process that is as inclusive and open to as much information as possible, then the commission can proceed perfectly well with outside help.

[10:15:21 AM](#)

CHAIR HOPKINS noted that Alaska is something of an island that is without power system and transmission line connection to the outside world. For example, he said, Fairbanks is at the end of

a large transmission line. He asked about the ways that IRPs could address end-of-line reliability and flexibility that might lend some light to directions that should be looked at for an IRP in Alaska.

MR. FARNSWORTH referenced Ercot in Texas and Ireland as mentioned by Mr. Hogan. He said a comprehensive approach is going to recognize everybody on the system. What's interesting to see is how thorough the process is at evaluating ways to address the folks who are at the end of the line. It may be a good solution to build a big new transmission line, big pipe right down to the end of the line. It may be that there are lots of smaller solutions that are useful at the end of the line that reduce demand, that maybe provide for micro-grids that can provide some of the supply that would have been sent a long distance down the system to the end of the line that could produce those things more effectively and at lower cost. For example, Bar Harbor, Maine, adjacent to Arcadia National Park, is exploring these things because Bar Harbor is in exactly that situation. Bar Harbor is looking at alternatives to a big wire going out to the community and looking at things that the community can do to provide more supply for itself, more flexible supply for itself, more flexibility in the way it uses energy, and more efficient ways to get what it needs to get done at lower cost.

[10:18:23 AM](#)

CHAIR HOPKINS related that one of the big energy projects in Alaska that's been going on for 50-60 years is the large-scale Susitna-Watana Hydroelectric Project that is currently off the shelf; however, no work is being done to that study. It is planned to provide up to 600 megawatts of power in its current iteration, he explained, which would provide one-half to two-thirds of the generation on the Railbelt. It seems to match well the goals of the capital expenditure (capex) and operating expenditure (opex) in 2050 as seen in slide 6 of Mr. Farnsworth's presentation. He inquired as to how a large-scale project like this would fit into an integrated resource plan that would look towards more flexibility in its sources.

[10:19:31 AM](#)

MR. HOGAN qualified that he probably knows less about Alaska and the Railbelt situation than does Mr. Farnsworth, who likely would suggest he's not an expert on it either. Therefore, he prefaced, he would need to know a lot more to give a truly

robust answer to the question. He said the question ties back to the other question just asked and to Dr. Colt's point about resilience versus reliability for people at the end of the line. He recalled the point he made earlier about the tendency to overvalue the contribution of investment in generating capacity to reliability versus the value of investment in transmission distribution and (indisc.) alternatives like demand response and energy efficiency. In a system the size of the Railbelt today, 600 megawatts come awfully close to being able to supply the entire system, which may sound like a good thing, but in traditional utility planning it is always wise to be leery about a system that is too overly reliant on any one failure, called the "M-minus-one test."

MR. HOGAN stated he doesn't know anything about the Susitna-Watana project. However, he said, assuming it's a reservoir hydroelectric project and it has adequate storage, the good news is that hydro can be quite a flexible resource, and it can be a great complement to intermittent resources like wind and solar. Assuming that the reserve margin of an installed generation on the Railbelt is adequate to comfortably adequate, which in preparing for this presentation he concluded that it is, it's not clear to him what reliability purpose that project would serve. It may be an excellent choice over time for meeting expected load growth from new industry and growth in the Railbelt region, but from a reliability perspective he said he questions the wisdom of adding a very large, single-point resource that is by and large going to be connected to distant load centers by high voltage transmission across a challenging landscape in a harsh environment, as opposed to focusing more on resiliency as Dr. Colt referenced. Resiliency, Mr. Hogan said, is about how quickly and to what extent a given level of essential services can be maintained in the event of a very significant reliability event on the system. It's not about building a duplicate system so that nobody notices that there's been a reliability event, he specified, it's more about maintaining as much of the central services as possible until the system can be restored to something resembling a stable system.

[10:25:40 AM](#)

MR. HOGAN advised that an issue that would be quite widespread is how many people are not "at the end of the line" in a system like the Railbelt. Planning is going to be a way forward as opposed to some combination of planning and market. When assessing these different things and their impact on reliability

and their impact on the cost of reliability, they must be put in some sort of a common context in order to weigh the "bang for the buck" of investment in different measures on the contribution they make to the delivery of reliable energy services to end use customers across the system. The mistake that is so often made in these prophecies is to focus on resource adequacy to the exclusion of a focus on the customers' lived experience of reliability, and what the causes and sources of (indisc.) effects on those lumped experiences are, and what the nature of the solutions are. There was a time when they'd take the (indisc.) generation adequacy separately from distribution issues because generation had to be added in such large increments that would occur in 5 to 10 to 15 years. It was more challenging to get into trouble on generation adequacy than it might have been to get into trouble on reinforcing part of a local distribution system that tended to fail from time to time - but that is increasingly no longer the case.

MR. HOGAN further pointed out that investment cycles on the generation side for many of the leading resources are now quite short, and those resources, those technologies, can be added in a very modular fashion, which is not what is being talked about with the Susitna-Watana Hydroelectric Project. It's a big project and it's a huge percentage of the total demand on the system. That's not to say it's not a good idea, but he would suggest thinking of it differently from the measures that are wanted to improve reliability, maybe more something to think about as a long-term way of addressing load growth to the extent there is confidence that load growth is going to be seen.

[10:28:55 AM](#)

MR. FARNSWORTH provided an example from IRP that would be informative here, although it's about an existing plant, not the idea of building a new one. He related that Southern California Edison in 1999 owned a plant called the Mojave Generating Station that was about 1600 megawatts. It had two coal-fired resources in it, built between 1967 and 1971. The owner executed an agreement with California officials to install sulfur dioxide controls or to close the plant by 2005. In 2003 the owners approached the California Public Utilities Commission (CPUC) with a preliminary engineering study for the retrofit. After hearings, the CPUC said it wanted a comprehensive review, an integrated resource plan, to be done for this unit. In 2005, they produced the Mojave Alternatives and Complements Study and it examined alternatives to that retrofit. In other words, pull the 1600-megawatt plant out of the picture and fill that 1600-

megawatt hole. In looking at alternatives they found a wide variety of alternatives that were far more cost-effective, and the study recommended closure. They closed the plant as a result of that study. He said Mr. Hogan alluded to that when he suggested that Alaska doesn't have to build or acquire all 600 megawatts at once, it could be approached in a modular fashion. This sort of observation underlies Mr. Hogan's earlier observation about financing periods being shorter because projects can be smaller. He asked the committee to imagine an all resources request for proposals (RFP) for 600 megawatts or whatever amount that Alaska thinks suitable to fill that need. What people submit as bids, and what is found to be reasonable proposals, might put the resource that is being thought about in the chair's question in an entirely different light, and it might help inform [Alaska's] decision about how suitable it would be to go with that one resource or these alternatives.

[10:31:58 AM](#)

MR. HOGAN added that in a system the size of the Railbelt system, adding 600 megawatts or even 300 megawatts from a single-point production facility would have significant ripple effects on how the overall system is operated, the economics, and operational characteristics of the other resources on the system. Especially in that situation, he advised, it will be absolutely critical to assess the economics of such a decision on a systemwide basis dynamically based on how it affects the overall system operation. Not on a busbar-to-busbar comparison between adding a 300- or 600-megawatt hydro plant (indisc.) basis versus, say, what a combination of a wind farm and a 100 megawatt highspeed diesel operating on natural gas or hydrogen and what the busbar production cost for that would be. It is absolutely critical to look at the economics of those two decisions based on how the overall system would function if one or the other were done. He added that that gets back to the question of achieving some sort of a coordinated economic dispatch balancing resources.

[10:34:17 AM](#)

CHAIR HOPKINS thanked the presenters and concluded the meeting.

[10:36:01 AM](#)

**ADJOURNMENT**

There being no further business before the committee, the House Special Committee on Energy meeting was adjourned at 10:36 a.m.