Rep Keith Ammon (00:00:08):

It matters, but did you clip that? All right. This is the first regular meeting of the commission to study advanced nuclear reactor technology in New Hampshire. And so we'll start the meeting is 8 42. Uh, the first order of business actually is our clerk is absent. So would anyone likes to volunteer to be, uh, clerk and take minutes? Michael, would you mind doing it?

(00:00:43):

I'm the worst. I of, I hope that's a David's a lawyer. He wants not to take notes.

David Shulock - NH DOE (00:00:56):

I'll take notes. Right.

Rep Keith Ammon (00:00:57):

Thank you. Appreciate it. All right. Uh, so we'll, we'll just go around the room. Uh, I think we're all here at the last meeting. Okay. Would you like to introduce yourself?

Matt Levander - NextEra/Seabrook (00:01:07):

Yeah. So I'm Matt Levander, uh, I'm the regulatory affairs manager at station for <inaudible> Energy. Then for about, uh, 20 years, uh, I'm off. I'm senior direct operator license. I've for a number of years, <inaudible>. I, nice to meet you all.

Rep Keith Ammon (00:01:29):

Excellent. Thanks. Group. Just good. Right? So you should all have an agenda in front of you. It's, uh, my printer at home, uh, bleeding the blue link the side, so that, that's how you recognize it. Um, so next we'll approve the minutes from our previous meeting. They're all now about <inaudible> the changes to the, from our October 11th to, to read the chair. Yep. Do you have a copy? I, I printed out 12 of them. It was all the motion to approve. So we'll, second. Second. All in favor say aye. Aye. Any opposed, right. Minutes are approved. All right. And we have the public input sign in sheet. So thank you to the members of the public for, uh, participating. If you have it signed in, please sign in. We can keep track of you. We're gonna put out an email list and, uh, broadcast as much information as possible. So I'm going use MailChimp so you can unsubscribe at any time that you, but you'll, you'll notices going commission is scheduled to run until December 2023. So we have a year of meetings to go.

Rep Michael Harrington (00:02:59):

You're still here,

Rep Keith Ammon (00:03:00):

And luckily I'm still here. I won my recount on Thursday. Congratulations.

Rep Michael Harrington (00:03:04):

I was sweating that up.

Rep Keith Ammon (00:03:06):

He's emailing me saying, please don't lose <laugh>. So we have two guest, uh, speakers. So we talked about in the, in our organization meeting that this is a good time to establish relationships with people

in the, in the industry and learn about what's happening currently. And we realized that this is still a few years out, whether it's a good time, you know, the old proverb of the best time Atry was 10 years ago. This is sort of like in advance. We're laying some groundwork, hopefully. Um, so we have two presenters. Um, the first one is from the Nuclear Energy Institute. He sit with us in the room, mark Nichol. Uh, so we scheduled 30 minutes, uh, and then q and a. So we wanna have some robust q and a, uh, including members of public. And then we'll have a presentation remotely from Chris <inaudible> from New Scale of Power. Um, and so he'll be presenting by Zoom and I see him on Zoom. Uh, and similar format, 30 minutes, uh, up to 30 minutes. Listen, q and a,

Rep Michael Harrington (00:04:19):

Mr. Chairman, like, sure, the guy from new skills there. Uh, just to give you a heads up, I'll be asking the 54 question and why it's not 54 anymore, just to give you a heads up on that. Uh, second thing on, I've worked with many, many times, they are the forefront of pushing nuclear power in the States. They only fight for 20 that years ago, uh, fight. So they a really good resource in Washington, and they, they do a good job. And third, I know, as you said, it is a while, and I don't think the power of New Hampshire is the first state, second or third or 10, but somewhere along the lines, if we're gonna go forward with the climate agenda, there's no option. Um, ISO New England just put out a thing a couple weeks ago, which I watched on. They talked about even if we get thousands and thousands of megawatts of, I don't think it's gonna happenings, but even did they still require 3000 new megawatts?

(00:05:22):

Not what we already have of what they call the SPA resources. When I asked them what, what that meant, they said, well, some of them could be non fossil fuels. I said, give for instance. And if it's batteries, tell me if they're gonna be able to run for at least 24 hours. And they said its a placeholder, meaning they don't have a non-US fuel other than the ssat other than nuclear course. One of the things that people should recognize is the new generation nuclear plants are probably gonna be more following, but seabrook really doesn't load follow, I mean, percent, they stay a hundred percent break or breaker, like, which is what they want to do. So in the middle of the night, the pipe prices go down to 3 cents a kilowatt hour or 3 cents a megawatt hour. They're still producing all their electricity. Uh, but the new generation are gonna be more flexible. So they will be to drop up and down follow load. If you don't have nuclear, it's natural gas, and then you go to cold oil. So if you push this agenda with the global warming and climate change, all that, there is no option but nuclear power. So just, it may 10 years, maybe 15, what gonna happen? That's, that's thinking about this not as it nice to have, but is a gotta have.

Rep Keith Ammon (00:06:42):

Right. Excellent. That's

Rep Michael Harrington (00:06:43):

My speech for today.

Rep Keith Ammon (00:06:44):

Great. Thank you. So, uh, so let's, we'll do a little input here. Okay. Um, members of the public, and we have about nine people online. Uh, so if you, if you're online, uh, I've got one comment that they're having trouble hearing some of us that, that silver, uh, globe. There is the microphone. So if you could speak loud, clear directly at that, that globe, our members online can hear it. If you're online and you

have a question or you'd like to make a brief comment, use the Zoom feature to raise your hand. Uh, but we'll start with commission members. If anybody has a comment they'd like to start out with, just to get us going, uh, now is a good time to do it. Any members of the public here, Doug?

Rep Doug Thomas (00:07:30):

Yes. Thank you. State your for the record. Doug Thomas, representative of Londonderry Rockingham County 16. Uh, also vice chair of the, uh, science, tech and Energy Commission. I just wanna say I, I echo Representative Harrington's words. I believe in it, um, something I did when I was in the Air Force, but more importantly, I'm also a member and I hope to be soon permanent member of the ncsl, uh, energy Supply task force. And so any ideas or, or issues that may come out of here that I can take with to the next NCSL meeting? Uh, I Appreciate that.

(00:08:11):

It's, uh, national Congress of State legislators, which is a bipartisan national organization that meets a couple times a year, and they push forward, uh, resolutions that they want to bring forward to dc and it's the largest conference of that type in the country. So, uh, and we do have that energy task force in which, in which, uh, states can bring forward, uh, ideas or resolution states that can actually, so I, uh, that's one reason why I'm here. And the other reason is cause I believe in everything that this stands for to, uh, move forward. This, I also have a request coming up later on, see, so I'll talk about that later.

Rep Keith Ammon (00:08:58):

Great. Thank you, Doug. And just to represent, or to point out two people on the, uh, the Zoom, we have Christine Csizmadia from NEI. Am I saying, am I saying her name?

Marc Nichol - NEI (00:09:12):

A cheese

Rep Keith Ammon (00:09:14):

Csizmadia

Christine Csizmadia - NEI (00:09:14):

That's, yeah, that's correct. Good morning, folks.

Rep Keith Ammon (00:09:17):

Thank you for joining us. And then we have Meredith Angwin, who is, uh, I guess you would, I would call you an energy maven and, uh,

Meredith Angwin (00:09:26):

Thank you. I, I'm a physical chemist who used to work at the Electric Power Research Institute, and has been studying the, uh, energy sphere for, I don't know, I don't want to say how long I have gray hair.

Rep Keith Ammon (00:09:40):

Okay. <laugh>, we've invited, uh, Meredith to, to present at a, at a future meeting. Thank you for joining us. Right. With that, we'll get started

Rep Michael Harrington (00:09:50):

With can. I just should know. And, but, um, I've actually been a member of the American nuclear society longer than I've been married, and I've been married for 40 years, so kinda figured that out. Um, but they have almost an unlimited database on a nuclear power issue. So if you have a specific talk, want a question on, send me an email. I can't give you access to the database, but I can get it, send it to you. So let know if that up.

Rep Keith Ammon (00:10:19):

So some key words to search.

Rep Michael Harrington (00:10:20):

Yeah. Just, you know, if you wanted to do I new thing this month was radioactive waste from fusion power plants. We don't have power, but if we did in that.

Rep Keith Ammon (00:10:35):

Right. Great. All right. With that, uh, we'll go to our first presenter. Um, would you like to stand, um, make sense? So that camera there is going to pick you up if you want to stand in front of it, if you want. How about you sit? Okay. Sit.

Rep Michael Harrington (00:10:57):

Next to Bart.

Rep Keith Ammon (00:10:57):

A great idea. And then I'm gonna be, uh, your, your clicker here. So let

Rep Michael Harrington (00:11:02):

Just put down the sign so I don't That's right.

Rep Keith Ammon (00:11:07):

So just gimme one second to set up here. And

Rep Michael Harrington (00:11:15):

That's at 20 years ago, five 20, basically. Yeah. That t with you figured it out, right, right. That go mm-hmm. <affirmative>. And that was a great help. Well,

Rep Keith Ammon (00:11:39):

Thank you. Would you like the mouse or you do it? Um, if it don't reach from here. I, that, that, that'll you, you're answer. So,

Marc Nichol - NEI (00:11:47):

Well, thank, thank you for inviting us to, to speak today. Uh, and so we're the Nuclear institute. We represent the nuclear industry. Um, my role is senior director of New and advanced reactors. And so we'd like to, um, provide you with information about advanced reactors, uh, here today. Slide doesn't look like <silence> All right. I wanna start with, uh, a picture of what nuclear energy is today in the

United States. So we have almost a hundred nuclear power plants in, in the United States, represents about 20% of the electricity that's produced, but it's over 50% of the carbon-free electricity. So this shows a depiction of, of many of the states where these plants are located. You're well familiar with, with Seabrook here at New Hampshire and, and all the great benefits that it brings to this state. Next slide.

(00:12:49):

There are many, uh, companies that are developing advanced reactors. Uh, this slide shows the ones that are any I members. There's certainly the, the leaders in the technology. There are some, some others, but it's over 20 companies, uh, developing. There'll be some that, uh, have been established nuclear companies for a very long time that you're likely familiar with, like Westinghouse and gei. There are other, uh, new entrants that are also very well established, NuScale, uh, which will present after me. Uh, and then there are some companies that you probably haven't heard of before, like in Alpha Tech or Radiant. And, uh, they're, uh, startup companies as well, that, that are a little bit earlier in, in their pathways for developing the technology. The one thing that's common with all these, uh, companies is that the reason that they're developing advanced reactors is because they're, they see it as a societal good, uh, whether it's for clean, reliable, and affordable electricity, or whether it's, uh, technologies that can be deployed remotely to, to help, uh, bring the sustainability and, um, and, uh, living, uh, standard of living. And, uh, less, less well off areas. Uh, they're, they're all looking at, at how nuclear energy can benefit, uh, society. Next slide.

(00:14:07):

There's a range of technologies that are being developed. Uh, and this will show, uh, two parameters on which we, we, uh, contract them. One is based on size. And so in this, you see on the far left, micro reactors, which are generally less than 20 megawatts, they can be larger than that. And they're primarily for remote deployment. Uh, Alaska and the Arctic is, is a key market for them, as well as perhaps mining operations. And then we have larger, uh, larger than that anyway. And we call them small modular reactors. That just means they're less than 300 night watts for each reactor. Modular means you can put multiple together to make a larger plant. And so new scale will talk to you about how they do modularization and reach, uh, and have flexibility for the plant sizes. Um, and there are a few that are looking at thousand megawatts, but what we hear from the market is that, uh, they don't want a thousand megawatt plant.

(00:15:08):

They want a smaller plant for many different reasons. One is its ability to better match low growth. Uh, instead of putting a thousand megas out, they can do small increments over time. The other is, uh, the capital cost, because nuclear plants are high capital cost, low fuel, low o and m costs. Um, so they're more affordable because it's a smaller total, uh, capital outlay. They're more affordable, especially for smaller companies. And so what we see with advanced, uh, reactors, and we'll get into some of the projects, uh, but some of the lead companies, ums, Pacific Core and brand accounting that are, uh, developing the first three projects. They have never owned nuclear before. They, they don't have a large enough market capitalization or, or a customer base to be able to afford or even utilize a, a large reactor like we have in operation today.

(00:16:01):

So these, uh, these smaller reactors are their first opportunity to actually be able to, to utilize, uh, nuclear power. And that's what really what's exciting about the advanced reactors. The other, uh, dimension that we can use to, to compare them is the material that's used to cool the reactor. Uh, water is used to cool the, the current operating reactors, and we see light, uh, light water, just water cooled.

Uh, small modular reactors are, are one of the, the technology groups for advanced tractors. Uh, we also have others, uh, based on gas or, uh, metal, uh, cool in or, or molding salt. Uh, the one difference between that is the non-water cooled can reach higher temperatures. And so as we look at heat uses, uh, and certainly light water SMRs can be used for heat applications. Uh, but there are some applications that require higher temperatures that the non tempera, uh, this looks again, at the versatility.

(00:17:04):

I covered the size aspect, but let's cover the variety of outputs, because if you look at the market or the nuclear products available in the market today, it's basically one product. It's a thousand megawatts base load, uh, for large grid operates all the time, wonderful at what it does. Uh, but we have different market and different customer needs, and some don't need electricity. Some want hydrogen or some want process heat, some want, uh, flexibility. And there was, uh, some comments earlier about, uh, SMR ability to be flexible and integrate with renewables. There's many different ways in which they can do that, but they certainly are being designed, uh, for, for better integration with renewables and, and batteries for clean energy system. Uh, the process, heat especially, is important as we look at the right side of this chart, which is the multitude of uses. So rather than just a single electric grid, now we can use, uh, advanced reactors to desalinate water. We can, uh, decarbonize industrial sector. In fact, if you look at carbon emissions, electricity is less than half the carbon emissions. Most of the carbon emissions come from transportation and, uh, industrial processes. And nuclear is essentially the only technology that can decarbonize those. Now, uh, I say essentially because you can use hydrogen, uh, for, for heat processes, um, in, you know, uh, you can use renewables to produce hydrogen through electricity. Nuclear can produce hydrogen, uh, through heat assisted electrolysis or other high, uh, high temperature processes, which are, uh, more efficient.

(00:18:43):

The, if, if we just look at the electricity system right now, the advanced react have a lot of benefits to the system as, as a whole. And, um, keep these in mind as we go forward to some slides to talk about economics. But the first is that high upfront capital, which has low fuel and operating plus has results in long term price stability. Uh, because you've, you've capitalized upfront and your ongoing, uh, costs are very, uh, insensitive too, uh, price changes and it's reliable and dispatchable generation. And, and so it's 24 7, uh, power high, very high cap capacity factors. Uh, we talked about integration with renewables and, and storage. The other thing to look at is the efficient use of transmission and even the, the land utilization. So if we look at how many acres does it take to produce a terawatt hour of enter electricity, well, we have, uh, the factors are the, the numbers up there for wind, solar, and, and nuclear.

(00:19:47):

Nuclear is less than 0.1 acre, uh, to produce that one hour of electricity, wind, and solar require a lot more, uh, and land. And the reason is because nuclear is so energy dense in, in its processes. And so there are benefits from, from that environmentally friendly. In fact, uh, if you look at total carbon footprint at advance, reactors are on par with wind, which is the lowest of, of any technology. And they're being developed with Blackstar, uh, capability and operation independent of, excuse me one second. Most people aren't gonna know with blackstar operations. Okay, I will. Yeah. Thank you. Um, so today's reactors, if the, um, they, they require power from offsite to maintain safety systems. Well, the advanced reactors, and we'll get into safety in a minute, um, don't require offsite power to maintain safety. And so because of that, they can operate, even if the grid goes down, black start means the entire grid went down and you have to start it back up from nothing.

(00:20:50):

So that's black, you know, no, no lights are on. And these advance reactors can start themselves up, and then they can be the, uh, source of power that starts the entire grid up. So, um, we don't really, really, really important Yeah. Can't do without. Excellent. So there have been many studies out there that have looked at, well, what is the ideal or optimum energy system, uh, for the future? If, if you want clean energy? And, uh, this is one study. Other, uh, others have been done by, by utilities, uh, that we know of. And they all look at, well, what are the, uh, choices of, of clean technology? They know that it has to not just be zero carbon or this, this study is 95% reduction in carbon. Uh, but it has to be reliable and affordable. You can't just have one. You have to have all three clean, reliable, affordable.

(00:21:47):

And so they run the study to produce the lowest cost system, and the, the model picks the technology that is optimum for that decision. This model, by the way, is an hour by hour matching of supply and demand. And it actually factors in, um, wind and weather and climate, uh, uh, a conditions over the year and, and during the day. And so it knows when the wind, uh, and, and the sun are not available. And so it knows that it needs a backup for, for that at that time. And so the model pick a lot of nuclear and that situation, because this firm dispatchable is so important, um, and it was up to 43%. And so that's a lot of new nuclear. And they reran the study and said, well, okay, that's a lot of nuclear. What if we couldn't get all of that nuclear into the system for whatever reason?

(00:22:41):

Uh, maybe there's a regulatory bottleneck. Maybe, uh, we have some supply chain constraints. Uh, whatever the, the reason, and it said, well, in that case, uh, we're, we're not gonna pick as much nuclear because artificially you said you couldn't. And so we're gonna pick more wind and solar up to 77%. Nuclear, still about 13%. Now, the important thing is both of these get to zero carbon. Both of these produce some, some reliable, um, energy systems. The, the difference is that the, the, the scenario with nuclear constrain was almost at half a trillion dollars more expensive, which has to be paid by the customers, uh, that used to have, uh, so this is, uh, a look at, uh, traditional comparison of cost levelized, cost of, of electricity. The orange are advanced reactors. The blue is natural gas with some price on carbon. Uh, green is wind and, and yellow is, is solar.

(00:23:42):

There's a lot of data in here. I I don't wanna go into the details. Um, but, but the main, uh, conclusion of this is that advanced reactors are in the ballpark of, or at least cost competitive with other, uh, technologies based on just a, a levelized cost of electricity comparison. And that's what most people do. The, the challenge though is that not all of these are apples to apples comparisons. So nuclear is firm dispatchable, and, and so it, it's there when you want it. Um, and, you know, wind and solar have some variability, and so you have to cover when they're not available. So the next slide shows, well, what if we try to make all of these, uh, reliable and clean? So it's apples, apples comparisons. And the method they used was an <inaudible> method, uh, that Texas, her cut. And it basically looked at, well, what's the peak winter and peak summer demand?

(00:24:39):

And what's the cost to assuring that you can cover that electricity for this various sources? So for nuclear, there could be some, some outage. So there's a cost to covering that, uh, for wind and solar. What if the wind or, uh, or sun isn't there? Well, there's a cost to covering that. And so this shows that it's a reliability adjusted levelized cost of electricity. And it shows that advanced react are, are actually, um, much more cost edited. And that's why, if you remember the, the study I showed earlier, that's why the model was always trying to pick nuclear, uh, because of its, its firm dispatch.

(00:25:19):

Want to talk a little bit about advanced factor safety? You're, you're likely familiar with, with Seabrook and, and safety record of, of our operating reactor plants. It's important to know that that operating, uh, nuclear reactors are one of the safest industries in the entire world. Um, and so a lot goes into that, uh, strong independent regulator, the Nuclear Regulatory Commission, they're built tough partly because of the requirements to build them tough, but we build them tough so that, um, they can, uh, mitigate and withstand potential accidents and avoid them. And then over the years, we've gotten really good at operating them. And what we find is operational performance, uh, leads to safety performance. Uh, because when you're doing operational performance, you're making sure that all of the components are operating and replaced and maintained and repaired, uh, on, on schedules to prevent, uh, uh, down times.

(00:26:17):

So advanced reactors are building on that record of, of safety, uh, and now the safety profile between different designs are gonna be different. So not all of these features will, will be in every single design. Uh, but what we find is that all of the designs are, are working in enhancing safety in three main areas. First is in using inherent safety features. So this would be like natural circulation or gravity, things that nature or physics do all by itself. And the important thing to know here is that they're much more reliable than an active system. So if you need a pump to put water into, to the reactor in order to maintain safety, well, something could happen to that pump. It may, it may fail. You may not have electricity to it. Um, but nature is always going to, to operate. So, so there's enhanced levels of safety there.

(00:27:10):

In fact, what we found is, uh, as we made advanced reactors and the shrunk them, so you're, you're going against the economies of size, um, you actually get what we call economies of safety or economies of simplicity. So as you build in those natural, uh, physics into the reactor, uh, you can eliminate a lot of complex systems. And, and that actually helps to increase safety and decrease costs. So safety and cost are not opposed to each other. They're actually, um, complimentary. The other thing is to look at is reducing the risk, the smaller size as smaller radioactive, uh, inventories. Uh, they're being designed to minimize the potential, or even in some cases, eliminate the potential for accidents. And then if an accident were to occur, uh, they're designed to mitigate the, the consequences of those. And then finally, an emergency response. If something happens, uh, they're being designed so that, uh, the accidents take, uh, longer to progress so you have more time to react. But in most of the cases, uh, the plant will respond itself partly due to natural physics, so that you don't need, uh, power or human actions, uh, to be able to, to maintain safety. So if you think about Fukushima, one of the reasons it had its accident is because it lost all of its power. It didn't have access to additional cooling. Well, these are designed so that you don't need offset power. You don't need additional water to, so that's enhancing

(00:28:44):

Talk about waste. We get asked this, this question. So in fact, before I get here, we, we often get times or often we, we get asked the free questions, um, in this order, when will they be ready? And I know that was a comment earlier. So, uh, to, to be aware, it takes about eight to 10 years, uh, from when a company decides they want and advanced reactor to when it begins operation. Uh, and we wanna get that down to five years. But today it takes about eight to 10 years, and it takes two years just to prepare the license, three years to get it reviewed, three years to, to construct it. So that's the timeline. And so it's not too early. If you're thinking about potentially needing a nuclear reactor eight to 10 years from now, now is the time to start planning and considering it.

(00:29:30):

Licensing. That's right. Yeah, licensing. So the second is cost. Uh, the, the third is, um, some of these risks, uh, so waste them. Well, if you think about any technology has to deal with its waste, and everybody has to do three things with their waste, you have to have a way to manage it safely. The nuclear industry is develop technologies, uh, to be able to manage, use to deal safely. Uh, today we store it in dry casts after it's been in the pool. And the NRC is confirmed that those can source the, the, the use fuel for decades, uh, even hundreds of years, uh, very safely. So we have the technology to, to do it, uh, you have to be able to pay for it. Now, nuclear is, is unique and that we actually collect fees as we operate, uh, to be able to pay for used fuel.

(00:30:25):

Um, and so today there's over 40 billion in the nuclear waste fund for the disposal of, of nuclear, uh, used nuclear fuel. Then you have to have a place to, to put it. Well, we do have a place, uh, there is by law and stipulated, uh, as a place to put it for an, um, you know, for, for permanent disposal. Now, there is a discussion in Congress whether jumping mountain is the right place, or should we go and have a consent based, uh, approach to find a different location. And you know, what's important is that we get that decision, right? And so while we wait for Congress to figure out exactly where it's gonna go, uh, we, we can recognize that what we can store safely. In the interim, an industry is actually pursuing what we call consolidated interim storage. So it's to take all the waste from the sites that they currently are and put 'em in, uh, a single place so that it can be stored there more efficiently.

(00:31:21):

Um, and so we are working on that. It, it does take time, but, but there is progress being, I should also mention, uh, the size of nuclear waste. So I talked about, uh, nuclear's energy density in terms of land utilization. When you look at all of the, the used fuel from nuclear operations over 40 years, over 20% of the US electricity, all of it stacked up at about 12 feet would take up the size of a football fuel. That's how small it's, and so it's hard to compare against other technologies, but it's a very, very small volume. And beyond that, it is solid in form. It's not gas, it's not liquid. It's easy to escape and get into the bar environment. It's, uh, solid. In fact, it looks, it's, I put nuclear fuel up there as a picture, that's a new fuel assembly. But the used fuel assembly looks identical from physical features.

(00:32:14):

So there is radioactive, uh, material in there. Uh, it does have to be protected from the public. It is dangerous if you get close to it. Uh, but because of its solid form, it's very easy to protect through engineering features. Um, you might mention on that one, it's also doesn't require anything. You could say public security. Once it comes out, it is, uh, it's just air. Cool. So as long as it's air, there's nothing that has to be done, just stay by itself. Nothing has to be maintained. The only thing is security, so someone doesn't try to steal it.

(00:32:56):

Um, so with all that is background, I want to talk a little bit about where is, where are advanced reactors going from here? So we, uh, it pulled our members, uh, which are almost 50% of the, the electricity generation in the United States, and asked them, what are your plans for the future? This was before the Inflation Production Act. Um, and over 90% wanted to, was the inflation production act help? Uh, the cause of nuclear? Yes. Yeah, absolutely. Yep. I'll, I'll talk over a little bit about the provisions that it has. Yeah. The IRA would, in my estimation, increase, um, these plans for benefits. So, uh, over 90% wanna operate the current fleet, uh, at least 80 years. Now they're looking at 90 gigawatts, all total among them of new nuclear by 2050. That's over 300 SMRs. And that's not all of the electricity generators, and that doesn't include non electricity. Excellent.

(00:34:01):

Uh, so I do wanna talk, one of the things that they're looking at is full, the nuclear transition. And there's, um, you know, shut down of coal for a lot of different reasons, and we're not advocating for, for the shutdown of coal plants. But if they do shut down, um, there is an opportunity to transition, uh, shut down full plant and into an SMR or advanced tractor. So, um, the, you can capitalize on the existing structure, certainly the transmission and transformers, but perhaps some other, the rails are, are really valuable. You can save the jobs and some more support the community. One of the things that we've seen in, in a lot of interest going forward full, the nuclear is, uh, just the experience of having, uh, towns that were dependent on a full plant shut down, and then the workers move because they need, uh, jobs. And as the workers move, the, the rest of the economy, uh, turns down because they were dependent on, on secondary effects of, of the economy. And then, uh, the, the community's just devastated. So, um, we, we do, uh, wanna talk a little bit about that <inaudible>.

(00:35:10):

This looks at the number of jobs that different, uh, technologies, uh, typically provide on average. And you can see a coal plant's about a hundred jobs, uh, nuclear plants, about 237, uh, jobs. And you can look at the difference in wages. Nuclear tends to provide the highest wages of any, uh, energy, uh, type out there, uh, much higher than than the rest. And, uh, so there are, there are benefits in terms of preserving all those jobs and, and preserving high wages. And what we see, uh, can we go to the next slide?

Rep Doug Thomas (00:35:46):

The, uh, number of jobs for, does that include your security force?

Marc Nichol - NEI (00:35:51):

Uh, yes, it does. Yeah.

Matt Levander - NextEra/Seabrook (00:35:54):

Can you also comment on the, the skills breakdown needed? Yeah, that's, I sort of, I wonder if we're comparing apples to oranges.

Marc Nichol - NEI (00:36:01):

Yep. That's what I was about to do. I thought I had a slide on it, but I don't. So, um, what we find are the skills are very similar between a full plant and new nuclear plant. In fact, the full plant and a nuclear plant are not that different. The only difference is how do you keep the water that drives the entire, um, energy conversion system. And coal burns. Coal obviously boil water, uh, nuclear splits, atoms to boil water. Other than that, there's really no difference. And so most of the jobs are related to that energy conversion system. And so those are directly relatable or transferable from coal to nuclear plants. Now, a nuclear plant will need a nuclear engineer or two, uh, that's gonna have to understand how nuclear reactions work.

(00:36:47):

Uh, so those, those probably are not transferable jobs, but, you know, 90, 95% of the rest are, in fact, in my experience, I've worked with Duke Energy early in my career, and I worked alongside older, uh, people that had come from the fossil side of Duke Energy and, and came over and transitioned to, to nuclear. A lot of them went through the construction and operations,

Rep Michael Harrington (00:37:11):

A mechanic is a mechanic, electrician is an electrician, that's 90% of the work being done on post nuclear stuff. That's right. Hot water and steam. Yeah. And it doesn't make any difference how you produce it. You gotta treat it the same way, the same sets of issues.

Marc Nichol - NEI (00:37:24):

Yeah. Yeah. And there will be some, some training for, you know, to understand what nuclear react safety culture is really big for nuclear industry.

Rep Doug Thomas (00:37:32):

Right. If I may ask question. Uh, so right now we have coal plants that are paid millions of dollars to sit idle, just in case they're needed start up for a week or two, replacing with, with a, a small scale reactor that could be running all the time. That had to be paid billions. Just

Marc Nichol - NEI (00:37:52):

Either. Yeah. Yeah. That, that'd be, yeah. I You could do that. Absolutely. I think that would be a huge economic benefit. Really reduced possibility. All right. So this slide is, is about federal support. We have had strong federal support on both sides of the aisle, uh, for a very long time now, um, with, whether it's in Congress or whether it's the administrations, all of them have been strong supporters Now for different reasons. Uh, the Democrats tend to like nuclear because it's zero apartment. Uh, the Republicans tend to like it because it's, uh, reliable. And, and so they're, they, they like nuclear for different reasons. But everybody, uh, in, in, you know, the federal, um, political structure, uh, like, like nuclear. And so DOE is funding 12 designs at over 5 million. Uh, they, there have been a couple of key bills, uh, that, that are up here in terms of fund providing funding and money.

(00:38:49):

There's been other bills that have, um, encouraged or directed the NRC to become more efficient is as well as other things. So the structure bill funded two of the demonstration projects, um, with, with the money front, so they don't have to worry about annual appropriations. The Inflation Reduction Act is, is the biggest benefit. Not only has it helped our operating fleet, but it's given both a production tax credit and an investment tax credit to nuclear. And now these are the same, um, uh, the same support that's available to all clean energy sources. But, uh, this, for the first time, nuclear has been able to access the same support for clean energy as renewables. Others, we've always,

Rep Michael Harrington (00:39:33):

but it doesn't apply to all plants. For example, <inaudible> that we used last week, uh, would not be eligible for these payment cause they're cost efficient already.

Marc Nichol - NEI (00:39:44):

Um, well, I don't, I, I won't talk about the operating, um, the operating credits because I, I don't, I'm not an expert on that.

(00:39:52):

So yeah, I'll to that, that, yeah, that, that, that is correct. Based on financials, depending on Right. Prices go opposite, correct. Yeah. But, and, and these up here are just for new reactors, new, new construction and built. And now there's bonuses. If you're in a certain energy community, certainly a pull to nuclear, uh, would qualify. So if you're repurposing a, a full site, um, it would get a 10% bonus. And then if you

use primarily domestic supply chain, you get another 10% bonus. So it can, it could be quite high. There's other, um, support in in there as well. And then finally, CHIPS Act has, which may be in of interest to, to New Hampshire's, the state of New Hampshire financial assistance. We're looking at RD and d research development and, um, uh, demonstration of advanced reactors. Excellent.

Rep Michael Harrington (00:40:47):

One question. You mentioned domestic supply. How, how does that stand now? I know the past it was pretty good, get most components from the United States, but since we have a made reactors in quite some time, I mean, can you get a reactor vessel even for a small smr, let's say it's maybe the United States a someplace else.

Marc Nichol - NEI (00:41:07):

There, there are US suppliers. I know our supply chain is not as robust as it used to be. If, if, if it's okay, I'll defer that to Chris Colbert for, cause they've done the detail chain. Thank you. You, yeah. Slide. Uh, this slide shows all of the states that have had recent legislative action for advanced reactors. Uh, most of it this year, not all of it. Um, and so you can see there's, there's quite a bit out there. Uh, New Hampshire obviously is, is up there as well as other states. Now. Now there's three main areas that states have, have acted to, to look at advance.

(00:41:42):

The first is to look at, um, look at the energy system and say, well, hey, nuclear and nuclear is something we need to take a look at. And so they do an SMR study bill or mission of, you know, a panel like, like this to study nuclear. Another is to, the states have looked at said, well, we, we actually have barriers to new nuclear in our state. We have a moratorium on building, or we have something that makes it difficult. Uh, and, and, and they've repealed those. So West Virginia is an example that we feel they're more on, on new construction. The third area are more, um, uh, positive, uh, supportive mechanisms like tax credits. So Idaho has some tax credits on the book. Uh, last year, Indiana actually passed the bill that gave all of the, the support available for renewables. They said nuclear, you can have access to that same type of support. So they put nuclear on a level playing field with, uh, with renewables in terms of, uh, recognizing their clean benefits.

(00:42:47):

Uh, this is a map of what that looks like in terms of, uh, the, the green and blue represent states that have passed or considered that didn't pass legislation, uh, in, in the recent years. Now the dots all represent projects that are considered or planned in the United States in can over 20. Um, and this, it can be surprising. It surprised me when we put it together the first time last year. We have been thinking there's maybe three or four. Uh, there's over 20, there's a lot of interest. A lot of this is, is developed recently. Um, a lot of it has come from the recognition that nuclear just has to be part of the solution, uh, to, to reduce some carbon in a reliable, affordable way. Others have looked at it and said, well, there's energy security issues with the Russian invasion and what's happening in, in Europe.

(00:43:36):

And so we want, uh, to look at aquarium in that regard. Um, others have, have looked at it and, um, said, well, you know, now that we have some support from the, the federal government, it might make sense economically to pursue this. Now all of this again, was before the Inflation production Act, which I, I think would help. Uh, probably in six months time we'll see that that map will have more on it.

Rep Keith Ammon (00:44:04):

Question the two under construction?

Marc Nichol - NEI (00:44:06):

Uh, uh, the 2 under construction menu are, uh, Vogtle three and four, uh, being built by Southern, uh, Nuclear. And those are AP 1000. So they're 1000 megawatt lot each and they're gonna come online in 23.

Rep Michael Harrington (00:44:23):

I obviously, okay, we've been told 20, 23 20. We were told 20 15, 16, 20 18, 19 20, 19 20, so forth. We were told 10 billion total. Now it's gonna be over 20 billion. I mean, that is the sore thumb and the whole thing. Nuclear. Yeah. People are looking at that and saying, why is that not gonna happen again other than South Korea? Yeah. Which for some reason has miracle workers. I guess no one can build a new, new plant. The one you don't mention is the one in, uh, in South Carolina. Uh, some three and four. Yeah. Which they spent out of like six, 7 billion on and canceled. Right. So that's the big thing that everyone sees. What are we selling the people? What are we telling people? Now that's not gonna happen. You know, this is one stock license Yeah. Construction permit in an operating permit. Westinghouse blew, they bankrupt, they've been sold and all that other stuff. What is it we tell people to say that's not gonna happen again at the next point?

Marc Nichol - NEI (00:45:22):

Yeah. Great. Great question. We get that a lot too. I mentioned the three questions at risk being one of them. So the construction risk is certainly one big concern. And so there, there are some things, uh, to, to understand. So, so first with the Vogtle and the the summer project, uh, we've learned lessons, uh, what, how, what not to do, um, in, in terms of, uh, beginning construction. So we know that we need to have the design more complete before we, we begin construction. Supposedly you was, yeah, there, there, I won't get into the details on, on uh, Vogtle three and four today. It'd be its own topic probably. Um, but there, there were external pressures that prevented them from being able to the design, uh, to the point that they had planned.

(00:46:06):

Um, and so that, that, that was a impediment to them. Um, there have been plans in the United States build on time, uh, a long time ago. I think super, actually I'm thinking of a different plan.

Rep Michael Harrington (00:46:20):

Um, we, we had the John Moody, who was the first, uh, station manager, say we had the record for the longest operation plant in the United States. Full license hour license of zero power and operated that way for like two years.

Marc Nichol - NEI (00:46:35):

Okay. Okay. I'll have to, to look off which one it was. Um, and you, you mentioned that, uh, sorry, just a second. Uh, you mentioned Korea and Japan also built on time on budget. So we've learned good things, uh, from them. So I know Nuclear NEI is putting together the construction best practices and making that available to our members so that they know what to avoid and what to do in, in building their next plants.

(00:46:58):

Uh, the other is, is that there are certain design features with Advanced Reactors that are going to help that. One, they're smaller. So it's a not as big of a mega project. It's still a big project. Uh, the other is that more of it is going to be in the factories. And so this allows parallel, uh, work. It allows better control over quality in the factory. So, and there's less work in the field. And what we found is the work in the field is where it, you get the, the challenges cause you're trying to work do too many things in one small combined space. And so those are gonna contribute to a, uh, to, to a better experience. But, uh, the honest answer is to nuclear industry has to do better and, and we need improve ourselves. Um, and so we, we understand that there's gonna be a lot of, um, caution.

Rep Doug Thomas (00:47:50):

Thank you. Um, you, um, briefly mentioned, uh, for construction risks, external factors, my thinking that means litigation protests, uh, all, all of your cost estimates, do they factor in the risk of excessive delays due to protests and litigation factors? Cause I know that was a huge factor in Seabrook back in the day when they said it'd be cheap energy and it really didn't become to be cheap because of all those litigation, uh, that dollars had to be spent. What can we do to prevent or mitigate that? And have you considered that in your process?

Marc Nichol - NEI (00:48:30):

Yeah, I, I know that there is, um, uh, mitigation, um, you know, cost increases to, to, to mitigate things like, like that. Um, specifically for interventions, um, using the part 52 process is one way to mitigate, uh, potential intervention. Cause you have the entire public engagement process before you get, uh, approval to begin construction. And so, uh, you, you don't spend construction is when you spend lots of money. So you don't start to spend lots of money until you've already got past, uh, all of the intervener contentions. And you've, you've went through the process to, uh, resolve all of those. So part 52 is one way, um,

Rep Michael Harrington (00:49:15):

Just to, to make sure people, when Seabrook was built that wasn't available, right? So what happened was you had a construction permit and you went through all the hassles and all that other stuff, and they finally got that. But then they had to go for operating permit after it was built. And that's why we were operating for, you know, multiple years, zero power. And that costs the delays, you know, millions and millions of dollars. Everybody's referring, do we get that all done once stop shop front once it's done, there's no venue about theoretically there's no venue for reprotesting once you try to turn the point on.

Marc Nichol - NEI (00:49:48):

That's right. Yep. And, and so the other thing that we're, we're looking at, do we want be more, uh, proactive with community and public engagement to get them involved in the process, um, up front. Not that we didn't do that in the past, but we wanna do more of it. Um, now when I talked about external factors, I'm glad you said that cause I was talking about different external factors and, uh, the VO and, and summer experience movement.

(00:50:12):

So, so the couple of things that happened is that, um, when they were approved by the nrc, they had to go back and change the design based on, um, new requirements from the nine 11, uh, attacks. So those, those were special security features that had to be designed at, after the NRC had approved the design.

Um, and so that diverted engineering resources from completing the design the way they wanted to. Um, but they couldn't delay start of construction because, um, the, uh, federal tax credits had an expiration date on it. And so if they had delayed construction, they would've gotten production technic tax credits. So, um, you know, whether somebody needs to redesign based on a, an event like nine 11, uh, nobody can predict nine 11. So, you know, that's always a risk, although very, very, very small terms of, um, the external pressures for, uh, federal, uh, support to expire. That's not in the inflation reduction act. In fact, the way it's worded is if you begin construction at some point in time, then you're guaranted to get it how long construction last. So there is a bit of in,

Catherine Beahm - NH DES (00:51:27):

So spoke a little bit about increasing community involvement, um Sure. Where environmental justice type issues fit into the plan?

Rep Michael Harrington (00:51:37):

So we, we have, uh, an environmental justice, uh, principles, uh, on our, our website and so we can get them to you all. And it talks about what are principles for being good stewards and environmental justice and, you know, good stewards for community to make sure that, that we're following that not just from the legal perspective, but sort of from the principle or moral moralistic or ethical perspective. Um, we're also developing, it's, it's only internal. We're not gonna release it publicly, but it's, um, best practices for pursuing, uh, environmental justice and community engagement.

Rep Keith Ammon (00:52:11):

Can we define environmental justice?

Rep Michael Harrington (00:52:15):

Uh, that's a good one. Depend you ask,

Catherine Beahm - NH DES (00:52:19):

I'm not expert on it myself, but I, I just was curious whether you had that in terms

Rep Michael Harrington (00:52:25):

It is on that term, you know, historically, uh, and maybe is an exception rule on this one, but mostly the rural areas, whole population now, given the fact that the SMRs gonna smaller and inherently more safe. But that's, that's the thing you have to be, do you see the location, the sighting of them continue to be areas or we can see them put more closer to them with the load center side?

Marc Nichol - NEI (00:52:53):

Yeah, so the, the, the safety aspects of the design and what the NRC is, is looking at with these, those safety aspects is that they can be located closer to population centers. And so that's one of the reasons why they're good candidates for full sites, because they're closer to population centers. Um, and, and so certainly that, that is possible. It, it's, it's not that it would have to be in a rural location cause of safety regulations, um, and that, that opens up the potential for the number of sites. Now what we do also find is that where nuclear plants are, um, they may have been some very poor communities before the nuclear plant came, but once the nuclear plant comes, it brings lots of jobs and tax base that communities actually become fairly wealthy after that. So the average, uh, income by,

Rep Keith Ammon (00:53:48):

I'm just gonna interject the time check. We're about an hour into the meeting and we wanna wrap around 10 30.

Rep Michael Harrington (00:53:57):

Yeah, the last slide, I don't about the slide very much. Um, I just wanted to point out that NEI had put together, uh, and just recently released, it's on our website, there's the link at the bottom, it's state options to support advanced reactors. So we recognize every state is different, uh, in terms of their interests, in terms of where they are, uh, in, in terms of what the, the communities and, and um, uh, the voters would, would like to see in, in the state. So there are a number of options in this paper laid out, uh, that you can, it's almost a menu you can pick and choose which, which ones you think might, might find in your state if you were interested in supporting it. That's

Rep Keith Ammon (00:54:43):

Right. So we did q and a during is, is there any other, any additional questions including from our Zoom audience? Raise your hand if you have a question using the zoom feature other hand up first. Okay,

Bart Fromuth - Freedom Energy (00:54:59):

Fine. Um, just in terms of the, uh, the licensing process, um, obviously you have to go through, uh, the nuclear regulatory. Nuclear regulatory. Okay. Um, and would, would, would FERC have any involvement with that as well? Or any individual iso jurisdictions?

Marc Nichol - NEI (00:55:16):

Yeah, so, so FERC would be more on the, um, the, the commercials, the commercial side of the plant. Uh, so they wouldn't be involved in the safety. But um, if you, yeah, if you're going to, uh, deregulated market, yeah, the ISOs people, if you're in a regulated market, the utility commission would be, but they would all be there for sort of the economic regulation. Are they, are they costs, are they, is it a cost effective?

Bart Fromuth - Freedom Energy (00:55:42):

So they wouldn't have any jurisdiction over the safety analysis. Okay.

Rep Michael Harrington (00:55:46):

In New Hampshire, the only people that would've jurisdiction over that, that the nrc, the state has no jurisdiction. The CEO has no jurisdiction. ISO England only hits jurisdiction to the point of you're putting electricity on the grid, they don't care where it's coming from. Okay. Uh, it's just you're putting this amount of electricity on, have to modify the transmission to accept it or whatever. And it's just nothing unique to nuclear. It's exclusively with the nrc. Okay. Yeah, there is, I, there is a little bit of, um, des because of, uh, water permiting, uh, which, you know, if you have a discharge permit, something like that, EPA defer to DES. So you do have to have a discharge permit through them, but that's not need to, it's simply that you're charging,

Bart Fromuth - Freedom Energy (00:56:34):

So you're talking about timelines in terms of like two years to prepare your application, then three years for licensure review. You know, once you get past that three years, you know, assuming you're approved you that there aren't any barriers left.

Rep Michael Harrington (00:56:46):

That's right. Right.

Rep Keith Ammon (00:56:49):

And so state your, for the record and speak loudly so that the folks online can hear your question

Michele Roberge - DHHS (00:57:02):

in particular state agencies, a lot of the security, um, management and have a fairly robust emergency response plan should any <inaudible> how do you envision these smaller units kind of fitting into the state's emergency response plans or it's matter?

Marc Nichol - NEI (00:57:26):

Yeah, yeah, we have looked in into that. So the, the nrc um, recognizing that advanced actors have some advanced safety, so there's, um, less radioactive material to get out. There's less chance that it's, it's gonna get out. Um, they, they're going through a rule making right now it's, it's at the final rule stage. Um, and so it'll be implemented soon and it's allowing, uh, the size of the emergency planning zone to be tailored, uh, to the, to the characteristics of the design of the site. So now it will allow, if a, if a site and design can justify it, it will allow a site boundary emergency planning are so in that extreme pace. Um, what it means is you don't have to prepare offsite emergency response, uh, capabilities. Now the EPZ is set, uh, based on the EPAs protective action guidance. So it's one run.

(00:58:22):

So it's very low, low dose. And um, so what that means to prepare the, sorry, the free plan offsite, uh, response is basically are you going to, um, hunger in place or are you gonna evacuate? So you don't have to do that. Uh, but you still have to have onsite emergency response. Um, in fact you have to do most of the response. Now even within that, um, and we've seen this with Uhlin River. So TBA had an early site permit, um, in, in Tennessee and they, they were able to get, they had two emergency planning zones. One was a site boundary and was two miles. Cause they hadn't selected the technology yet. So they didn't know which one that technology can qualify for. So within that, even for the site boundary you agency, they worked with the state environmental agency and the local emergency responders and they came up with, well this is what feels right for us, you know, beyond what B NRC requires. This is sort of how we're going to work it out for the, so there still will be, uh, state interactions with the project on environment.

Michele Roberge - DHHS (00:59:37):

So I think what I'm hearing is that each of the visual site would have its own essential emergency response plan and the agency would be, uh, specific to the technology distance. Whether that, whether that's an offsite response plan or not, whether it's all within property boundaries or,

Marc Nichol - NEI (00:59:59):

That's correct. That's correct. And the thing I forgot to mention is, even with that, if it's a site boundary using, you have the onsite emergency response plan. It provides the, um, foundation for an offsite

response if you should need it. But, uh, that, that offsite would be at home. So the, the idea is the doses are so low, the times that you have are so long you don't have to replant that you can, if, if the situation arises, you can work in real time with the state to find out what the proper offsite response will be.

Rep Keith Ammon (01:00:33):

Excellent. Uh, and so we'll provide contact information, uh, if you have any questions, I forward, I just asked that you include myself and our vice chair in that conversation so that we can plug the commission in if there's Yeah. The gentleman, would you state your name for there?

Bruce Berke (01:00:49):

Sure. Bruce Burkey. I just wanted to ask whether the NEI slide deck will be available to commission, to the public?

Marc Nichol - NEI (01:00:57):

Yeah, you welcome to share iit.

Rep Keith Ammon (01:00:59):

It at the very end. So we're gonna launch a website that's gonna have all the information from all these, including the videos, and I'll include the presentation. I'll give you a quick preview review of that at the end of the meeting. You have other questions?

Rep Michael Harrington (01:01:10):

I actually two questions. Um, angle the high assay low rich uranium, uh, just so we understand that right now most react like some review somewhere around five or 6% in which 35, uh, they have to do this Exactly, bring it up from the natural enrichment, which is only about less than 1%. And the advanced react is almost all the SMRs are gonna use, it's called hay, which would be five to 20%. And, cause I think it's once you over 10% enrichment the whole new world of, uh, regulations. Cause you get closer the, which is 80%, so it's a little waste away. But they just gave, what was it, 700 million dollars something? Is that going to solve the bigger problem, solve last fuel available, the leads advance reactors when it built?

Marc Nichol - NEI (01:01:59):

Yeah. A couple of things. Uh, just for clarifications. Um, so, so not all advance reactors need. Okay, so only it's mostly the non-water pool. All the water pool, like the new scale that's gonna present after me, um, they can utilize, yeah. So the, and then the other thing is, is it's enriched up to 20%. Now that's still far below, uh, you know, weapons rate, weapons rates like 90%. So it's still considered low enriched and it's still considered proliferation safe. So, um, now you are correct that after 10%, we don't have any ability to easily expand the commercial of supply event. It's gonna require, um, you know, changes to the fabrication and enrichment facilities. It's gonna require other things. And the industry doesn't wanna make that investment without a guaranteed demand. Yeah. So that chicken, so yeah, there's 700 million from the, uh, ira that, that goes in into that. That's not enough. We need more, more than that. So it's sort of the, the initial, uh, payment and, uh, doe still need gas diffusion.

(01:03:13):

It, it, it's not yet decided. What, what technology, I think it'll depend on, on who they go with. DOE they just sign a contract with Centris and that'd be gas institution. So for, I think it's <inaudible> that may not be right. But, um, so yeah, it's, it's yet to be seen.

Rep Michael Harrington (01:03:29):

And then if the final, the question I have, I mean, kind of goes to the next presenter, but I mean, since you representative the nuclear industry, it's gotta be the go question. Um, we just saw summer plant, 7 billion topic. Um, we saw the plants in Georgia up to 20 billion, basically double price, very many delays, cost runs. And now I see this goes out last week that the initial price for the new scale plant Wyoming, it's 58 a megawatt. Now they're talking 90 to hundred. Why would anybody look at that and say, nuclear's crazy. Why would I ever get involved in it? Because they cannot deliver on a price.

Marc Nichol - NEI (01:04:14):

Yeah. That, that is a concern for some. And so what we hear it

Rep Michael Harrington (01:04:19):

For people that are gonna spend their money on, well, so there's... Would you approve the plant that is that subject to over class, over ones was a regulated state?

Daniel Goldner - PUC (01:04:28):

Not going to answer that question.

Marc Nichol - NEI (01:04:33):

So what we do see is that there are a lot of utilities that wanna be set. They, they wanna wait and see for the first ones come in on time, on budget. But there are companies that are out there that are willing to build the first ones. And that's why you have 20 projects, uh, on that map. I, I should now, part of what's helping them do that is that there's government support, which helps to, with the economics. The other is that they look at what the things I talked about before, the, uh, simplicity of advanced reactors. The fact that we're being proactive on, on lessons learned and, and trying to implement them. It all applies to NuScale, which is almost, yeah. Yeah. Well in all add NuScale, talk about their, the price. But I I will say, um, just, you know, so, so it's not, not left out there too, too long, is that the cost increases are almost entirely due to inflation and interest rates. And those are gonna impact not just nuclear, it's gonna impact everything.

Rep Michael Harrington (01:05:28):

Let me ask you write a question then. There was a memorandum of understanding signed with Dow Chemical in somebody to build an SMR to provide electricity to fund there without chemical plants in Louisiana. To the best of my knowledge that went forward, it would be the first plant ever built in the world. Private funding rely 100% on rate payer or government funding. Is that, is that possible actually happen? It is possible, yeah. And now sign their, their agreement with X-energy and we see a lot of interest from others. We see interest from oil and gas that change. The world changes. Yeah. We, we see interest from the mining community because they, they all have imperatives to reduce their carbon emissions. Um, and some are, uh, government directed. Some are, you know, uh, board directed. Others are directed by their customers. They say, you know, like mining, we're not gonna buy your copper if it's, if it has carbon attached to it.

(01:06:26):

So, and in New England, we're all so as it is right now, that would be the option than rely on ratepayers.

Rep Keith Ammon (01:06:36):

We're, we're gonna have X seven present at a future meeting. They're in the queue as well. We gotta do a time check. Cause I think our next presenter, um, has a meeting following ours. So I think there's a time, but we do have two people on the line. So if you could keep your questions, uh, you know, brief and to the point. I'm gonna, uh, ask Meredith Angwin, would you go first, please?

Meredith Angwin (01:07:00):

Yes. Uh, uh, my question is, is is simple that in one of the earlier slides you showed, uh, one, uh, situation, which had like 60%, uh, nuclear and another with like 17% nuclear, and they both provided low carbon, um, and, uh, and, uh, reliable power, both of those situations, one was like 70%, uh, renewables. I wanna know about the renewables. Uh, what, what was modeled as the backup for times when the solar and wind was not available? Was it pump storage? Was it batteries? Was it something else? Uh, uh, just, I just wanted to know what the backup was for that model?

Marc Nichol - NEI (01:07:48):

Yeah, I, I'm, I'd have to go back to, but I'm certain that it was battery for

Meredith Angwin (01:07:58):

<affirmative>. Batteries are famous for not having very long, uh, time to discharge. In other words, if there's a, a really, uh, bad stretch of weather that lasts two days, I don't know how the batteries are gonna do for it, but at least I know that the, the model was batteries, which is helpful. Thank you so

Marc Nichol - NEI (01:08:18):

Much. Yeah, and I, I think it was batteries because there, there's not very many other choices for, for storage, for, for renewables. So you can't do heat storage. Uh, you know, you could do pump storage, but there's a lot. It, you, you have to have access to the land and that's not available everywhere.

Meredith Angwin (01:08:35):

Yeah. Thank you.

Rep Keith Ammon (01:08:36):

All right. Thank you. And next we have, uh, representative elect Carry Spier.

Rep-Elect Carry Spier (01:08:45):

Hi, uh, I, my, the sound hasn't been great coming through my computer, so I'm hoping that I'm not touching on something that was already brought up. And if I am, forgive me. Uh, we've talked a lot about the, uh, nuclear energy and it all sounds wonderful, but what technology has advanced recently on, what the heck you do with the, uh, spend fuel cells or rods? Is it still just being dumped into water and just covered up and waiting for forever?

Marc Nichol - NEI (01:09:16):

Yeah, so the, the use fuel today is being stored very safely. So I, I wouldn't personally, I wouldn't use the word dumped. Um, but yeah,

Rep-Elect Carry Spier (01:09:25):

You're right. Sorry.

Marc Nichol - NEI (01:09:26):

The, the, the use fuel for, uh, the advanced reactors. So you have light water SMRs, they're going to, uh, store fuel in very much the same way as the operating, uh, reactors, which we have a plan. And, and it's very to say for some of the other technologies like gas and, and molten salt, uh, we're working on the technologies, uh, to be able to do that. It's, it's an engineering, sorry, engineering to design, um, activity. It's, we, the technologies exist, we just have to design it. Um, so it's not that we need r and d, uh, we just have to put the engineering time into to,

Rep-Elect Carry Spier (01:10:02):

That's interesting.

Rep Keith Ammon (01:10:03):

These new designs can reuse fuel?

Marc Nichol - NEI (01:10:06):

There, there are a couple of companies looking at, well, actually all of the, the designs can reuse, uh, used fuel. So, and used fuel has over 90% of the energy remaining in it. So, um, so it could be recycled. Today we don't recycle because of economic reasons. Uh, it's just much cheaper to, uh, mine new, new uranium. Um, but there are a few designs that are looking at, um, recycling, uh, for the purposes of creating new fuel for the reactors that would be, uh, less expensive than hay. The so,

Rep Keith Ammon (01:10:39):

Mm-hmm.

Rep Michael Harrington (01:10:39):

<affirmative>, the other thing was liberation. Cause if you do reprocess fuel, you're taking out B 2 35 and P 2 39 in basically fuel weapons grade quantity. So you have a whole new realm of security to deal with. Yeah. These advance companies that are looking at it for new fuel, for their designs, they would not separate it out, right? So, so they would avoid the growth proliferation issues.

Rep Keith Ammon (01:11:05):

And so for instance, there's spent fuels at Seabrook, right? That's potentially a source of fuel for at some point in the correct.

Rep Michael Harrington (01:11:14):

But remember, it's, this isn't an issue of pollution, right? It's a solid thing that sits there on platform. You could be a hundred yards away from it and you're not getting any abbreviation exposure. It doesn't require any safety systems. All it requires it has to air. So, you know, we don't have any air well dead

anyway. So that's it. There's no other fool mechanism here, which just, it's there. Benignly doesn't do anything. You don't have to do anything to it, just don't allow people to steal it.

Rep Keith Ammon (01:11:39):

Right. Excellent. Thank you very much. Marc. Uh, you have to be sitting next to, uh, a sign that says Marc with your exact spelling. So that was all right. And next up, we're gonna go right to our second presenter. This is, uh, Chris Colbert from NuScale Power, and I'm gonna give Chris the ability to share his slides. He is remote, so I'm gonna make you a presenter. Chris is, I think I have to pass you the host of controls, and then you'll need to pass them back to me when you're done.

Chris Colbert - NuScale (01:12:29):

Okay. I'm not in the past.

Rep Keith Ammon (01:12:34):

And actually, you know what, it might mess up our recording, so I might need you to hit record to the cloud as soon as I give you the hosts control.

Chris Colbert - NuScale (01:12:43):

Yeah, you go to the, um, your email, I sent you the shortened deck, so,

Rep Keith Ammon (01:12:48):

Okay, let, let me do that. Uh, I have the cheap version of Zoom here, so that's why.

Chris Colbert - NuScale (01:12:54):

Yeah. So I, I'll keep this, pulling that up. Let me just, uh, introduce myself. I'm Chris Colbert, the Chief Financial Office for New Scale Power. Uh, I've been with the company for 11 years, held positions, uh, chief operating officer, chief Strategy Officer before coming into nuclear in 2007 with large reactors. I did 20 years of fossil plant development, so both coal and natural gas, uh, in the US and overseas. Um, so that's my background. Um, new scale power, uh, itself was formed back in 2007 to pursue the development of a small module reactor. Started off by our chief technology officer and co-founder with just a handful of employees and three patents. We now have 600 employees, over 600 patents pending a granted worldwide. Received our NRC design approval in 2020 and, um, have about 1.4 billion invested in the, in the design and licensing of the technology, um, over that time.

(01:13:51):

And, um, currently, uh, when went public, uh, sore publicly listed now in May of this year, and a transaction that Rays and another 340 million for us to complete the design and licensing work become commercial with the goal of having our first modules operational in 2029 at the UN Amps. Um, I did go through, so I know that the slides were sent out beforehand. I went through and edited and shortened down, um, my deck just to reflect the information that Mark had shared with you and the questions you had, uh, during the previous session in interest of time for that. So I see that Keith is now sharing it. So Keith, um, if you could go forward. Sure. So go to this slide that shows a technology, um, and I'll just dive right into it. Can you tell me what to stop? Uh, don't you go to slide, um, slide six. One more.

(01:15:02):

There we go. So the new scale power module, it's shown over there on the left. It's 76 feet tall by 15 feet in diameter. It's meant to be built in a factory and delivered to the site for installation. When connected to a steam turbine generator, it produces 77 megawatts electric. Um, you can put up to 12 of those into a single facility to produce 924 megawatts electric. But each one of those modules is independent with its own steam turbine generator. So each module, um, can, um, be operated independently. So if you have one module go down for refueling or for an outage, the other modules in the plant continue to operate, providing a great degree, uh, of resiliency for it. Um, if you could go forward, just the one slide, um, go backward, one slide to the inherently safe design.

(01:15:50):

Yeah. So, you know, the things that Mark talked about, um, in his deck about advanced reactors and what they seek to do over existing designs, uh, we've demonstrated through our review and approval by the NRC that came in September of 2020. Uh, the first is what we call an unlimited coping period for reactors. So, you know, typically, um, reactors that are operating today, uh, have what's called a coping period. And that means how long can they stay safe, uh, without outside, uh, power and, um, on emergency diesel generators. And so the thing to think about there is Fukushima or even Zizia, where the concern is not so much about a direct hit on the reactor itself, because they both were fine during the earthquake of Fukushima. And what's happened so far in Ukraine, it's the loss of power to provide cooling, uh, the new scale design because it's been greatly simplified and relies upon natural forces for circuit for, for, uh, cooling.

(01:16:43):

So just gravity and, um, for the moving of the water by natural circulation, we don't need any operator action, power or water outside of what's in the building for the safety of the plant, meaning it's basically walk away safe. So you don't need to worry about having that connection to the grid, like we're concerned about. And its appia situation. The second thing is that because it's smaller and because of that simplicity, and we have a lower rate of incidents, but also lower amount of fuel in each module, um, we have an emergency planning zone that can end at the site boundary of the plant. Typically, it's 10 mile radius for operating plants today at the new scale plant, it'd be more like 300 meters. So we're going from, from miles to meters. And what that means is you don't have the impact upon local communities that may be, uh, nearby or other infrastructure, uh, that you might wanna site next to, say, for example, a Dow chemical plant or a oil refinery.

(01:17:38):

You can be right next to it, not impact on its operations. Again, that's been, uh, validated by the NRC review of our design. And then finally, uh, capability performance, we can operate off-grid, have black star capability, uh, really important for resilience. And somebody talked about emergency response earlier, I think it was more in the context of, you know, if something happens at the plant, well, let's turn that on its head. What happens to something in the grid? A new scale plant can operate off-grid, provide power using one of its modules to the plant. And if we're connected by a microgrid, we can provide power to first responders. So you police, fire, um, you know, hospitals, um, the very mundane pump treat, deliver water to people's homes or mission critical facilities, uh, for defense use or, you know, data, Google centers, um, whatever you want do.

(01:18:26):

Uh, great opportunity to have highly reliable power and an asset that is a, an asset, uh, to resilience of the grid as opposed to being a liability for. So those, those are the three things that we demonstrated through the NRC review. If you go one slide backward, again, just on that NRC review to hit the point that Mark talked about, um, we're the first to undergo the licensing in the us. Um, we submitted our

design certification December, 2016. The nrc, um, published a schedule of 42 months for the review and issuance. Uh, they met that with the approval in September of 2020. But it wasn't a small effort. Uh, it was over 12,000 pages, 14 topic reports, 2 million labor hours, about 500 million in terms of putting the application together because you can't just, you know, say, Hey, it's safe. You have to demonstrate and have the proof of it being safe to the satisfaction of the nrc.

(01:19:17):

And after that 500 million was spent on submitting the application, there was $200 million spent by the NRC and us reviewing and answering questions by the nrc. So a very thorough process that goes through it. And again, this is for a lightwater reactor design, so typical of all the reactor designs print today, including at, at Seabrook. So with a technology that the NRC knew. But this just speaks to the level of, um, of diligence that's performed by the NRC in reviewing applications to make sure it's safe and for the intended purpose. Now, if we go forward three slides, um, yeah, this kind of shows the application of the plant. And I just wanna point this out. Um, there's questions being asked about the, uh, spend fuel. If you look over in the, um, on that design, uh, sir, where you see that Voyager name in the bottom on a concrete pad in an area, keep going over to your, uh, right a little bit, up a little bit, sort of where those tanks are.

(01:20:18):

Oh, anyways, uh, and on one acre pad, you're not quite there. But anyways, on a one acre pad, you can store 60 years of spent fuel and dry casts, um, that's good for another 60 years beyond the life of the plant. It's being done at 70 sites in 35 states in the United States. Most people don't know about it. Why don't you know about it? Because it's not a problem. Uh, it's been done that way for the last 20, 30 years. In fact, uh, uh, the home state for new scale, we're located in Oregon for a corporate headquarters. They have a Trojan plant that shut down back in the nine eighties or nineties. They went in the nineties. Uh, they've been stirring spin fuel on that site for the last 20, 30 years. And again, not an issue, uh, because it's very energy dense. It's, it's totally passive.

(01:21:00):

Uh, all it requires is a security force. Cause you don't want people stealing it. But, you know, keep in mind these things are stored in steel concrete cast that weigh 50 to 75 tons. So it's not like you can go in there and grab a handful and run away with it. Uh, it, it requires a pretty sustained effort on it. Um, but very, very safe. Uh, if you go to the next slide, and this gets into the kind of the question of the cost and what we're doing differently. You know, the, the big challenge with large plants today is most of it's built out in the field and assembled, but, you know, very large pieces, parts, you know, hundreds of tons pipes that can be 40 to 8 36 inches in diameter that need to be welded together. We've taken all that, put it into the new scale power module, which is built in a factory.

(01:21:45):

So all you do is you erect the building on the site. Once that building's ready, you take the modules in by rail tracker, barge, install it, connect it up to its connections, um, for steam and otherwise, and you're producing power at 77 megawatts electric for each module. So a much different, uh, you know, um, deployment, um, scheme than what you have with the large reactors, which allows us to, you know, reduce the time from, say, six years of construction in the field to three years of construction in the field for a new scale plant. Also, when we took the design of the new scale plant, um, because we went the natural circulation and we went smaller, we were able to eliminate about two thirds of the systems and components, uh, that you would find in that typical large plant. So again, simplicity leads to cost savings, leads to operational flexibility leads to, um, higher availabilities of the unit and greatly increases safety. Where, you know, most reactors have core damage frequencies. That's how often you'd expect

something bad to happen that might be measured in, you know, once every 10 million years or a hundred million years. For our case, it's once every 3 billion years or about once, uh, a solar system. So very low, uh, very safe, uh, design features there. Next slide, please.

(01:23:01):

Um, and that flexibility of the design of each of these modules being independent comes really in handy when you look at, um, providing, you know, energy to other systems. So if you have a 12 module new scale plant, you can take three, four, or five or six in the modules and use them produ provide heat and electricity to other platforms such as oil refineries, hydrogen production, desalination. And if you're not using the modules to produce the energy for those systems, you just put it back on the grid for electricity. Also, because the modules are small, they're very flexible in power generation. So they can ramp up or down from a hundred percent to 20% to a hundred percent power, and about 34 minutes. So if you have a grid that's highly penetrated by wind and solar, you know, solar, we know what a sun's gonna set. The sun's gonna rise a very large swings and power generation wind is highly variable. Uh, what we're demonstrated is that we can move power very rapidly to accommodate those shifts and generation from other resources. And as mentioned earlier, we can also provide power of connected by a microgrid to mission critical facilities. Um, so again, a great deal of resilience that you can provide for applications that may need five nines or six nines of reliability. Uh, next slide please.

(01:24:12):

And when you have this capability with the advanced reactors, particularly a small module reactor like new scale, it really widens the aperture of things you can do. Instead of being a large temporized generating plant that's sort of, you know, um, limited to its application and use for utility scale, electricity power, um, we can do things that, you know, provide for grid resiliency, mission critical facilities mentioned earlier, flexibility and operation allows you to support wind and solar development. So as you have more wind and solar coming to grid, a new scale plant as well characterize to compliment that generation by being able to flex, uh, as needed. And we can do these other things such as carbon capturing sequestration or hydrogen production. Uh, which basically either way you go require large amounts of energy, and if the goal of carbon capturing sequestration or hydrogen production is to get away from carbon emissions, then providing that energy with a new scale, small module reactor makes a lot of sense.

(01:25:10):

Um, so that's just, uh, really broadens the aperture of things that we can do to help decarbonize not just the electricity sector, but these other parts of the economy, um, as well. Next slide. Um, not so relevant, uh, I would think for, for New Hampshire, but in many parts of the US is about 200 gigawatts of coal in the US That'll be 60 years or older, provides about 30% of the electricity overall. Uh, it's gonna go away. Um, using new scale plants to repower those sites makes a lot sense. Um, you know, you can put it in the same footprint. You can use the workforce, as Mark mentioned earlier, we'd have about 270 people on a new scale plant versus 110, 140 at a coal plant. They're all can go over and work at the new scale plant. In fact, we have to hire extra people for those things that they don't have, such as the radiation protection, uh, the nuclear plant operators and a few of the nuclear engineers you need to be on the site.

(01:26:01):

Um, but importantly, you know, as you get to use all those workers so they don't lose their jobs, in fact, they'll get slightly higher pay, uh, for their jobs. You also don't have to do things like build a transmission line. And, you know, for those of you ever involved in energy projects, if you have a transmission line, that is the hardest thing to get permitted and built, whether it's a wind farm, a solar farm, a nuclear

plant, when you start going across the countryside with transmission lines, uh, that's a huge challenge. If you do it at a coal plant site, they already exist and are there. So very simple to bring that across. Uh, you don't have to do that. There's no permitting involved. So much simpler. Next slide, please. So getting into our first deployment, um, and it'll hit one of the first questions that came off here.

(01:26:44):

Uh, it's a carbon-free power project headed by Utah Associated Municipal Power Systems. They're a joint action agency representing 50 plus municipal power systems in the west. 27 of them are participating in this project, uh, which would be a six module 462 megawatt electric, um, uh, plant. Uh, we provided them a price target in 20 $20 of $58 per megawatt hour. Um, so the reports have been reading about the increases as marked in order. It's all due to inflation and interest rate increases. Um, you know, steel, glass, concrete, all those things have gone up 25, 30% over that time period. And interest rates have gone from, you know, in the case of uams, their cost of capital maybe 3% to about 5% today. So those two things weigh pretty heavily. But if you read those same articles, they're reporting on the increases by, um, the city manager is responsible for the project.

(01:27:39):

Every single thing they're looking at is increased. If they had a, a solar plant or a wind plant or a gas plant, those things have all increased the same amount or more over time. And you know, there's no surprise to that because all you do is go to the gas pump and you know that you're paying twice as much as you were two years ago. Um, or if you're filling up your home heating oil tank, same thing. Um, or buying a loaf for bread, dozen eggs, a pound of meat, um, all that stuff's happening. Um, so it does come down to a question of, you know, really compared to its alternatives, um, whereas a stand, it still stands in the view of those members as a good alternative for them because they need the energy, they want it to be carbon free. Um, and they need it to be reliable.

(01:28:22):

You know, this isn't about some sort of a, you know, let's go out there and do some, you know, um, uh, you know, some, some value signaling about, you know, look how good I am. This is about keeping the lights on and the beer cold. For the members of uams that have had reliable power provided by coal for dozens of years, that cold's going away, they need to have something, uh, reliable for now. That project is helped out by a cost share award from the Department of Energy, uh, 1.4 billion. And that's done in recognition in the fact that the first of anything always costs more, takes longer. Um, if you don't believe me to go out there and buy like three pieces of furniture from ikea, time yourself building it, the first one, it'll take you like a day, the second one half a day, and the third day you'll do it. The third one, you'll do it in 30 minutes. It's just a process of learning and getting better at things as you go through it. And that's gonna be true for these plants as well. Um, next slide, please.

(01:29:16):

Um, and it's not just the US phenomenon. We're looking at these going across the globe. So these Dodge show, not only in the US where we're looking at projects, uh, but overseas really driven. Uh, if you look at those dots in central and Eastern Europe and other places, um, by energy security, um, many of those folks relying upon Russian gas or Russian nuclear technology that ain't happening anymore. And they're looking to, um, not only decarbonize, but decarbonize, decarbonize a lot de in a way that provides with our energy security in the future. Um, so it's a technology that will demonstrate first here in the US at the UMS project, but then be bringing overseas. And in fact, the most advanced projects we have are in, uh, Romanian, Poland, but, uh, dozens of other opportunities that we're pursuing as well. Next slide, please.

(01:30:04):

Um, mark hit this already about the Inflation Reduction Act. You know, so in some ways the 30 to 35% inflation that we've seen over the last couple of years, uh, is unfortunate. Um, but with the Inflation reduction Act, it's basically 30 to 50% off a new scale plant and investment tax credit. That in the case of the U amps, is paid directly outta the US Treasury. Um, so, you know, before those benefits were granted only to wind and solar projects giving them an advantage, uh, as clean energy. But now it applies to any clean energy technology and the new scale, small module react accounts. So that provides, um, a very significant benefit for folks, but it does phase out over time. So in terms of, you know, policy, uh, those credits will be around to, uh, the layer of 2032 or when US electricity carbon carbon is reduced by 75% from 2022 levels.

(01:31:01):

So I don't think we're gonna hit that by 2032, but just in terms of planning purposes, if as Mark says, you know, it takes eight to 10 years to do a plan and you have to be in operation by 2032 or maybe 2034, now is the time to be planning for that to take advantage of this, uh, particular credit, uh, which I think is actually one of the more important things that has happened to, uh, nuclear since Atomic Energy Act passed in 1950. Um, and then a final page is just in terms of community benefits, when you look at, you know, what does it mean to a community, um, if you put a plant in your, in your local area, next slide please, Keith.

(01:31:37):

Um, you know, so 270 jobs full time to a hundred peak construction jobs over the three year period. Um, high incomes, you know, usually very strong, uh, economics provide to the local area. But Mark didn't mention, if you look at any kind of a poll about nuclear, the, the favorability for nuclear plants, uh, other than say maybe, uh, Vermont and, um, and outside of Manhattan, uh, very favorable and more so than it is to the general population. Um, and once we're in there, you can produce, uh, the local taxes, uh, also provide the additional labor and adding to local state and tax revenues, uh, annually as you go. So, pretty good, uh, situation economically from a development standpoint for those, you know, cities that are, or communities that are interested in doing it. Clearly, you know, some places may want it, some may not. Um, our goal isn't to try to put these where people don't want them, but where people do want them.

(01:32:33):

We think they have, um, great benefits and, you know, provide power as, you know, more cleanly and more safely than any other source out there. So with that, happy to take, um, any questions. And I think I answered at least one of the questions I heard very early on, but happy to dig into the, the cost issue, uh, cause I agree. Um, mark mentioned there's three questions we get. I'll say that three questions that I get are one about safety, second about spent fuel, and third, and where we spend all the time with folks is about the cost and the schedule and how we're gonna be sure we can build them on time, on budget. So thank you for your time and I'll turn it over to any questions.

Rep Keith Ammon (01:33:12):

Great. Thank you, Chris. That was a great presentation. Um, the benefit, the audio is gonna be excellent on the zoom recording, so for those on the very, very back, if you missed it, that'll be online in in a few days. Um, so, uh, open up questions. We'll start with the commission numbers. If you have any questions for Chris, Kathy, and just state your name for his benefit too.

Catherine Beahm - NH DES (01:33:35):

Sure. Chris, this is Kathy Beam. I work for the Department of Environmental Services. You speak a lot about, um, repurposing coal facilities. As we know, over the last five years, many have been shutting down as a result of increase in natural gas usage. So if it takes eight to 10 years to get a project off the ground, at what point does, uh, repurposing of coal plant become unviable, not only for the technology or the equipment but's form it for 15 years, but also the, the employees that have moved on. Has, has that been taken into consideration with costs?

Chris Colbert - NuScale (01:34:07):

Yeah, I mean, that, that's, that's, um, you know, it's a shame that the plants are shut down. You know, people gonna to eat, they gonna find jobs, they're gonna, they're gonna move. Um, so you try to do this well, punch is still operating, and in fact, um, there's a plant that's being looking at advanced reactor in Wyoming called the Nten plant and camera. And that plant's still operating. So that's an excellent example of trying to time it right. Uh, my CEO is out talking coal strip in Montana. You know, it's the town of 2000 people. It has 2000 megawatts of coal plant. Uh, that plant slated the shut down in the mid to late twenties. Um, if that plant shuts down, then that town is gonna shut down. Um, so it is kind of a once in a lifetime opportunity that you want to transition it.

(01:34:53):

Um, but that said, even for plants that are shut down, uh, if nothing else has been done there, you still have the transmission lines and, and you know, probably the water supply intake and discharge structures available, which aren't insignificant, uh, as you can appreciate, you know, citing a transmission line, extremely difficult, getting water, water offtake, you know, intake and discharge permits hard. Um, so those things have value. And particularly for a site that's hosted in energy infrastructure in the past, I think it's a, um, you know, an easier path forward. It makes more sense because that infrastructure is there. And in fact, the plant in, um, in Romania that we're pursuing with SN nuclear electrica that's at a closed coal plant, um, which as a result of it, they're actually accelerating the decommissioning of those structures to make room for the plant coming forward. Um, but the transmission lines and the water supply and discharge, uh, structures are still there. You know, they'll need to be, you know, reviewed to make sure they're okay. But, um, you know, a huge benefit, uh, that people usually put in, you know, 50 to a hundred million. But, you know, really what we would like to see is to do it for coal plants that are, haven't shut down yet and have a transition pathway for people that doesn't leave them behind, but take them with it.

Rep Michael Harrington (01:36:19):

Yeah. Just, yeah. Mike Carrington, uh, state representative science, technology and education, um, a few questions. You had mentioned your ramp rate going from 20% to a hundred percent, 30 minutes. Is that linear? So you would be eligible for payments, for reserve power, say, going from, I don't know, 20 to 40% in 10 minutes?

Chris Colbert - NuScale (01:36:42):

Yeah. So, um, yes, it would be. Um, and the way we do that is you can actually move power, um, in a new NuScale plant by one of three ways. One, you could just shut down a reactor in a shoulder months second, you can move reactor power, which is not as quick, um, in terms of that, um, mode. But the way I mentioned on, on the line here was by, we have a steam, um, bypass to the steam tur generator. And if you just, you know, open and close that valve, you ramp power very rapidly. So that is what we would do. And that was in response to customers.

Rep Michael Harrington (01:37:16):

In that case, you're just dumping the steam or would you have an ultimate use for, for storing eating something?

Chris Colbert - NuScale (01:37:22):

No, you dumped the steam. So it's, you know, a loss of efficiency. But you have to remember is that, you know, the nuclear steam, it's, it's pretty cheap. And you only do that, you know, if you're being compensated by the system for doing it. So

Rep Michael Harrington (01:37:37):

My, my second question is a little more complicated, a little difficult for what I said earlier. Um, you know, we look at Vogtle, we look at some plant, and now we look at, I seen statements from, uh, people that are representing these various municipalities, uh, that are signed up to the plant out in Utah saying it's not gonna be economically viable, and they don't know if they're gonna stay on the past 2024 because the cost increase went, I guess was 65 to 58. Now it's close to a hundred, um, just as a selling point for nuclear power in general. How do you explain that to people so they don't go there, they go again, those new, they promise the world and they never deliver.

Chris Colbert - NuScale (01:38:19):

Yeah. So, you know, the folks who, if you read those same articles, the people say, you know, I don't like the fact that the prices have gone up, but I look at all my other options, whether it's gas, wind or solar, and they've all gone up as well. And you know, for them it comes down to a question, can I wait longer and see if prices come down for all those things or one of those things to make it happen? But, you know, all their options have gone up. Their coal plants are shutting down, they have dates on 'em, they need to provide power to their, to their citizens. Um, and so they're gonna look hard at it, but you know, they're like, you or me, you know, first time I went by a gas station, I saw a $5 gas, I said, I'm gonna go to the next gas station. And I, after I drove by enough that my tank was near empty, I went in and paid five bucks a gallon. Um,

Rep Michael Harrington (01:39:03):

No, you're basing a lot of this on the shutting down of coal plants, which cause is everybody's in favor of until they have actually pay for that. So if you're got a coal plant that's putting out electricity at uh, $35 megawatt hour and you're gonna replace it with a nuclear plant at a hundred dollars megawatt hour, maybe all of a sudden people aren't as keen on global warming when they see their electric bill double that's that we're gonna have to deal with. We're gonna go forward with nuclear power.

Chris Colbert - NuScale (01:39:32):

Yeah. So you, you're absolutely right. Um, I guess the, the two things I would say to you, um, cause that's the same argument that the developed world makes, right? So people who don't have the first megawatt, all those people without power, and we're sitting there telling 'em to take, you know, do wind and solar or do something, you know, that doesn't work for 'em. They're telling you to go take a hike for the same reason. Um, you know, I would say it's a lot of these coal plants, uh, they're shutting down, you know, some for economic reasons, some the life of their mind has gone out. So it's no longer $35 coal, it's gonna be a hundred dollars coal. Um, or that they put in very expensive retrofits to, you know, meet air pollution standards. And, you know, while people may say like, you know, Hey, you

know, I want cheap power, they're not gonna sit there and say, I wanna drink, I wanna breathe dirty air. So I, I don't be some places I will work. That won't be in all places.

Rep Michael Harrington (01:40:23):

I think the industry as a whole, and that kinda addresses through a i as well, um, they have to get better at getting this information out to people that it's not a choice of keeping the power, uh, at 30, I mean, right now it's a like just checked as $140 a megawatt hour, something was the LMP in New England. Uh, so it's not an option of going back to the days of $30 a megawatt hour, uh, and uh, staying there, it's an option of which technology you gonna choose to get you to 80 or $90 a mega hour. And I think the nuclear industry really has to push the cost part of that because it's not, it's not the option of, you know, it's not sea work, $38 a mega hour, it's wind and solar at $85 maket hour. That's, that's what the competition is. But people don't see that. People look at wind and say, oh, it's practically free cause you don't cost anything for fuel. But, you know, the one off of Massachusetts is 75 an mega hour and they just, they're gonna be delayed and their prices are going up.

Chris Colbert - NuScale (01:41:26):

Yep. I live in Martha's Vineyard. Yep. I I get it all. And that's what happens, right? Um, and these ums members are the same way as that, you know, they used to be paying, you know, $60 a megawatt hour for electricity. They're now paying 85 to 90 bucks on average for this year in two years time. So they, they actually see it. Um, the reporters don't report it, but those customers see it. Cause I can tell you I'm in those meetings with them and that's why the projects still moving forward.

Rep Michael Harrington (01:41:53):

Okay. So do you expect even at that higher price that it will be built?

Chris Colbert - NuScale (01:41:58):

Um, I won't say it will be built, I'm saying is that they don't have much better options. Um, you know, they're like you or me. If you have the opportunity to save the money and not spend it at all, then you're just gonna try and keep it in a bank and, you know, get 8% interest rates on it. But if you have to keep the lights on the beer cold, at some point you're gonna have to pull over and fill up your gas tank in the same way for these folks.

Rep Michael Harrington (01:42:18):

All right. Thank you.

Chris Colbert - NuScale (01:42:19):

Yeah.

Rep Keith Ammon (01:42:21):

Other questions for commission up to the audience that's present in the room, any questions for our presenter? Were you able to hear most of that s's good? Uh, so we'll, we'll improve our, uh, I think the numbers around the table. We can hear fairly well, but we'll, we'll improve our system from next meeting. Um, and then we'll open it up to anybody on Zoom. If you just raise your hand, I'll give you a few seconds to respond. All right. Not seeing any questions on Zoom. Uh, Chris, uh, from NuScale, thank you very much for presenting and uh, is it okay to make your slide deck? Is that with you?

Chris Colbert - NuScale (01:43:06):

Yeah, absolutely. And if there's ever any questions, feel free to reach out to us and Okay. I'm sorry, I could be there. Person today was coming back from, uh, Asia and it was a little bit hard to get up to Concord today, so, uh, hopefully next time I'll be able to meet you folks in person.

Rep Keith Ammon (01:43:23):

Excellent. I think you were coming from Japan yesterday or something, right? Is that right?

Chris Colbert - NuScale (01:43:27):

Yeah, I did

Rep Keith Ammon (01:43:28):

<laugh>. So we'll provide contact information to the group. And again, just if you could include myself and, uh, Representative Harrington in your communication, that way we can keep the commission plugged in. All right. Thank you. Thank you again. Uh, we have about 10 minutes, uh, for the rest of the meeting. We're gonna go quickly just through some, uh, housekeeping stuff here. We have a report that's due on December 1st. Our commission was just stood up. This is only our second meeting. So I think that report, I'm gonna write a draft. It's gonna be brief, non-controversial. This is gonna describe, you know, what we've done, what we'd love to do for the next six months. Uh, and the report goes to the speaker of the house, president of the Senate, and the governor's office. So that's our audience for this report. Um, we, we, our commission was a little delayed getting set up and that date didn't move. So, um, you know, we'll do the best we can to get that.

Rep Michael Harrington (01:44:29):

Might just add that cause of the late naming of commission members weren't able to hold a meeting. Cause

Rep Keith Ammon (01:44:36):

We didn't have a form, we didn't have a forum. That's right. And so, uh, maybe we'll do electronic sign off for some somehow if, if we need actual signatures from all the commission members, I'll try to, we'll try to do that without having a meeting in the next 10 days. Um, do that. I, I'm gonna check, I'm gonna do what we can and then I'll check the call if they're gonna send me to jail file. <laugh>. All right. And so Representative Thomas, if you could, uh, describe briefly, I think you have a bill idea. Well, and, and we may or may not achieved your bill in that report, that, uh, but if you could, you know, as a recommendation. So if you could just briefly describe you're thinking.

Rep Doug Thomas (01:45:20):

Well actually I was thinking about putting in an LSR but I've to hold back, uh, next year, uh, RSAs in New Hampshire. Uh, use the term clean energy. I'm thinking about 11 times in various ways. Uh, mainly associated with projects, but nothing in uh, general. Uh, but nowhere in the RSAs do they define the term. So my suggestion, um, is, uh, in fact I'm having a meeting tomorrow to kinda of, uh, start some discussion. But I would like to see this commission work on a definition of clean energy or green energy, pretty much the, it's fashioned after the eu because I believe it is important that any definition of that included included. And so rather than put something together hastily, there's only a few days left for LSRs <laugh>, um, I would rather work on a well worded definition that we can submit as an LSR next

year on my behalf. So that's what I'm thinking right now. And I, I believe we, we do have a meeting tomorrow with DOE and uh, forget who else to kinda start out, how we can do the best way to, uh, so, so that's my idea. I have something mentioned so many times in our s that, but not having to defined it I think can be a qu later on and I think would be part of that definition. So that, that's my idea.

Rep Michael Harrington (01:47:04):

I there's a really good idea. Cause I mean just for example, you've that a uh, more that says department strategy for reduce the use of fossil fuel and we're gonna change that, say reducing of basically fuel if you term because it's someone you don't necessarily have to fossil fuel could use some on the, that capture coarbon dioxide and the ideas do greenhouse gas, not fossil fuels per se. So that's energy, not be something that produce greenhouse obviously.

Rep Keith Ammon (01:47:47):

Yeah. So, uh, department of energy, 10 year strategy, I actually have some snippets in our, uh, agenda of notes. Um, but if you look on page five of the agenda, uh, there's actually a statement that supports that in our 10 year strategy "In current statute, the RPS excludes nuclear power under consumption is not a renewable fuel. This is correct under theistic definition where renewal means that fuel be like it regenerate and can replenish itself indefinitely. However, with somewhat artificial draw a distinction between a fuel that can replenish itself indefinitely, even when there may be significant resource environmental impact to capture. And then the last sentence of that paragraph, achieving the more RPS emission reductions better served by major eligible zero carbon resources that are currently excluded. And that would include, so there's um, support in the ten-year strategy from the part of energy. For

Rep Michael Harrington (01:48:50):

One of the point I wanted to make, really New Hampshire people have to understand we're a deregulated state or less regulated know what the term is. But no longer does people like Dan, uh, make that says, okay, go build this power plant and the rate pays will pay fine. You'll get some kind of a guaranteed rate return. It's all merchant plants now. So someone wants to build a new anything, whether it's nuclear or whatever. Uh, they get out and they raise capital on the private sector. And a lot of plants, they get a lot a and then they turn around and built. Uh, right now there's never been an nuclear plant built without taxpayer backing or or rate payer back any place in the world that I'm aware of. So this would be something completely different here. And I think someone mentioned it earlier about being, you know, second and third in line.

(01:49:51):

I, I really don't see someone putting up their own money even with a 30% tax credit. I don't see people putting up their own money in a place like New Hampshire unless they build something successfully someplace else first. So that's just something we have to think about going forward on this. Cause though the other way is back to the <inaudible> with the rate phase on book and I realize public service, a lot of money in that and so forth and so on. But sort of the rate. So, you know, going forward I have to look at that, that's a reality I mentioned Dow Chemical cause that would be a great truth that happened that way, that someone's actually online and it's not unique to nuclear. For example, in uh, Massachusetts when they build tos offshore wind to 12 megawatt facilities, but they're not really with private investment.

(01:50:44):

Cause they, what the state is, they told the utilities you will buy the electricity coming outta its place. You just negotiated price, you negotiated that, which is the time substantially higher than the rates would go. So that's another look at it. I hope New Hampshire doesn't follow that road. The only is to build partial with any place in the United States without something like that, with great payers. I don't wanna see us going down that road there. Um, but I mean, just something we need to be aware of that that's really different than the place they're building it out Utah.

Rep Keith Ammon (01:51:29):

Right, right. Excellent. And just, we'll, we'll just wind down our meeting here. Uh, we need to decide on, on our meeting schedule. Uh, does this location work for most of us? Uh, I've been told that if we wanna reserve this room, we should probably schedule in advance, uh, maybe decide on the same day every month. I think a monthly schedule is probably appropriate to this commission. Um, and so I know we have some members that aren't here. I think what I'll do is send out, um, a, a survey with multiple choices and we'll see which one, uh, fits the most of us. Okay. Um, so we'll, we'll decide on the meeting the next few days. So watch your email for email from me so we can nail down and schedule this room so we don't lose the resources here. Um,

Rep Michael Harrington (01:52:16):

Feedback.

Rep Keith Ammon (01:52:17):

Yeah, we've through concrete <crosstalk>. Uh, Christine, uh, I'm gonna mess your name again. Csizmadia, would you like to comment on anything, uh, in our final moments here?

Christine Csizmadia - NEI (01:52:33):

No, we just appreciate the opportunity to, um, to, to brief the committee. I think Mark did a terrific job and he really covered all the, the topics. But, um, you know, if you're looking for any kind of subject matter expertise as you continue down this, this journey, uh, we have a number of other experts that we can offer to the group. So, uh, o is, uh, um, offering resources to, to the task force as you explore this a little bit more.

Rep Keith Ammon (01:52:59):

All right, excellent. Um, my computer ising right now, I do have technical, it's just, it knows I'm, uh, trying to get something done. So it's, so, uh, the NEI does have resources. Um, I'm really hope that this will come up cause I mentioned the website. Let's see if I can.

(01:53:46):

And then, uh, Chris Lar, I'm gonna come to you last cause I know your, your commission number. You have, uh, some responsibility after this, uh, soon after, so I know you could be your person. Um, so this website is still in draft mode. It's, uh, nuclear nh.energy. Um, I'm putting this up so that we get a full disclosure to the public. We don't have these kinds of resources with, uh, the House or the Senate. So I'm gonna put agendas, meeting videos, uh, you know, even, uh, possibly comment sections. So people comment online if they wanna, we'll experiment with that and see how that goes. But we're gonna have all the meetings listed. Um, it'll have some news from nuclear, but I do have this tab here. And, uh, Christine has been sending out, uh, information from NEI and I've been putting those resources here. Uh, the NEI resources, uh, I think this is the most recent one. I'm sorry, policy options for states to

support mc there. That's the most recent one. So Christine, I've been putting your, uh, your resource links to your resources on this. Oh,

Christine Csizmadia - NEI (01:54:53):

Terrific. Thank you for doing that.

Rep Keith Ammon (01:54:54):

Yeah. And this has not launched yet. Um, I'm gonna just, this is for commission members. I'm gonna put up, uh, bios for, for each of us on the site. I don't know if you saw in my email, but our bios are in breach Latin. Uh, and that's just to, to draft. I haven't done mine yet. So if you could gimme apic, a headshot, a short bio, cause it's gotta fit the page. And then, uh, contact information that you'd like to be public on the internet can be a phone number, website, LinkedIn, Twitter, whatever. Kind of contact that info that you want. And we'll list all, all of our, uh, bios. Um, and that'll be for our guests know, they can research our commission before they come. So

Rep Michael Harrington (01:55:38):

If you want, I can send you a ands other weekly to clear

Rep Keith Ammon (01:55:42):

Who's, yeah, we could certainly have that send. Right. And so this website is not launched at the search engines, don't know about it yet, but they won't pretty soon. So send me your bios please. And then Chris, would you like to just, any closing comments, uh, because you've set wireless drivers.

Chris McLarnon - UNH (01:56:00):

Um, no, I don't have any particular comments at the moment, Keith, there. I think I'm gonna reach out to the speakers. I have a couple of questions that we couldn't get to, um, because of timing. Um, so I'll, I'll, um, email them and copy copy you on those emails.

Rep Keith Ammon (01:56:15):

Okay. And just for the record, state, uh, your name and your position at unh.

Chris McLarnon - UNH (01:56:20):

Uh, my name's Christopher McLaren. Um, I'm in the chemical engineering faculty at U N H, um, teaching a number of courses including introduction to Nuclear Energy.

Rep Keith Ammon (01:56:33):

Excellent. All right. So final thoughts from, uh, members of the public. Any more input? Right. So I'd like to entertain a motion to, uh, adjourn. Right. Motion to adjourn. All favor say aye. Aye. Aye. Opposed. Right. Thank you everyone. And, uh, thank you to NEI and NuScale for presenting.