Richard Barry (00:00:03):

Somebody picture where we're going get there. I'd like to see a copy of the slides at some point,

Rep Keith Ammon (00:00:12):

A copy of the slides. Would you be able to provide us with those slides? Joshua?

Joshua Parker - BWXT (00:00:17):

I can. They are available for public release.

Rep Keith Ammon (00:00:20):

Excellent. All right. And we have a, there's a microphone there. I think it may be muted. You have to push the button. Good to go. All right. So we're focused on getting the state ready for at least understanding this technology in time for when it's going to be commercialized. And so one thing that stood out to me in your presentation was the year 2028 you'll be going to production I guess either the hurdles as far as the fuel supply chain, it looks like you're very vertically integrated. More, more so than some of the other presentations that we've seen. But regulatory hurdles, supply chain for the fuel. Anything that you know, any concerns about delays or you know, issues that you might have to overcome? I think it's probably a general question, but Joshua, if you could address that.

Joshua Parker - BWXT (00:01:25):

Yeah. I'll take a first shot at, at supply chain, and then I'll, I'll ask my colleague Scott there to, to address some of the, I think what you're targeting in regards to enriched fuel supply. So we, we are living supply chain issues right now with the Project Pele actually demonstrating a reactor. We're working through those. The nice thing is, is the Department of Defense is paying for a lot of that. And, and I say that for a lot of the other components of the reactor in that we're making vessels. We are making control ride drive mechanisms, we're getting pumps, we're getting motors, we're getting valves we're getting key materials strategic materials that you need for that. Fuel for that reactor is, is coming via the, the strategic stockpile that we have today for enriched material. And Scott kind of mentioned that, that we've done down blending programs. Scott's been on the front end of, of, in the fuel cycle. So Scott, I'm gonna let you speak more to the fuel side of that question, especially in enrich material I think that they're driving at.

Scott Nagley - BWXT (00:02:30):

Yeah. So as Josh mentioned, for some of the early, early programs that we're involved with that are primarily associated with national security such as project, project pay, the us, the US government has allocated fuel from, or has allocated enriched uranium to be used for those purposes. Those are finite quantities of enriched uranium and the ability to leverage those for future commercial applications are limited. Now, the government is looking at other forms of either HEU or High Assay LEU scrap that can be recovered, that can be made available. Some of it is of questionable quality from a fuel manufacturing perspective, but that's all being studied, probably looking in total less than six to eight tons of material that would, that could, could come via that route. And, and as you know and Carol probably talked to this better when you get to the X-energy portion here, but you know the ARDP program was going to obtain High Assay LEU from a Russian source.

(00:04:01):

Well, as of this time last year, that's no longer an option. So the, the, the DOE has established the HALEU availability program, and they're in the process of establishing enrichment at Portsmouth, Ohio through a demo program with Centrus Energy. That program is underway, and by the end of this, this year, beginning of 24 should be producing one order of about 900 kgs per year of High Assay LEU. In parallel there there are supposed to be issuing an RFQ to the commercial industry to to receive proposals to supply larger quantities of High Assay LEU in the 25 up to 25 metric tons per year in the future. But quite, quite honestly, those those sources probably will not come online for the next five to seven years. So that's, that's kind of where we stand right now on the availability of the enriched uranium from that perspective from a licensing perspective, so BWXT is already licensed for High Assay LEU we're licensed all the way to HEU. So for us to stand up and expand our manufacturing operations, those would, would require license amendments, but we wouldn't have to start all over with environmental reviews and other base licensing activities, I'll call it.

Rep Keith Ammon (00:05:45):

All right. We have one hand raised online. So we'll go to Walt Stapleton. Walt, would you please unmute?

Rep Walt Stapleton (00:05:57):

Yeah, thank you. Thanks for taking my question. In your presentation, you mentioned reactors building over 5%, but no reactors get a hundred percent utility. And it's interesting on the reclamation side, but what kind of enrichment factor do, do you to you utilizer in making these reactors? Or are they variable dependent upon the application, enrichment over the 5% that you mentioned?

Joshua Parker - BWXT (00:06:30):

The, yeah, thank you. The BWXT reactor there, the, the banner reactor that we have we're targeting to use what's known as high assay, low enriched uranium which is just below 20 weight percent uranium 235. We usually refer to as 1975 weight percent. And as far as I know, most advanced reactors are using that fuel. I I think sometimes we tailor it a little bit in enrichment up and down just to get the power shape we need, but that's the goal is to use up to 28% for these reactors.

Rep Walt Stapleton (00:07:10):

Yeah, that's that's appreciably higher than the old, old style generators except I understand the Russians were using a higher up to 30% or so in some of their reactors, but a whole different kind of technology there. The, the other question is, is, is the gas reactor replacing the water reactor? And you're phasing out water reactors in favor of the gas?

Joshua Parker - BWXT (00:07:39):

So I'll, I'll step back and, and give a larger industry perspective. So, at least in the United States, I, I still think we operate close to 90 light water reactors. A lot of those are getting their life extensions going to 60 years, and some of them are starting to pursue 80 year license life extensions. Our intent is, is not to replace those, those are really big reactors. You know, they make a thousand megawatts Vogel three disk came online down in Georgia there, that's a Westinghouse reactor makes about a thousand megawatts electric. Those are lightwater reactors. The micro reactors where we, we envision them at least in high temperature gas, we're looking at industrial processes where you need high temperature heat. Lightwater reactors gonna give you 300 C heat. We're operating at 800 C heat. So we're tailoring to the market to, to meet the decarbonization demands that are out there.

(00:08:40):

There are other developers that are developing molten salt reactors that are developing. There are other developers that are developing things such as liquid metal liquid sodium cooled fast reactors. Each of them are trying to meet a different market and product demand. And there's multiple developments ongoing and being supported by the Department of Energy. I think if, if really we are going green and decarbonization, the market exists in, not only in North America, but globally for multiple reactor technologies, BWXT is focusing on gas reactors, but there are, there are others out there that are investing in these other technologies as well. And, and I expect that Lightwater reactors will continue to play a role in our electricity generation well into the future. So,

Rep Keith Ammon (00:09:31):

All right. Next we'll go to Paul Gunter, and if you have a question online, if you could use the hand raising functions, we can notice that you have a question.

Paul Gunter - Beyond Nuclear (00:09:42):

Thank you. Can you hear me?

Joshua Parker - BWXT (00:09:45):

Yes,

Rep Keith Ammon (00:09:45):

I can hear you.

Paul Gunter - Beyond Nuclear (00:09:47):

Okay. My name is Paul Gunther. I'm with Beyond Nuclear in Tacoma Park, Maryland. The the speaker mentions that you know, they're, they've recognized the uneconomical conditions that particularly new builders are, are facing. I I wanted to point out that the Energy Information Administration has established that a new generation demand in the United States is currently dominated by renewable energy. And there's, you know, even a doubling right now, projected for 2023 in terms of storage. So there is a boom underway, and that is projected to just continue. So it, it really seems like you know, particularly the small modular and advanced reactors are faced with a supply issue. And, and I wanted to just see if I could get some more comments from the speakers with regard to how suppliers aren't gonna invest in new capacity without small, Hey, Paul,

Rep Keith Ammon (00:11:12):

What's, what's your question specifically? What's your, what's your question?

Paul Gunter - Beyond Nuclear (00:11:15):

Yeah. Yes. How are you projecting to overcome the issue that suppliers are gonna have a hard time investing in new capacity without strong order books from your company?

Joshua Parker - BWXT (00:11:33):

I think I've got a, a handle on that question. So, what we see in the industry, there's, and I can't speak specifics because we're got a lot of things covered in the commercial realm. We are having a lot of

discussions over end users and, and what they need in regards to electricity. You're renewables, solar, wind dominate but solar and wind are variable sources of electricity. There are places that that just doesn't work for a, a customer. And they're beginning to see that and their impact on their ability to operate, that changes the economic game and, and drives them to look at other technologies. Also nuclear being energy dense, whereas solar and wind energy diffuse our key there as well. That, that becomes part of the conversation of the economics of paying for a green energy dense a strategic asset, if you will for their capabilities.

(00:12:33):

That's being played out on the table. I, and they do acknowledge that you have to buy more than one. If you buy one, it's really expensive. If you buy 10, that becomes a lot better. A lot of the companies are facing this, we are facing it as well as we discussed with customers, but they're acknowledging it on the other side because they're industrial users. They know they know things about, if I buy six rock crushers, I get cheaper than if I buy one rock crusher that does a specific thing. Those types of of things are playing into the economics and the discussion that's ongoing, and I think it's gonna play out over the better part of this decade as we see the zero emission goals of 20 35, 20 40, you know, 2050 play out that the states are implementing. And that may be coming at a federal level. So yes, I think that are being considered. I hope that answers your question.

Rep Keith Ammon (00:13:30):

All right. Thank you Mr. Gunther, and thank you Josh for answering that. Representative Stapleton, do you have another question?

Rep Walt Stapleton (00:13:39):

Yes, I do. Thank you for taking my questions.

Rep Keith Ammon (00:13:42):

We're, we're running long on time, so let's keep it brief if we could.

Rep Walt Stapleton (00:13:45):

Okay. I keep it brief. As you downsize the ability to generate power out of these reactors, are they getting small enough to for instance, utilize in locomotives railway locomotives,

Joshua Parker - BWXT (00:14:00):

<Laugh>? I, we, we often joke, we have some people who who at one time historically looked at the old locomotive engines we're not quite that small yet. I, I don't know if we'll ever quite be down that size. It's always an intriguing thing. I often joke, we call these advanced nuclear just about every design you can see today was conceived in the 1950s. It, this wasn't economical back then. We have technology now that enables it. I, I wouldn't put it past somebody looking at it again today. We're not looking at it at locomotives at the moment, so

Rep Walt Stapleton (00:14:39):

Thanks for the question.

Rep Keith Ammon (00:14:40):

You, you're looking at spaceship propulsion, though, that's kinda

Rep Walt Stapleton (00:14:45):

<Laugh>.

Joshua Parker - BWXT (00:14:46):

I, we, we are, and there, there you are very much mass and size constrained in what you can get off the surface of the earth. And and it does bely where you can possibly take nuclear in the future. So that's fine. I gotta say, never say never. It might come back, but at the moment, I don't know of anyone looking at a locomotive.

Rep Keith Ammon (00:15:09):

Alright. And I just have one quick question. Part of our commission's duties is to study non-electrical applications, and I know you mentioned medical isotopes. If you could just give us a few words about how that, how that production is tied to is, is it tied to a nuclear generating facility or is it tied to a fuel manufacturing? If you could just give us a few words about medical applications.

Joshua Parker - BWXT (00:15:41):

Sure. Medical isotopes are, are typically generated in two primary forms. One is through an accelerator driven back on our map. We have a facility over in Vancouver, Canada that does that. Our major medical right now is, is with a, an isotope known as Molly 99 that is actually taking targets or starting material and a radiating it in a CANDU reactor in Canada in order to activate the material to get the medical isotope out. And so you can use nuclear reactors. Nuclear reactors can, can generate neutrons, which can create new materials such as medical isotopes. And there are a couple of reactors in the United States that do that. The University of Missouri reactor is really good at, at making medical isotopes for the industry. The CANDU reactors in Canada have some capability there. That's where we've industrialized some of our processes. And then, like I said, there are some accelerator created isotopes that you can do. Being able to handle fuel and material just means that we have the skills and the technicians and the capabilities of the chemists to handle the material safely as well as extract the material that's valuable to medical isotopes. So that blends well with our, our fuel facility and our chemists that are, that are doing that process as well.

Rep Keith Ammon (00:17:11):

All right, great. Thank you very much Joshua and Scott for this presentation. We really appreciate your spending the time with our group. And we may have further questions for you. So I have your email addresses and is that the best way to reach out to you?

Scott Nagley - BWXT (00:17:27):

Yes, it is. Yes.

Rep Keith Ammon (00:17:30):

Very good. Well, thank you. BWXT, and we'll move right into the next presentation, X-energy. And we have Carol Lane, she's the vice President of government relations for X-energy. And her bio, again is on our website, nuclear nh.energy. You can find today's meeting posted about there. And so, Carol, we'll

turn it over to you. You, we'll do a sound check and then we'll are you comfortable presenting your slides?

Carol Lane - X-energy (00:18:02):

Oh, I'm just, did they come up?

Rep Keith Ammon (00:18:04):

That came up? Yep. Well, we can see, we don't see anything yet, but we see that you're sharing your screen. There we go.

Carol Lane - X-energy (00:18:10):

Okay,

Rep Keith Ammon (00:18:10):

Perfect. Yeah, and if you, I think if you hit F five, that would gives you full screen just a second.

(00:18:22):

And then everyone else who's not speaking, please mute yourself.

Carol Lane - X-energy (00:18:29):

Okay. That work looks like it's coming up.

Rep Keith Ammon (00:18:29):

There we go. Full screen. Thank you.

Carol Lane - X-energy (00:18:38):

Okay, thanks. And I apologize the date's wrong on the front chart, <laugh>, I just realized That's okay. Really happy to be here today. And I also wanted to do introduce John Valentino. He's our Director of business development and he's on the line also to answer any questions as well. When I talked to Keith, I did wanna just mention that when I was a kid, I used to go to camp at Lake Sunapee, so I have very, very fond memories of being in spending my summers in New Hampshire when I was growing up as a kid. So wish I were up there instead of down here.

(00:19:18):

So just to start real quickly X-energy is a reactor, design and fuel manufacturing company, and we were started in 2009. And I'll get through our history a little bit and I'll, I will spend some time talking in 2020 was a very significant year for us where we ended up being selected as one of two awardees for the Department of Energy to deploy the first first non Lightwater reactor. In our case, it's a high temperature gas reactor, which we've talked a little bit about, but I'll get into a little more detail as well. We were actually started by Dr. Kam Ghaffarian. He's a aerospace engineer that started a company in the mid 1990s. Built it up to be a 650 million engineering support services that he sold to a company called KBR in 2018.

(00:20:21):

He's kind of a serial entrepreneur, very commercially minded. But we really got him into thinking about X-energy, and it was kind of two things. One was he and his partner had started a school in very poor

section of the Congo where there was an electricity. And you know, the kids would come to school and get a meal and instructions for half a day, and then the other kids would come and get a meal and, and meal an instruction for the other half of the day. And he really saw firsthand what it meant in terms of the 800 million to a billion people that don't have electricity in the world and, and really in order to change the standard of living, needing to you know, really provide electricity and make it accessible and affordable and clean.

(00:21:21):

And that was a, a primary driver for him. The second was recognizing, again, the clean energy challenges. He started looking at hydrogen as a you know, hydrogen economy. And as he started peeling back the onion of what does it take to get there, realized that you needed really to be in to develop nuclear energy at a much larger scale than we were implementing it in the mid two thousands. And so he talked to a lot of people, he wasn't wedded to any particular technology, and ended up deciding on a high temperature gas, pebble bed reactor, really based on maturity of the technology at the time, and felt that it was the closest advanced reactor technology that could get to market by the end of this decade. So that was really what was the driver for him. So as I said, we started in 2019.

(00:22:24):

I actually started at the company in 2015. There were about 12 of us at the time. We've just topped 440 people headquartered in Rockville, Maryland. And as a, a real driver in growth was the advanced reactor demonstration program. We are in three, what I call three business areas, and I'll spend a lot of time talking about our high temperature gas reactor that is a grid scale reactor. We call, you know, we, our most economical version, we call it four pack, which is four modules that would come together in a plant. In 2015 - we heard a lot from BWX Technologies about the TRISO fuel. We also are TRISO fuel based company. In 2015, we decided to invest in our development of our own capability to make TRISO fuel, and I'll spend some time talking about it.

(00:23:26):

So we do have a fuel manufacturing business line, and then we are in some strategic government R&D initiatives both for space nuclear reactors, as well as very small, one to five megawatt reactors for terrestrial applications. A couple of highlights in that timeframe from 2009 up till this year we did bring over, you know, the last, I guess most recent version of high temperature gas reactors had been worked on by the South Africans. It was a derivative of what the Germans had been doing in the seventies and eighties. And we did bring over about half a dozen to a dozen of the core team from South Africa over to the us and they formed our basic core team when we started the company. We have been involved with the Nuclear regulatory agency, both on the fuel side and the reactor side since 2018.

(00:24:33):

In 2019, Clay Sell became our CEO, former Deputy Administration Deputy Secretary for the Department of Energy. And then in 2020 we won the Advanced Reactor Demonstration Program. And then in the 22 timeframe we have signed an agreement with Ontario Power to look at nonelectric applications for our reactor. We broke ground on our TRISO facility down in Oakridge, Tennessee, and announced our initial letter of engagement with Dow Chemical in August of 2022. And then in 2023 just a couple weeks ago, announced Dow as a sub-awardee for the Advanced Reactor Demonstration Program.

(00:25:26):

I won't spend much time on it since Scott talked very eloquently about the history of advanced high temperature gas reactors. And that's what we're really trying to build on, learn from what has been done in the past. It's been, the technology has been deployed at research level and initial operational

levels around the world. And these are tend to be much bigger reactors. And what we're trying to do is really not so much prove out the technology, but prove out the economics. And so a lot of our changes to the design of what we're doing with a high temperature gas reactor is focused on what does it take to make an economical and deployable in the next five to seven years.

(00:26:16):

We spend a lot of time on TRISO fuel, so I won't spend much on it. Other to say Scott talked about their compact where they put their TRISO particles into a compact design that he said was about a half inch long. We put ours in a pebble, so we are a pebble bed reactor. It looks like this. And about 220 pebbles go into our reactor pour, which you see on the right hand side. You can kind of think of it as a giant gumball machine. So the reactor, the pebbles are packed in there. We flow helium over our, over the pebbles, and that's what heats up and gets carried over to the turbine and the steam generator to generate electricity or steam. Pebbles, there was an earlier discussion,

John Valentino - X-energy (00:27:09):

Just Carol, one clarification that's pretty important that it's not 220 folks, 220,000,

Carol Lane - X-energy (00:27:16):

Yes, sorry. Thousand in there. Thank you. I appreciate that. So we talked a little bit about burnup. Somebody brought that up earlier. We have very high burnup of the fuel within the particles inside the pebbles. And so what we do is, as the pebbles come down through the reactor, we about 70 to 80 pebbles come out a day. We test them for how much fuel is still left in the pebble. If there's still enough fuel to be burned, we recycle 'em back into the reactor. And if the fuel has been completely burned up or mostly burned up, about 95%, it goes into spent fuel storage. On average each pebble will go through the reactor about six times, and it will take it about six months to get through the reactor. So each pebble will spend about three years sorry three years in the reactor before it comes out and goes into spent fuel storage.

(00:28:26):

So I talked a little bit about the you know, the sizing of the reactors really based on the economics we saw at the time. And we can produce both electricity as well as processed heat, but there are some other things we're doing. And I think BWX Technologies talked a little bit about it as well. You know, we're trying to modular modularize and standardize as many of the components as possible. This is really important, particularly as you get into supply chain issues. And one of the things we've done as part in particular is look at, you know, how we can design our subsystems and components to be able to have at least two suppliers for each of our systems. It's not possible across the board, but what we're trying to do is get as many subsystems and components that fit into that category. So we are not dependent on single sources for supply for as, I guess our attempt is to do, to minimize that, do for as many as, as minimal subsystems as possible. And also, we are road-shipable. So our reactor core is able to be shipped by truck to get to a construction site.

(00:29:54):

You know, one of the things that has shown to be very expensive for the current fleet of reactors has been the, the construction cost and basically the current fleet has assembled on site. So we talked about the delivery model that we're using in terms of trying to get our supply chain lined up, making the components shippable and assemble, assembleable as much as possible before we get to the site. But we've also engaged with our construction contractors early to get their input into the design and their costs into the design, and to talk about how we do it so that we're connecting the manufacturability and

the constructability and marrying them up early before we complete final design. So we view this as very important. We announced our contract, our construction contractors last July, and we have two teams. One that Zachary Group is leading and the other is a Burns McDonald and Dan Zimmerman team. So they are currently working with us and, and agreed to the arrangement. And it's been working very well over the past six months or so.

(00:31:16):

So the Advanced Reactor Demonstration Program, it was a great program we felt for the government to take the initiative. One of the challenges in these reactors is how do you get the, the somebody to buy the first unit and, you know, in the first of a kind of, of our reactor. And so the Advanced Reactive Demonstration Program really provides that bridge to allow customers to not be the first and take on the risks associated with the first of a kind. So we were thrilled to win that program in 2020. We, excuse me, we are designing a four, what we call the four pack reactor that will be deployed now with Dow Chemical at a Gulf Coast, Gulf Coast site that will be announced shortly. So we're really excited about it. The other part of our advanced reactor demonstration program, as I mentioned, we had decided to become, to be in the fuel manufacturing business. And it does include construction or commercial scale price of fuel fabrication facility that we'll be building in Oak Ridge, Tennessee. And I'll talk a little bit more about that. And I think I've covered most of the other elements other than from an investment standpoint, we did complete a phase B fundraising campaign in 2021 and 2022, were focused on a series C fundraising campaign. That's still ongoing. But we did announce in December that we will be going public as a commercial company this year in 2023.

(00:33:12):

From a regulatory standpoint, as I said, we did begin our discussions with the Nuclear Regulatory Commission back in 2018 for both the reactor and the fuel facilities and has been in pre-application since then. On the reactor side, we've submitted what's called topical reports to get an indication from the Nuclear Regulatory Commission that they are in agreement with the processes that we are using to move forward. And we've submitted seven topical reports in seven white papers in the past couple of years. And we will be submitting our construction application at the end of 2023 to move forward with the first site. This is in, in 2016, we won an award from Department of Energy to set up a pilot manufacturing TRISO fuel manufacturing facility. This is at Oak Ridge National Lab, and we've had it operating since 2018. And what we've been doing is really, you know, working on our processes for our commercial application. The way we set up this facility was to put the equipment in that we would be using for a commercial facility. So it's not downscale downsized, it's not scaled at all. It's the actual equipment that we will put in a commercial facility. It's just one line of that equipment. And I said we've talked a lot about the, the pebble and the particles, and that's what we manufacture in this initial pilot facility right now.

(00:35:00):

We did groundbreaking at our facility in Oak Ridge for a commercial plant. That's what the picture is on the left hand side. April 6th, 2022, we submitted the first commercial application for a HELEU fuel facility fabrication facility. And that what that means is we won't be making HELEU, but we will be taking HELEU in as our feed stock to make the TRISO pebbles that we need for our reactors. We believe we're moving towards a 2020 initial operation. Our application was accepted by the Nuclear Regulatory Commission in November, and they held their first environmental public meeting at Oak Ridge in January 25th of this year on we've spent a lot of time on operator and training simulation in terms of how do you really, if we're building the next generation of reactors, how do we operate them and train the operators differently than the current fleet? So a picture on the left is our control simulation room in Rockville and we've had a lot of opportunity to look at how the operation and the design really work together. And

then we're right now in the process of building a plant support center, which will be our full scale operation and training center in Frederick Maryland. And that's due to open in the fall of this year.

(00:36:41):

So this is what our plant would look like. It would be standard plants four modules sits on 26 acres. And we would produce about 200 megawatts of thermal energy, 80 megawatt of electricity from a high temperature gas module, and then four modules. So it'll be 340 megawatts for the full plant. And then a standard plant basically during construction would have about eight, create about 800 to 1200 jobs. And then operationally it'll probably be about a hundred, between 102 hundred jobs. And so what this does, we're looking at how do you transition to have the workforce that we need to deploy our plans as we move forward in the future. We did a study which we could spend more time on, that was funded by the Maryland Energy Administration last year. And it looked at what does it take to use a retiring coal plant site to replace it with a nuclear reactor about like the size of ours.

(00:38:05):

So it was a very interesting study in terms of the process and the models that we use to be able to evaluate both the infrastructure that's there and how it would be applicable to a facility like the XC 100, as well as working with Frostburg State University on the socioeconomic impacts of a nuclear reactor in a coal community. And so if we wanna go into that in more detail, we'd be glad to spend a little time on that. One advantage of a high temperature gas reactor plant like ours is the ability to load follow, which is similar to both a coal plant and a, and a gas plant. So we can go from a hundred percent power down to 40% power in about 15 minutes and ramp back up to a hundred percent power. Gives a lot of flexibility to the utilities in terms of blending their loads with renewables, particularly solar and wind.

(00:39:14):

So there's a lot of interest in our ability to give that flexibility to utilities as we move forward. We talked a little bit about the advantages of the steam that we produce. We, right now, our plant produces 565 degrees C. And what you see graphically is what Scott talked to a little bit before, is that different levels and temperatures of steam are really applicable to different kinds of industrial applications. And we see that as a really big market if you're going to decarbonize not just the electric sector, but the 35% of the industrial sector that uses fossil fuels today. Interestingly enough, Dow's chemical facility, which we're looking at in the Gulf Coast needs about 500 degrees C for their processes. So we have an ideal match, and we're looking forward to being able to deploy both steam and electricity at that site.

(00:40:18):

So we, I I just in summary, we think there's a lot of applications for these advanced reactors that are different than what have been been used for nuclear energy in the past. We talked a little bit about retiring coal sites. The size of the reactors are very applicable to the size of many of the coal sites, coal plants that are retiring. We do think that we can get cost competitive with respect to carbon free heat and powered industrials facilities. And then ultimately with the high, very high temperatures we think nuclear can play a big role in hydrogen production, clean hydrogen production as we go forward. I just wanted to comment for a minute on the political situation. You know, the last five years have really been very interesting on the federal side. The federal government has been very supportive of advanced nuclear and trying to get to deployment get from nuclear get from research and development to actual deployment and commercial activity, and have tried to tackle a number of the different areas that are important to get to that deployment.

(00:41:42):

So I had mentioned the advanced reactor demonstration program. There was 2.5 billion that were provided and, and forward funding for that in the bipartisan infrastructure bill. There's we talked a little bit about HALEU fuel. There was 700 million that was funded in the Inflation Reduction Act to begin to stand up the HALEU production facilities domestically since we do not currently have that capability in the us. And so the support for nuclear energy and advanced nuclear in particular has been bipartisan and bicameral. And they've really been what I would call policy forward in you know, where they've I think they're maybe ahead of public opinion, but they've really taken a very broad look at where legislation has been needed and licensing modernization, how do we license advanced reactors different from light water reactors you know, looking at export issues, looking at micro reactors and looking at industrial applications.

(00:42:59):

So there's been legislation that's been considered in all of these areas to help move the advanced reactor community forward. You're probably very familiar with a lot of the changes in the state environments. We follow that very closely and, you know, be more than glad to work with you as you move forward on, you know, what your considerations are for the state of New Hampshire. And then finally Scott I think mentioned energy density and the power of nuclear reactors from the standpoint of their density. So we talked about what a, a, a reactor can produce with 220,000 pebbles in it, but just to give you a feel, this one pebble could power an electric vehicle for 98,000 mile hun, 98,000 miles, which is basically the circumference going around the circumference of the earth four times, or about two fifths of the way to the sur to the the moon. So very powerful energy source and hope to deploy these reactors in the next coming years. So that's my presentation and be very happy to answer any questions.

Rep Keith Ammon (00:44:14):

Great. That was excellent, Carol. Thank you for your time and John all as well. John, did you have anything else you'd like to add?

John Valentino - X-energy (00:44:24):

No, no, I appreciate it. I figure there's a limited time left, rather I figure better use maybe to just open it up to, to questions,

Rep Keith Ammon (00:44:31):

Question and answers. Okay. And we have some in the room here. Cathy Beahm. Cathy works for the Department of Environmental Services and she's a commission member. She's off the off camera, but in the room.

Cathy Beahm (00:44:47):

Hi. Hi, Carol, it's Cathy Beahm. Thank you. Hi. Agree, thank you for your presentation. I I was gonna ask you a question about federal incentives, but you did a very good job about talking about that as well as potential regulation obstacles. So I appreciate that, that aspect because that's part of our charge here at the commission. I wondered you, you had talked about a Maryland generation study or feasibility study of converting coal plants to nuclear. Is that something that's readily available or could be available to the commission?

Carol Lane - X-energy (00:45:19):

Yes, there is a public version, but let me, I'll ask John to comment if you would a little bit on the study.

John Valentino - X-energy (00:45:26):

Yeah, that's Cathy would, that there is a public version, there was a proprietary and a non-pro proprietary version. The pro, the non-proprietary version is publicly available on the Maryland Energy Administration website. Keith, I can send you a link for that. And I can also, I think I have the PDF of that. I can attach the PDF that's available to the general public. Happy to send that along to you.

Cathy Beahm (00:45:51):

Thank you. I appreciate that. And then I, I kind of have a, maybe a basic question because I'm not a nuclear expert. Both presentations were about this TRISO pebble, or cylinder or whatever.

Carol Lane - X-energy (00:46:03):

TRISO pebble. Yeah.

Cathy Beahm (00:46:04):

Right. And I, I recognize that it appears that it's a very stable way to create, you know, a small nuclear source, but I, I'm having a hard time visualizing how it becomes an active power source once it's in the, in the reactor itself. Is there a way you could, just for basic understanding, <laugh>, how does that convert from being so stable to being reactive?

John Valentino - X-energy (00:46:27):

I, I'll, I'll take the first shot at that. I guess simplistically you have these call 'em poppy seeds, these little trio particles. They're for, for our brains to figure out, I think an easy way as a poppy seed or a chia seed, something about that size. When they get into a neutron field with the uranium 235, the neutron causes that uranium 235 that's embedded in those little poppy seeds. Some of the uranium 235 will split releasing the heat, and then you just pump the helium or in the old fashioned way, the water over the, the, those, those particles and they extract the heat from it. Does that make sense?

Cathy Beahm (00:47:11):

Yes. Thank you for that. Appreciate it.

John Valentino - X-energy (00:47:14):

Sure.

Rep Keith Ammon (00:47:15):

And just a follow up question to that, how do you regulate that heat? Is it the, the flow of the gas and when you need to shut down? How do you shut what, what's the safety mechanism?

John Valentino - X-energy (00:47:27):

Sure. The, that during normal what you're gonna do is exactly, you're gonna control the fluid flow, the gas, the gas flow over the pebbles. In shut down, if you're shutting the plant down, there's control rods that you'll insert in the control. Rods will be inserted into the reactor core. The insertion of the control rods is gonna start to suck up all those neutrons. So the neutrons get sucked up in the control rods when they go into control rods. They can't cause more reactions and more heat generated from the fuel.

Rep Keith Ammon (00:48:03):

Alright, great. Any other questions in the room?

Carol Lane - X-energy (00:48:06):

So if I could just make one more comment. When I talked about load following, that's one of the really nice features of this is you don't have to change the temperature and the reactor, so you're not putting stresses on the reactor. That process is really done by the pressure of the helium I with the on the non-nuclear portion of our plant. And so it gives that flexibility to the utility without having, without any wear and tear on the reactive port itself.

Rep Keith Ammon (00:48:44):

Great. And just another follow up question on the load following we want to kind of delve into this idea of the large flexible load. And you, you mentioned helium, or sorry hydrogen production is, is that, is there a relationship between, are you wasting energy when you load follow? Is there heat that's being vented and not utilized during that process that could be used for some other some other productive source like helium or source hydrogen production?

John Valentino - X-energy (00:49:19):

Keith, you're, you're exactly right. There's no point in generating the heat if you're just gonna reject it and use it for nothing. Right? That's a complete waste of effort in, in money, frankly. So what you'll do on a load following, for instance, pick, imagine a day where there's a lot of sun and you're getting a lot of solar, or there's big windstorm coming and you're getting a lot of wind. You keep the, you can keep the reactor at, at full power. What you'll do is you'll do exactly what you're referring to. Ahead of time, you'll have it set up, so your reactor, instead of spinning, spinning a turbine in, in making electricity, you can divert that same heat flow to other uses, such as hydrogen, such as thermal storage systems or desalination plan if there was one nearby. So the reactor operates at the same constant steady state, but instead of sending the heat to do electricity production, you can divert it. If you've set up the system ahead of time, it takes, obviously we have some utilities that are interested in, in thermal storage plants where you can store the thermal, the heat from the reactor, store it in a molten salt contraption, for instance, and then extract it five hours later when the sun is down. And you need the power. So it's all part of the planning process so that Keith, you don't do exactly what you said, which is lose essentially lose efficiency. That's what none of us want, want to do.

Rep Keith Ammon (00:50:46):

Very neat. And I have another question about retrofitting a coal plant. New Hampshire has one of the last, I think the last coal plant in the New England grid. And that plant just lost a bid for a three year energy contract. Someone in the room can correct me on the details, but there's a, there's a chance they didn't, the capacity auction, they didn't clear the capacity auction, so there's a chance they may be in trouble. So if you could talk a little bit more about how do, how do, how would you go about retrofitting a somewhat antiquated coal production facility? What would that look like? That process of, of converting.

John Valentino - X-energy (00:51:32):

It's an issue that New Hampshire is not alone on by any stretch, hence the Maryland study in a number of other places that are evaluating the same thing. One of the great things about an existing facility is

already has a lot of infrastructure available, not the least of which is you have transmission switchyards already there. And as you probably know up in the New England area, you know, doing any new transmissions can be quite a task, but they're already in place. Another huge item, you have trained workforces, people that have been working at these plants for 20, 30, 40 years that know exactly how to operate. You know, their, they're tradesmen, they're electricians, they're mechanics, they're used to operating heavy equipment. So you essentially do a study to evaluate the environmental perspectives, including things like buried piping and what's, what's at the sites.

(00:52:28):

You can reuse some of that equipment, some of it will not be reusable and you'll have to bring in special stuff just for the nuclear part of it. But a huge part of it will be non-nuclear related. What can you reuse on that side? Like the transmission distribution systems, how many of those personnel that saves jobs and tax base? Right? That's a, that's a huge issue in, in every state, in every locality. And the studies essentially start to evaluate that type of setup to look at the coal facilities and they, and then say, how can we use the people and the processes and the hardware for a new use?

Rep Keith Ammon (00:53:17):

And so it, it's,

Carol Lane - X-energy (00:53:18):

So some of it, I, I was just gonna add, some of it wouldn't necessarily be retrofitted, but for example, like on the, you know, the turbine, that steam generator where we might use you know, a very similar or even an identical piece of equipment, but depending on how old that is, I mean, it's just may be more economical to, to buy, you know, a new version of that as opposed to, you know, utilizing something that's been there for a long time. So, you know, it, it wouldn't necessarily, you know, those are the kinds of trade offs that you would make,

Rep Keith Ammon (00:53:56):

You would make. And what is the and I, I see hands raised online. What is the buffer zone required around a reactor like yours? As far as population?

John Valentino - X-energy (00:54:12):

As far as population or, or, it's, it's usually by distance and

Rep Keith Ammon (00:54:17):

This, right? Like the

John Valentino - X-energy (00:54:20):

Yeah, the, it is, I believe it was 400 meters. So much, much smaller than the current 10 mile. That's, that's around Seabrook, for instance,

Carol Lane - X-energy (00:54:31):

About 26 acres.

John Valentino - X-energy (00:54:33):

Yep.

Rep Keith Ammon (00:54:34):

26 acres. Oh,

Carol Lane - X-energy (00:54:34):

It's a, a lot of the advanced reactors are doing it basically the emergency planning zone shrinks to really the fence line of the reactor. Right.

Rep Keith Ammon (00:54:47):

Okay. So we have, one of our members is from NextEra Seabrook. He couldn't be here. Matt Lader, he couldn't be here cuz they're doing a refueler. So he has a, the night shift. He's probably sleeping right now. So. Alright, let's go to Representative Stapleton first and then we'll go to Paul Gunter. And just

Rep Walt Stapleton (00:55:09):

Yeah, thank you for taking my question. You mentioned looking forward to micro reactors. Just wondering how far along that process processes in, in that particular field.

Carol Lane - X-energy (00:55:26):

So we also had a contract for two years with the Department of Defense to look at a very small one to five megawatt reactor. We are continuing with our design on that, so we're really in the design phase. And looking at how to make it economical. It's, you know, the, the larger size reactors are actually more economical than the really small reactors. And so we're looking at the kinds of things that we can do to make that commercially economic economically viable.

Rep Walt Stapleton (00:56:04):

Thank you.

Rep Keith Ammon (00:56:06):

All right. And Mr. Gunter, do you have a question?

Paul Gunter - Beyond Nuclear (00:56:09):

Thank you. Paul Gunther Beyond Nuclear you raised the issue that the these high temperature gas cool reactors are not gonna have emergency planning zones. It, it's also should be noted that they also will not have overall containment structures each of these 240,000 pebbles. The ceramic coating constitutes the credit for the containment. So can X-energy offer confidence in its containment strategy by not participating in the Price Anderson Act? Or are you gonna come to the taxpayer to cover the liability of any potential accident?

Carol Lane - X-energy (00:57:07):

I don't know that I can answer that at this point. We're, we're looking at our final design and going through the regulatory process and you know, we'll have to make that decision between us and our customer at a future date.

Rep Keith Ammon (00:57:28):

Alright. any other questions in the room? Seeing none we really appreciate your time Carol and John. The hydrogen production was kind of interesting. I'm trying to line up Q-hydrogen, which has a facility in New Hampshire where they manufacture hydrogen. So potentially at a future meeting it, it makes sense to me that having a, a cap the capacity to utilize the energy a hundred percent of the time for some productive capacity would lower the ROI on a, on a small nuclear project. And so, so that's intriguing to me to see how those things fit together to make a project be viable. So,

Carol Lane - X-energy (00:58:19):

Well the other thing in considering that is that, you know, the, the costs for the industrial steam is valued differently than the electricity for that's needed to be put on the grid. So you actually need to look at both of those cuz you're not just because you've got just to have different markets and different price points for each of them. And so when you look at utilizing both, you need to look at the price points for both of those markets.

Rep Keith Ammon (00:58:56):

Yeah, and here's another thing that's interesting. I'm, I'm reached, I've reached out to a company called TeraWolf. They have large scale bitcoin mining facility in Pennsylvania and they, they've set up a five year contract with a nuclear power plant in Pennsylvania and I think they're getting like 2 cents per, per kilowatt. So there's, there's some kind of mutually beneficial arrangement in, in that area. So

Carol Lane - X-energy (00:59:24):

Interesting.

Rep Keith Ammon (00:59:25):

Yeah. A lot of interesting applications.

Carol Lane - X-energy (00:59:27):

Yeah.

Rep Keith Ammon (00:59:28):

Alright, thank you very much to you both. We have a few more minutes of just some minor things to cover and you're welcome to stick around or, you know, we won't have our feelings started, a few drop off. Okay. We'll just wrap

Carol Lane - X-energy (00:59:41):

This. Well, thanks for inviting us, we really appreciate it.

John Valentino - X-energy (00:59:43):

Thanks, Keith. Appreciate the time from all you

Rep Keith Ammon (00:59:45):

And if you're ever back in lake Sunapee reach out to us we'll have some ice cream.

Carol Lane - X-energy (00:59:51):
Okay, thanks.

Rep Keith Ammon (00:59:52):
Very

Carol Lane - X-energy (00:59:53):
Good. Bye-Bye.

Rep Keith Ammon (00:59:54):
Bye-Bye. Yeah, if you wanna pass that mic over and just make sure it's green.

Richard Barry (01:00:05):
Can you hear me?

Rep Keith Ammon (01:00:08):
Oh, as long as it's green, you have to push a little button on the side. There's a tiny button. Oh, okay.

Richard Barry (01:00:16):
Good. Now it's, can you hear? I don't know,

Rep Keith Ammon (01:00:22):
As long as it's green, you should be good to go.

Richard Barry (01:00:25):
That's right.

Rep Keith Ammon (01:00:26):
Push the button. Mark, can you help him with that? You just have to push it once. Yes.

Richard Barry (01:00:35):
I'm turned green.

Rep Keith Ammon (01:00:37):
Oh, you did? Just don't hold it.

Richard Barry (01:00:39):
You go. It's, it's, it's basically for this group and I'm delighted that Mike Harrington is on a committee becuase he is something to do with the PUC. I was on the Seabrook Nuclear Decommissioning Commission and, and was amazed at the amount of money that we have already put into Seabrook for end of life. When you look at competition and what the cost is upfront today, if you factor that in, then either that's, that's a, a government issue and maybe something needs to be done there to, to, to

mitigate that, that whole content. I mean, you're talking billions of dollars that we've already paid for to decommission Seabrook.

Rep Keith Ammon (01:01:32):

So we, we paid in advance for end of life on Seabrook. And that's state money you're talking about.

Richard Barry (01:01:37):

That's utility money. I mean, it comes out of our property

Marc Brown (01:01:40):

Ratepayer.

Richard Barry (01:01:41):

Ratepayer money. And

Rep Keith Ammon (01:01:44):

So the dynamics might be different with one of these modular reactors, right?

Richard Barry (01:01:48):

Absolutely. Yeah.

Rep Keith Ammon (01:01:50):

Very interesting. All right. Any other discussion? I thought both those were really awesome in presentations. So I feel like we're learning a lot in it's it's a fun thing to do with your time, right?

Cathy Beahm (01:02:06):

I was thinking it would be helpful. We had grid of all the different speakers and what their reactors and tools covered.

Rep Keith Ammon (01:02:15):

Okay. That's a great idea. Do we have an intern? Yeah, <laugh>. Yeah, we'll see if we can come up with something like that.

Richard Barry (01:02:26):

See if we've covered,

Rep Keith Ammon (01:02:28):

Right. Yeah, and I think we've covered most of them, but there are a few that we haven't, but the different technologies involved in like Helium versus Lightwater, so forth. Molten salt. Alright. Let's just look at the agenda here. Any other public input? We got some people in the room

Douglas Mailey (01:02:52):

Question, not input.

Rep Keith Ammon (01:02:53):

Sure. because we have people on Zoom, would you mind taking that mic and just talking into it? You're done. Good.

Douglas Mailey (01:03:01):

Should be great. Okay. Thank you. Actually, I, I I have a broad overview.

Rep Keith Ammon (01:03:04):

If you state your name and,

Douglas Mailey (01:03:05):

Oh, I'm sorry. Douglas Mailey, a member of the public. This committee, this session, what is sort of the final objective? Is it to come up with some specific recommendations for just an overview report to another body? I'm just curious where this heading?

Rep Keith Ammon (01:03:20):

Yeah, I mean, one aspect would be any adjustments to state statute. Yeah, that's a big target and there's a few ideas for that. We haven't got into citing mm-hmm. <Affirmative>. So as we, once we get a, a good overview of the industry, we're gonna go into how can we apply it in state and you know, siting wouldn't be a big issue. We have I have lined up some, I have five, five or so future speakers in the can. One of them is the Department of Nuclear Energy. So they're gonna be speaking their assistant secretary from the Department of Nuclear Energy will be speaking to us. So one of the other aspects is how do we engage our federal delegation? And, and they mentioned there's 2.5 billion in the Inflation Reduction Act that are available for this industry. So we're exploring how to connect the dots on those different avenues. So any help that you could give us, we'd appreciate it. <Laugh>. Okay.

Richard Barry (01:04:30):

Question. No input.

Rep Keith Ammon (01:04:31):

Okay. Great. <Laugh>. Well maybe you'll, you'll have soon. Alright. Any other questions from the public? Vikram, you have anything to say? No. Okay. And you actually spoke to what was it, Oklo? Yeah. Are you still in contact with them?

Vikram Mansharamani (01:04:48):

Yeah. Learning about what they're doing and spent more time, they

Rep Keith Ammon (01:04:55):

Oh, would you mind using the mic? <Laugh>

Vikram Mansharamani (01:05:00):

Vikram Mansharamani, member of the public. Just yeah, I did speak with the Olo management team, including the founder really just to learn more about what they were doing and, you know, selfishly to

see whether they potentially looked to New Hampshire as a place to try some of this stuff, what it would take for that to happen. But aside from just very preliminary conversations, it has not progressed yet.

Rep Keith Ammon (01:05:24):

Okay. Great. We'll keep this in the loop. I'll be awesome. And maybe X-energy and some of these other companies might wanna reach out to Vikram. Yeah. Former, former US Senate candidate <laugh>. Well, semi, semi-retired. All right.

(01:05:45):

Matt gave us a suggestion. I don't know. I don't, we don't have it printed out and that's fine. But the Department of Energy, maybe this will be good to get up to speed on when we have the department energy present. But they, they issued, it's linked to in the, the Minutes and also on the website, they issued this report Pathways to Commercial Liftoff for Advanced Nuclear I skimmed it. I have to go back and study it more. But it's actually their vision of taking this technology and, you know, the path to commercializing it. Both of our presenters today had the date, 2028 for production. Those dates tend to slip a little bit, but it's not that far away, you know five years goes by very quickly, especially on a project this size. So that report is very interesting as far as how the federal government is you know, greasing the skids for this technology to come to commercial production.

(01:06:46):

Yeah. It's, it should be printed out, it's pathways to com. Yeah, the, the link is on the website if you go there, actually their report is hosted there. But, but that was a suggestion sent to me by Matt Lavander. And something that we should definitely get up to speed on. Another just fun item is the Oliver Stone is releasing this movie called Nuclear Now <laugh>. And it's it's playing one day only in New Hampshire, in Newington. So I was gonna go just for the fun of it. I might buy a few extra tickets and, you know, promote our commission with those tickets, if that is okay with everybody. Aand if you'd like to join me and my wife to go see an Oliver Stone flick and I'm sure I'll agree with some of it, but not all of it, all of it.

(01:07:37):

But it's on nuclear and there's a link on the webpage for the tickets. So I thought that was interesting. And then just an update on my request to the executive council that statute, RSA 162B, we talked about last meeting. It actually is a, a position that someone is supposed to have to keep tabs on Atomic energy, it's called in the, in the statute, and if they're appointed by the executive council and the governor. And that position is supposed to issue a report every six months. And so I sent an email and I think I line copy everybody on the commission to the executive council and the staffer that that works for the executive council. That email got forwarded to the governor's office and Dee from the governor's office reached out to me on Wednesday.

(01:08:35):

So they're, they're aware of it, they're looking into it. She gave me an update on the statute, and I think it hasn't been filled since the year 2007, but it was updated recently when the Department of Energy was created. They added that piece to the statute. And so I'm not sure I, my my feeling was I'd like to get it on their agenda and just come and say, are you aware of this? What can we do to, you know, maybe modernize it? But it's this statute here for people on Zoom, I guess I should share. So for those on Zoom this is the statute here, peaceful uses of atomic energy. But there is a,

(01:09:28):

There's a section in here that they have to issue. So conduct, conduct of studies concerning changes in laws and regulations with the view to atomic industrial development. So that's what this commission is

doing. And that's been in there since 1955, which is kind of interesting. Coordination of studies and development activities. So they shall appoint the head of one of the state departments concerned as advisor to the governor with respect to atomic industrial development within the state. They're gonna coordinate development and regulatory activities. And there's so here's the position, the Coordinator of Atomic Development Activities so that, that link is in the minutes and on the website too, if you want to dive into it. But I'm trying to see if we can resurrect this, and maybe it's part of one of the outputs of this commission. We could update this statute and get ready for these, this commercialization that we know is coming. Right. So that thought that was interesting. Dick, do you have any insight into that position?

Richard Barry (01:10:41):

No.

Rep Keith Ammon (01:10:42):

Did, did you ever, but you, you were aware of it? Yeah. And has anybody spoken to you? So Dee gave me the man's name. I, I didn't write it down. I was in my car.

(01:11:01):

It hasn't happened yet. I want to, so Dee came up with a name, and I think the person lived in Merrimack, I can't remember. I can get the name from where I should, I should have, but to see if person's even still alive, <laugh>, and maybe get an update on, you know, what that person knew about that position. So I'll, I'll follow up on that. Yeah, I'll, I'll, I'll send you their name, maybe you know them. Very cool. Alright. And so for for action items I'll, I'll continue to follow up on that executive council thing. Our next report is due in July. I, I've been thinking about it. I'll probably do a draft, if anybody wants to help me with that, feel free. But I'll definitely want everyone to feel like they have input and make sure I'm not missing anything.

(01:11:52):

But we'll give a, a preliminary, it's an interim report it's due July. And then our final report is due in December. So we'll probably take at least a month off from the summer, whatever you guys think is best. But we'll, you know, we'll, we'll keep planning these meetings as we go. Sure. I'll keep trying to get Southern, Southern would be great. In X-energy's report, they had a couple contractors listed. Maybe to dig a little deeper into, you know, the, the ecosystems supply chain. The supply chain was trying not to overuse it. <Laugh>. But here's who, see if I, if my notes will update here. Okay, yeah,

(01:12:53):

Yeah, that would be great. And that the report there's some charts on that report that Matt linked us to that might be useful. This doesn't seem to be updating. Let me see if I can pull it up on my phone. If you use OneNote, they sync between the devices and most of the time it works. Oh, you know what, it's maybe, yeah. So Katie Huff is assistant secretary for Nuclear. So I, I'm gonna line them up as soon as possible. I think we have Gareth Thomas from Holtec.

(01:13:40):

I have connection with that, that TeraWulf company. I mentioned Michael Enright. I'm trying to get ahold of Q Energy, but if there's any other, but it's called a large flexible load. That's the category in Ercot. They have a whole commission about large flexible loads. But if there's any other, desalinization was mentioned, right? I thought maybe we'd do a one meeting about that kind of stuff just to, because it's a piece of the puzzle to make the project viable and, and, you know, economically feasible. I think. So we should know a little bit about it.

Marc Brown (01:14:18):

I know there was some discussion about putting a desalinization plant at Seabrook at one point.

Rep Keith Ammon (01:14:25):

Okay. That'd be a good spot for it, right? I

Marc Brown (01:14:28):

Think a bull.

Rep Keith Ammon (01:14:31):

Okay. All right. And then, oh, LightBridge is another fuel manufacturer and they're interested in presenting to us. So I'll try to get those lined up and make sense. But if there's anything, any other suggestions or connections that you have, feel free to plug us into that and we'll we'll put 'em on the board.

Richard Barry (01:14:57):

Yes.

Rep Keith Ammon (01:14:59):

Yeah, it's I'll pull it up real quick here. I don't have a connection to them. Is it Patrick Burke?

Marc Brown (01:15:06):

Bruce.

Rep Keith Ammon (01:15:07):

Bruce.

Marc Brown (01:15:07):

So Simon Logging Simon works for, and he also represents NextEra. I think they're a client. Okay. They a client of his. But

Rep Keith Ammon (01:15:18):

So Q Hydrogen, let me just show you what I saw the other day

Marc Brown (01:15:22):

From Utah.

Rep Keith Ammon (01:15:27):

I think it's on their about page

Marc Brown (01:15:29):

Some growth. Cory.

Rep Keith Ammon (01:15:36):

Yeah. So it's in our first commercial implementation in New Hampshire is the world's first power plant completely fueled by clean hydrogen. I thought it said the town. You see the town there. Anyway, I

Marc Brown (01:15:55):

Think it's, I think it is Groveton.

Rep Keith Ammon (01:15:57):

Okay. And I'm, I'm guessing that's a picture of it there. Yeah. Hydrogen is a energy storage. It's not an energy source. It's a, it's more like a battery than it is oil coming out of the ground. Right. You gotta produce the hydrogen. So, you know, we'll, maybe, we'll, does that sound like I'm going too far off the rails? If we line them up and there's been articles recently, I don't know how true this is, but there's been articles I've seen recently that they're finding stores of hydrogen like underground that they can tap into. There's like these traps of hydrogen that they can, like, I, I don't know how, how feasible that is. Like we

Marc Brown (01:16:43):

Have other gas that straps on.

Rep Keith Ammon (01:16:44):

Right. But, you know, that's not, not exactly related, but I

Richard Barry (01:16:50):

Think natural is just probably hydrogen powered.

Rep Keith Ammon (01:16:54):

Okay. Wow. Fuel cells. Yeah. And fuel cells were invented like a hundred years ago. So it's, it's, we should have them by now. Like electric cars. Yeah, like electric, but it's zero carbon. Right. That's kind of cool.

David Shulock (01:17:07):

It would be interesting associated with ing,

Rep Keith Ammon (01:17:15):

Right?

David Shulock (01:17:16):

If you're looking at taking,

Rep Keith Ammon (01:17:19):

Yeah. How does it affect, can they make you pay? Right. How does it fit in?

David Shulock (01:17:31):

Right. How do you get those?

Rep Keith Ammon (01:17:33):

Well, well what's interesting, I mean, this is my assessment and maybe I'm way off, but grid scale storage, like lithium battery, it's never gonna be there. Right. It, the physics don't work in my, it's a lot of lithium. Right. And it's, it's only for an hour or two. It's not like you can store days of it. Right.

Marc Brown (01:17:54):

Let's not get into geopolitics Congolese minors making the dollar a day,

Rep Keith Ammon (01:18:00):

Right. The ground, the alt mines and so forth.

Richard Barry (01:18:09):

I haven't seen

Rep Keith Ammon (01:18:12):

Right, right. How long?

Marc Brown (01:18:15):

We have about four hour duration right now. It's pretty much

Rep Keith Ammon (01:18:20):

In Australia and four hours doesn't work around here. Right? Nothing. But the hydrogen is a way to store energy and then run a generator with it. Right? So I'm sure there's, there's loss in the whole process. Right. But but you

Marc Brown (01:18:35):

Can keep it,

Rep Keith Ammon (01:18:36):

Well, you can keep it right.

Marc Brown (01:18:39):

And that's part of the discussion about things like offshore wind, right? Instead of curtailing the wind when it's producing more than the grid can handle, you're using it to produce hydrogen storage. And that's our back on the grid as well.

Rep Keith Ammon (01:18:53):

Right?

Marc Brown (01:18:53):

So that's something that's being talked about too.

Rep Keith Ammon (01:18:57):

And then does the, the loss of energy, because you're converting it to one thing and back to another, does that affects the economic, right? But anyway, what I'll see if I can line up Q Hydrogen if you have any connection, Alvin.

Alvin See (01:19:12):

One other option might be pump storage.

Rep Keith Ammon (01:19:15):

Pump storage. Yeah.

Alvin See (01:19:16):

Reservoir on top of a hill and <inaudible> at

Rep Keith Ammon (01:19:19):

The bottom. Right. And you need a hill to do it on. Right. So you've probably heard about pump storage. Yeah.

Marc Brown (01:19:25):

Northfield in the Mass. Think it's a large Right.

Rep Keith Ammon (01:19:30):

But it's pretty efficient. I think it's like 80% efficiency

Richard Barry (01:19:33):

Something. Yeah, like 85% around, you know whatever. It's circular efficiency. Round trip.

Alvin See (01:19:40):

Yeah. That was based on round trip efficiency, overnight. Unneeded capacity of millstone. New power plant down.

Rep Keith Ammon (01:19:49):

Oh, was it? Okay. Very interesting.

Alvin See (01:19:51):

That's where we got the elector pump up.

Rep Keith Ammon (01:19:54):

Very interesting. I think anybody else have any final thoughts? So, we'll, I think we'll call, call the meeting. All right. Motion to adjourn. All right. All in favor? Aye. Any post. And then we'll do our minutes next meeting. All right. All right. Thanks everybody. Look good to see you, Dick. Do you have to run off or are you gonna stick around a little bit. Wanna see me while <laugh>? Thank you everybody online. We really appreciate you participating or listening in.