Rep Michael Harrington (00:00:03):

Here or not. Okay. They also only do a lot of stuff that they know.

Rep Keith Ammon (00:05:21):

All right. We'll call the meeting to order. It's 9:03 AM this Monday morning. This is the the, the study commission to study Nuclear Energy Technology focusing on NextGen technology. There's a very long name that I can't remember for the official title of this commission, but that's basically what it does. if you are on the chat, if you're on Zoom, I'll send you, this is a link to our agenda and things that we'll be talking about. I'm gonna post it in the chat there and we'll start with welcoming our new member. Mikael, thank you for joining us.

Mikael Pyrtel (00:06:04):

Thank you very much for having me.

Rep Keith Ammon (00:06:05):

Would you like to say a few words?

Mikael Pyrtel (00:06:08):

Thank you. good morning. My name is Mikael Patel. I'm here to represent New Hampshire business and Economic Affairs. this is my first, first meeting here. So I look forward to meeting all of you and participating in the commission.

Rep Keith Ammon (00:06:29):

Alright, that's great. Thank, and you pronounce it Mike Mical.

Mikael Pyrtel (00:06:33):

Michial. Yes.

Rep Keith Ammon (00:06:33):

Michial. Okay. I'll, I'll get that right.

Mikael Pyrtel (00:06:35):

That's alright.

Rep Keith Ammon (00:06:37):

Alright. Right. Very good. So, welcome. the next thing we'll do is we have minutes from the May 12th meeting, and this was American Nuclear Society and Holtech, I think, I think Daniel you'll probably abstained.

Mikael Pyrtel (00:06:50):

Yes.

Rep Keith Ammon (00:06:50):

Yeah. So if anybody, I, I sent this out on Saturday evening, if you had a chance to, to read it. So we had Craig Piercy from the American Nuclear Society. We had Gareth Thomas from Holtech, and it's a summary of their, of the points that they made and some detail on the q and a that we had with each of them. So any, any changes to the minutes? Good to go. Alright. I'll accept the motion to approve the minutes Bart Fromuth moved. Second. Second, Chris. Thanks. all in favor? Aye. Aye. Aye. Any opposed? And then Anys Abs. Okay. Two abstentions. All right, good. So those minutes will go up on the website. And we have, I have two people in the waiting room here. It's Monday and my coffee's just kicking in, so, all right. So we're gonna go Seth, I'll ask you to unmute

Seth Grae, Lightbridge (00:08:08):

Morning.

Rep Keith Ammon (00:08:09):

Great. And let me I'll put you on the the spotlight here so everybody can see you. Good morning. Thank you for joining our commission. I'm off to the side here. I don't know if you see my hand waving, but the, the, the cords for the camera are, are short, so I need to sit close to the TV. Okay, great. So, Seth, welcome and if you'd like to introduce yourself and I, I have your slide presentation. Do you want me to present or do you want me to make you a presenter?

Seth Grae, Lightbridge (00:08:37):

why don't you make me a presenter?

Rep Keith Ammon (00:08:40):

Alright. See, that's not,

Seth Grae, Lightbridge (00:08:45):

And while you're doing that, I'll, I'll say I'm Seth Grae. I'm the CEO of Lightbridge Corporation. We are designing advanced fuels for reactors for the existing plants reactors. pleasure to share the bill with my friend Matt Wald, who will be on next as one of the leading analysts and writers in the nuclear power industry. So I also look forward to Matt's presentation. I look forward to any questions and comments that all of you have.

Rep Keith Ammon (00:09:17):

Great. And I am trying to figure out how to make you a presenter.

Seth Grae, Lightbridge (00:09:22):

Okay. You might be able to just share my screen if you let me. Oh, you know what? Ifs faster. Why don't you just, why don't you just start, that's fine.

Rep Keith Ammon (00:09:36):

Here we go.

Seth Grae, Lightbridge (00:09:37):

I just do it from your machine.

Rep Keith Ammon (00:09:39):
Try that now.

Seth Grae, Lightbridge (00:09:41):
Let's see

Rep Keith Ammon (00:09:43):
Where it was.

Seth Grae, Lightbridge (00:09:45):
Okay,

Rep Keith Ammon (00:09:46):
Well that's on the tv, so Yeah,

Seth Grae, Lightbridge (00:09:55):
Disabled. if you can just put it up, that'll be fine.

Rep Keith Ammon (00:09:58):
Okay. I have it here somewhere.

Background noise (00:10:04):
Video dis reduction close gmi,

Rep Keith Ammon (00:10:14):
Just take me one second.

Seth Grae, Lightbridge (00:10:16):
Yeah, yeah.

Matt Wald (00:10:28):
All right, Seth, I got you beat while we're waiting here. Yesterday was Father's Day and I got a nuclear neck tie, so I dunno if you can see it on the screen, but for my presentation, really love you. I'm wearing a, my Father's Day nuclear neck tie.

Seth Grae, Lightbridge (00:10:45):
Oh, that's fantastic.

Rep Keith Ammon (00:10:47):
That's awesome.

Seth Grae, Lightbridge (00:10:49):
One

Rep Keith Ammon (00:10:49):

Of, I'm catching up.

Seth Grae, Lightbridge (00:10:50):

Your kids actually know what ties are

Matt Wald (00:10:53):

<laugh>. My kids do. My grandson's shirt doesn't.

Seth Grae, Lightbridge (00:10:57):

S Okay. All right, well, well,

Rep Keith Ammon (00:11:02):

Welcome. I was doing that all day.

Seth Grae, Lightbridge (00:11:04):

Okay. Well real pleasure to be here and to join the nuclear New Hampshire Study Commission today. Lightbridge is a publicly traded company on the NASDAQ Stock Exchange under the ticker symbol LTBR. We are one of the few, but growing number of pure nuclear publicly traded companies showing investor and public interest growing in nuclear power. From the information sharing to the investing, we are a bit unique in that we are only designing new fuel. We're not designing a new reactor. And the fuel we're designing will be for the existing reactors as well as for new, small modular reactors of similar technologies to the current reactors, but smaller. And the, the next slide I think we'll, we'll, we'll skip for now. It's a video, three minute Introduction, three minute introduction to Lightbridge. It's on our website and, and you can go to, but I think I'll cover it all in the presentation here and spare you the commercial that YouTube puts at the start of that video.

(00:12:24):

So, on on this slide, you can see the pictures of some of the fuel rods that, that we're developing. Current fuel in reactors, like at the Seabrook plant in New Hampshire have a couple of hundred pellets of uranium stacked up in uranium zirconium tube. And that technology has been around for over six decades with only very slight incremental changes along the way. And at Lightbridge, we decided to reimagine and redesign nuclear fuel from scratch, taking advantage of new metallurgy, new science and engineering, come up with a superior product. And what I'll do is just pick one or two things off each of the slides and if there's anything else you wanna focus on, let me know in the Q&A. So this fuel is designed to significantly improve the economics of nuclear power as well as proliferation resistance, safety in an already very safe industry.

(00:13:41):

And better allow the reactors to load, follow, go up and down in power paired with renewables on a zero carbon grid. We go to the next slide. This is the introduction to Lightbridge fuel. And now we go to slide five. So here we have a photograph of these same kinds of fuel rides put together into a nuclear fuel assembly, the bundle of fuel rise that go into the core of a reactor. This particular fuel assembly is for Russian VVER type reactors. And there's a lot of interest in replacing Russian supply for fuel and central and eastern Europe with with, with fuel from friendlier countries to, to those nations that have the reactors, the Lightbridge fuel will utilize in these kinds of reactors what's called high assay, low enriched uranium, higher in enriched uranium and used in reactors today, but still low enriched in that it's under 20% enrichment. And this is part of what allows our fuel to improve the economics of reactors by the fuel running longer in reactors. So the reactors are shut down less often and giving the reactors a power up rate. So every day the utility produces and sells more electricity. We go to slide six.

(00:15:14):

So this is a cross section of one of our fuel rods that went through testing. You can see the outer layer of the rod where there's a cladding made of a zirconium alloy. The displacer down the center line of the rod, like the lead down the center of a pencil, which is also a zirconium alloy with chemicals in it that absorb neutrons, keeping the center of the fuel rod extremely cool for nuclear fuel. So even with the increase in power output, this fuel runs about a thousand degrees Celsius cooler than the current fuel does in reactors, down that center of, of the fuel rod. And then the fuel core is the high assay, low enriched uranium in a mixture with zirconium alloy. And this whole rod is metallurgically bonded as one piece of metal in, in a very high tech system that we invented the design and the production methods for. And one of the benefits here is the absence of a fuel clad gap. When you stack pellets inside a tube, there's space between the pellets and the tube and the fission products in a gaseous form and form in the fuel. And if there's a breach in the fuel rod, there's a burst of release of that radioactive material. But in Lightbridge fuel, you don't have that. Which we'll we'll explain on a, on a current coming slide. We go to slide seven.

(00:16:52):

Thank you. So on the right side is a quote from the US Nuclear Regulatory Commission. This isn't from Lightbridge. This is currently on the NRCS website and it mentions Lightbridge by name. And on the next to last bullet on this slide down at the bottom right, complete retention of fission products means no burst release of those products upon cladding failure, what we were just talking about. And then this goes on to mention how this fuel supports higher power and longer fuel cycles. And you can see on the image here how the fuel runs about a thousand degrees Celsius cooler down the center of the fuel rods on the current fuels used in reactors. We can go to slide eight please.

(00:17:47):

So how we design safer fuel. So we developed the fabrication method for this fuel, which we are now demonstrating at Idaho National Laboratory and at Pacific Northwest National Laboratory, using a co-extrusion method that produces all of these zones within the rod from a bi, from a bullet, from a billet all at once. And we, we extrude these rods which also has an advantage of being a much quicker and faster, simpler in a sense, even though it's height fabrication method, which may among other benefits potentially reduce radiation exposure to plant workers. The metallurgically bonded fuel rod with this shape has much greater surface area than a round rod where the fuel rod touches the water transferring heat faster from the fuel rod out into the water. There's a shorter path for the heat to escape from the rod. And because it's made of metal and not of a ceramic uranium material, that also moves the heat much, much faster out of the rod, allowing for a much more efficient fuel. And again, not a gap for the heat to jump from the pellet out to the outer tube of a current fuel rod. So if we go to slide nine, please.

(00:19:28):

Capacity factor is an important issue in power generation. Nuclear, you could see in the green line at the bottom has the greatest capacity factor. Capacity factor is the percentage of time during the course of a year that full power is produced by a power plant or by another energy generating source. So you could see solar thermal average production about 20.5% of the time nuclear is up to about 92.7% for all our plants in the United States year round. And nuclear utilities are looking to find ways to increase that even further. And when we started Lightbridge, we started by talking to the utilities and working closely with utilities, finding out what it is the customers want, what it is that the companies, the utilities that own and operate the reactors want, and they want to increase these capacity factors even more so by giving a longer fuel cycle that Lightbridge does. So the reactors are shut, shut down less often increases the the capacity factor. We also can improve the output of the plant and reduce the cost per unit of electricity produced by the plant while increasing the revenue that we think we're answering what utilities are looking for. We go to 10 please.

(00:21:07):

In addition to being transparent as a publicly traded company and putting out filings to the SEC and press releases and doing presentations like this, we're also uniquely transparent as a nuclear company in just how much we patent our technology versus hold it as trade secrets. Many companies developing reactors now are sort of black boxes about a lot of their technology, but Lightbridge goes the patent route with almost all of our technology putting it out there for independent analysis and evaluation. And we can go to slide 10 please. So I'll talk about some of our recent fuel development milestones. We'll go to the next slide, please. 12 now. So Lightbridge has one of the few strategic partnering program agreements with the US National Laboratory. We have a strategic partnering program agreement or an SPP with Idaho National Laboratory, which is a seven year agreement.

(00:22:29):

And under this agreement we are manufacturing our nuclear fuel samples. There at the lab, we will be obtaining government stockpiles of high assay, low enriched uranium that we'll be using in this fuel rod production. And we'll be testing this fuel inside the advanced test reactor, which is the largest test reactor in the world, is, I'll talk about it a few slides from now. Actually used to be only for government purposes, but has more recently become available for industry to use, which is something very, very good for Lightbridge and for other companies. We have a world class nuclear quality assurance program that allows for all of the data produced in this testing to be utilized for licensing at the Nuclear Regulatory Commission and so the data will be acceptable to industry, including those utilities that will be the customers or this fuel. And this long term partnership with Idaho National Laboratory and with the US Department of Energy, it is something that is new as a contracting mechanism for the government. We're very happy to be pioneers in this, and this is a partnership that is going extremely well. We're also demonstrating some slightly different manufacturing methods that we've developed over at Pacific Northwest National Lab in Washington State. We can go over to 13 please.

(00:24:15):

So the top right photo is looking down on the head of the advanced test reactor, and the bottom photo is actually inside the core of that reactor with its famous serpentine light core looks a little like it's snaking around the bottom of that pool. This partnership with Lightbridge is leading to commercialization of the fuel. And as we'll show on the next slide, it's helping us prioritize what that commercialization pathway will be. So if we go to the next slide, please. So from the top photo here, which is another part of the advanced test reactor at Idaho National Laboratory we can go off to the bottom right here, which was our original path. The large light water reactors, pressurized water reactors, boiling water reactors, and the pressurized water reactors include those Russian type VVERs in Eastern Europe. The pressurized water reactors include the Seabrook plant in New Hampshire.

(00:25:27):

We could also go to the small modular reactors that are also pressurized water reactors like NuScale or Rolls-Royce or Holtech or boiling water reactors like the GE Hitachi BWX 300 bring benefits of Lightbridge fuel to SMRs. And there were also pressurized heavy water reactors, including CANDUs mentioned on the left here, and there are about 40 of them in the world. And these the, these reactors use shorter fuel rods and with our fuel would not need high assay low enriched uranium to get all the benefits of Lightbridge fuel with enrichments under 5%. And there are reasons why the producing fuel for CANDU reactors would actually be the, the cheapest, quickest path for Lightbridge fuel as a first set of commercial customers. as we're also rolling out the other two that will be evaluating the balance of this year and into next year. and as we get data from this testing at Idaho National Laboratory, over to the next slide please.

(00:26:53):

We started this project under Lightbridge focused on the large reactors. And as we were doing that, the DOE, the Department of Energy started funding the small modular reactor program and pushing for new small modular reactors. And our analysis is that as good as this fuel is for the large reactors, it looks like it'll be even more superior for the small reactors in the large reactors. The water moves through the core powered by large pumps, and in many of these small modular reactors, there's also natural circulation using the forces of physics to circulate the water. The Lightbridge fuel doesn't need what's called spacer grids or bridge straps that hold the nuclear fuel rods together in the assembly, we could just lock the top of the rod into the top plate of the fuel assembly, the bottom of the rod into the bottom plate, and not need these spacer grids up and down the fuel fuel assembly that block water flow that flow through the fuel rods and Lightbridge fuel because it won't have any of that, will have much more unimpeded water flow in natural circulation SMRs bringing the power upright potential, the other benefits of Lightbridge fuel to be even stronger we expect in the small modular reactor.

(00:28:26):

MIT and NuScale started looking at benefits of Lightbridge fuel for small modular reactors, particularly for NuScales, Voyager SMR that they're developing and deploy will deploy their first unit at Idaho National Laboratory and NuScale and MIT applied to the Department of Energy leverage to support this for a government grant to examine this. And DOE has now funded $800,000 to MIT to study advanced fuels for SMRs, including specifically Lightbridges fuel for the NuScale small modular reactor. And that work is underway, it's a total of a three year program, and we're looking forward to very good results coming out of this program at MIT funded by DOE. We are the next slide please.

(00:29:44):

So a, a bit of the timeline, we came up with the initial concept of this metallic fuel after talking to utilities in 2010. In 2012, a unit of Siemens issued an independent report confirming economic benefits of the Lightbridge fuel. Siemens then also issued a report confirming enhanced non-proliferation benefits of Lightbridge fuel. In 2013, we began developing the fuel rod fabrication methods to produce this fuel. And in 2014, we were granted our first key US patent for the metallic fuel rod design. In 2019, the GAIN program at DOE gave us our first DOE award. Under that program to work at Idaho National Laboratory, GAIN is the gateway for accelerated innovation in nuclear and is something that's very rare and very positive for Lightbridge. Before we even finished the work under that GAIN voucher, we were awarded a second GAIN voucher that overlapped with it in 2021 or work at Pacific Northwest National Laboratory that we're doing.

(00:31:04):

And in 2022, we entered into this strategic partnering program, umbrella agreement at Idaho National Laboratory. And in 2023 to 25, we're going through reducing these samples and testing them in the reactor to get the data and prove out the benefits of Lightbridge fuel. Now, this whole program since we came up with this concept in 2010, has taken longer than we would've hoped because of changes in the world of the combination of Fukushima and the global financial crisis. But basically, when Fukushima happened in 2011, part of the aftermath of that was that the country of Norway eventually decided to close what was called the Halden reactor, which was the finest research reactor in the world. But that was okay because we would've access to a similar reactor called the NRU, the National Research Universal Reactor at Chalk River in Canada, and the MBIR reactor in Russia.

(00:32:17):

And a new research reactor in, in China, except that Russia invaded Ukraine in 2014 and seized Crimea. And ever since then, we've decided not to do any work in Russia, which has invaded Ukraine. Again, as of last year we have decided not even to pursue China, partly because of political difficulties and partly because of intellectual property concerns of doing our work there. And like Norway, eventually after Fukushima, Canada decided to close the NRU reactor at Chalk River. And there was literally not a reactor in the world available to test our fuel, which was a problem for many other countries too. And we started to work with the US government, and the US government has decided to take the advanced test reactor, the largest test reactor in the world at Idaho National Laboratory that was built for government use, particularly for the Navy testing fuels, for aircraft carriers, and for nuclear powered submarines, and open it to industry, what they call a what, what, what's available for industry, what they call a user facility.

(00:33:40):

So the advanced test reactor is now a user facility. And Lightbridge is just thrilled to be a pioneer in entering that user facility and working at Idaho National Laboratory to test our fuel there. And what the US government has done in opening up its facilities to industry is really allowing US industry to compete and win worldwide. Without that, I could see US innovators going overseas to countries that, that are not very friendly to us. Lightbridge wouldn't do that, but the the, the availability of these facilities in the United States is a momentous move by the US government for nuclear innovators. if we go to the next slide, please.

(00:34:30):

So a bit about the global energy transition and really two reasons for the transition. I would say the stronger reason right now is getting allies off fossil fuel from Russia is energy security. And it turns out countries all over the world that use fossil fuels don't really trust the countries that sell them. The fossil fuels never to cut off that supply. And we've seen energy used as a weapon, particularly as Russia has cut off supplies and threatened to cut off supplies of fossil fuels to gear up. Nuclear has more than a 1 million to one energy density advantage over anything else in producing energy if we're going to massively produce power in a clean way, not relying on fossil fuels. Nuclear just has to be part of the diversified energy mix. And of course, the other reason why we're having an energy transition and the reason why that term even came into vogue is climate change and needing to stop burning as much carbon - fossil fuels are made of carbon - if we're going to reduce carbon emissions into the atmosphere. So if we go to the next slide, please.

(00:35:56):

So the small modular reactors I think are going to be a crucial part of the energy transition. And in fact, I think we will fail as civilization to meet the energy transition goals unless SMRs succeed. And that is a reason why since the DOE introduced the SMR program, Lightbridge, you know, has been shifting some focus to, to the fuel for, for those reactors. We've demonstrated producing fuel samples using surrogate materials in the rods to SMR length fuel rods. And we're very pleased to be part of the study at MIT now with NuScale that's funded by SMRs. If we go over to slide 19, please.

(00:36:52):

So here's an image from NuScale of their voyager SMR plants, and there are many SMRs in development in addition to the one being developed by NuScale. And all of these water cooled SMRs, all of the pressurized water SMRs, like NuScale and boiling water, ones like GE Hitachi are target markets or the Lightbridge fuel. And these plants can be deployed for a myriad of reasons. These SMRs can be used to produce the electricity, but also process heat or high or high temperature steam for industrial processes for factories for what's called behind the meter applications for desalinating water. I could see these along with California coast for many, many reasons, including in remote areas where energy is very expensive now to bring to mining operations and to other remote locations for industry and for towns. So if we go to the next slide, please.

(00:38:05):

So if we look at what to me seems to be four main groupings of reactors, the current large lightwater reactors like at Seabrook in New Hampshire, becoming small modular reactors that use similar technology like NuScale is a pressurized water reactor system, smaller version of Seabrook, then the future advanced reactors. And Matt will cover these more in in his talk that these are fission reactors also, but not with fuel rods in, in a lightwater system. These are molten salt and different technologies, also known as Gen IV and then fusion reactors due to the amount of new energy the world will need. I think that SMRs are going to be the driving force here if nuclear is to play a big role here and the world will succeed at meeting its goals depending on whose calculations of how much new clean energy the world will need.

(00:39:16):

If you levelize that to energy produced by a large standard lightwater reactor, say like a Westinghouse AP 1000 reactor, the total new amount of clean energy that needs to be produced in the world added to the world between now and 2050 for all energy using reasons, is about 14,000 of those very large reactors at the lowest end. And up to 20,000 reactors, if we have a large set of economic growth and lift many, many more people out of poverty around the world and that that's for powering industry, powering transportation, powering everything, if it was all produced by reactors, 14,000 to 20,000 reactors equivalent to new energy. When I talk to the CEOs of the companies that produce those large reactors, none of them think we'll have, you know, 150 of them produced by 2050 and added to the World's grid. These companies can make a lot of money selling 20 of them or 25 of them.

(00:40:30):

But where will the other 99% loss of new clean energy that we'll need come from if it won't come from building so many more of these new large reactors? The two new reactors just opening in Texas (Georgia), the Westinghouse AP one thousands of the Votgle site. Many people expect to be the last large reactors deployed in the United States. And there are none on order or on the drawing board in the US there, there are some others around the world. In terms of the future advanced reactors, I'm very supportive of these technologies and these companies, but the Nuclear Regulatory Commission does not have expertise in licensing these technologies. The supply chain does not exist to a large extent to produce these technologies. None of these companies have built the factories needed to mass produce these plants. And I think they will come, I think they'll be very important, but not in large enough quantities to matter much for the 2050 climate goals about 26 and a half years from now.

(00:41:40):

And the future fusion reactors. I also look forward to it again, I just don't see fusion moving the needle on global energy production in the next 26 and a half years to meet climate goals by 2050. I think it will be much later. So that leaves these small modular reactors that use lightwater technology, the off supply chain exists for and the regulators know how to deploy. And if we look at the small modular reactors how can we produce lots of these in factories? And it's kind of like Boeing produces 737s, make these by the hundreds, eventually by the thousands and ship them out. And just as airports are built around the world, but not, airplanes are built around the world and airports are built using civil construction, these sites where these SMRs will be can just have civil work at the site and the SMRs shipped there.

(00:42:44):

This is similar I think an analogy to military aircraft in World War II. The day that Japan bombed Pearl Harbor the US produced fewer than 9,000 military aircraft a year. The aircraft is another specialty of Matt Wald you might mention. And three years later, the US had produced over 300,000 military aircraft in what looked like a miracle of parts going in one end of a plant and then strip with airplanes flying off the other end of the plants. And without that effort, we wouldn't have been able to help win the war. And I think we can get to the point where there are hundreds and eventually thousands of SMRs. But to do that, they need to be more economical, which Lightbridge fuel does. And if there are over a thousand of them in over a hundred countries, even more non-proliferative, more safe. And I think the, the Lightbridge fuel answers the call on these. We go to the next slide, please.

(00:43:56):

One of the other benefits of the Lightbridge fuel is it can surge up and down in power very quickly, which the current fuel and reactors can't do. So small modular reactors designed with Lightbridge fuel can replace natural gas plants as balancing with renewables on a zero carbon grid. So when the sun isn't shining, when the wind isn't blowing, nuclear power can provide clean energy. And when the sun is shining and the wind is blowing, the renewables can and you could have a truly zero carbon grid. The image at the bottom of the slide is just one other example of what SMRs can be used for in helping to produce hydrogen as a base for liquid fuels that can be used to decarbonize hard to decarbonize areas like heavy trucks and trains and steel and cement production. And we believe the Lightbridge fuel can be very useful in these processes. We have the next slide, please.

(00:45:03):

The coal to nuclear transition is a very important topic. The Nuclear Energy Institute has found that 80% of the sites with retired coal plants in the United States are suitable for small modular reactors. That's 190 sites around the us about 198.5 gigawatt electric of energy production. To put that in perspective, that's more than twice the current nuclear generation in the United States. So if SMRs were deployed in all these sites that would triple nuclear energy production in the United States. The coal plants generally have cooling water sources nearby. They have an electrical switch yard, a connection to the transmission lines. We would not need to build out new transmission lines, which is a big slowing factor in deploying new energy since they're already right there at the coal plants. There are workforces that already work in operating turbines and generators and switchyards and the coal to nuclear transition potentially can bring in tremendous employment into communities that in many cases are suffering now. And I want to be very careful. I don't wanna make any promises to any specific communities, but I do think that SMRs are the most likely and certainly best for a local employment perspective of what could be done with the, with the coal sites and are very good for the nuclear companies to go to sites with workers already working in energy and electric grid connection and very good for those communities to, to get the jobs. Go to the next slide please.

(00:47:10):

Just to summarize there on the existing reactors, there's a very large market for fuel. Lightbridge is going after this market. We think even without a single new large reactor or single SMR being built in the world, an enormous market for Lightbridge. We do expect though that this market will become much, much larger with large numbers of small modular reactors. You know, the next slide, please.

(00:47:47):

On a typical what's called for loop, Westinghouse type, large pressurized water reactor like the Seabrook plant in New Hampshire, this says 1100 megawatts electric Seabrook is, is greater than that now due to increases in capacity factor and power upgrades since it was built over two decades ago. But this is exactly the kind of plant that Seabrook is. The Lightbridge fuel we expect could be used in, in different variants. It could be used to increase power from the reactor by 10% while increasing the fuel cycle length from 18 months to 24 months, or increased power by 17%, one seven, but without increasing the fuel cycle length or increased power by 30% in a new build reactor because it would just be more expensive to make changes to an existing reactor to take 30% more power than build a new reactor.

(00:48:51):

And those are the kind of benefits we expect to bring to SMRs and even more. But a 10% increase in electricity output by an existing plant would bring in about $48 million of added revenue to the plant per year, increasing the reactor operating cycle from 18 months to 24 months. And this is what we find most of the utilities we talked to want to do would bring in about 8 million from selling electricity during times of the plant, otherwise would've been shut down for the refueling outage. And these outages are expensive by avoiding as many outages and bringing in so many guest workers to perform the outage and equipment purchases on an annualized basis would save about an additional $4 million per plant per year. And these benefits don't even include the added potential benefits from carbon credits that are being introduced around the year for zero carbon electricity production.

(00:49:53):

And they don't include the cost to utilities of buying replacement power to provide while the reactor is down. So we think the economics that to our customers will be very good for Lightbridge fuel. If we go to the next slide, please.

(00:50:10):

There's also tremendous bipartisan support for nuclear, and this is one of the reasons why we're seeing these advantage and advantages at National Labs, these changes that Lightbridge is participating in, like using the advanced test reactor as a user facility. And it's really remarkable how strong the bipartisan support is in Congress and howbeit a Republican or democratic administration, these issues go on with very strong House and Senate administration support. You know, the next slide, please.

(00:50:46):

So the political landscape has shifted in favor of nuclear power. It was shifting before the 24th of February last year when Russia invaded Ukraine. But that invasion has really changed the dynamics tremendously. Our allies need to get off relying on Russian fossil fuels. We need to help them do that as a nation. The European Union has, its what's called taxonomy favoring green energy and has designated nuclear as part of that the United States. Similarly under the Inflation Reduction Act is providing production tax credits for nuclear power for the existing fleet and tremendous financing support for new nuclear technologies. And all of this has sort of been supercharged by Russia's invasion of Ukraine on top of what was already considered a climate emergency. So the energy security plus climate have really helped shift the political environment rapidly. And polling shows also globally, attitudes of the public toward nuclear power have been increasing, especially as these newer, smaller, safer technologies are preparing to come out. The next slide, please.

(00:52:13):

The strategic benefits of nuclear power, including what Lightbridge does, are very important to the country. When we say we have a strategic partnering agreement with our government through Idaho National Lab, it's strategic to the US government, it helps the United States and our allies meet climate goals. It helps the United States and our allies meet energy goals and it helps with employment. And new reactors can be part of a hundred year agreement between the United States or a hundred year relationship with other countries from starting to deploy the reactors to decommissioning them at end of life. We're starting to see reactors licensed for 80 years of, of life. Some will run for even more, but if you look at the time from first contracting to build those reactors, build them, run them for 80 years and decommission them, these can be a hundred year relationship between the US and another country or China or Russia.

(00:53:21):

The US government gets that. It doesn't want to see more countries rely on China and Russia for energy goals. We have the next slide, please, as we have the end here, some of the new legislation that's been coming out with bipartisan support is really enabling what Lightbridge is doing, what a lot of the companies that Matt will talk about is doing. We are exactly aligned with US government goals with the benefits that the Lightbridge fuel brings and are testing and proving it out at US government facilities, with US government support that we just couldn't be prouder of. If we go to the next slide, please.

(00:54:09):

At Lightbridge, we want to hear from you today if you have any questions and comments, but always the easiest way to contact us is ir@ltbridge.com through email. We'd be happy to have any follow up. We're also on Twitter and look forward to any questions and comments you might have. Very honored to be here with you today. Thank you.

Rep Keith Ammon (00:54:33):

Very good. Let me stop sharing here.

Seth Grae, Lightbridge (00:54:38):

Thank you, Keith.

Rep Keith Ammon (00:54:39):

Yeah, we'll do, we'll do questions now if that's okay with Matt. You, is it okay if we go right to questions?

Matt Wald (00:54:46):

Yeah, yeah, fine.

Rep Keith Ammon (00:54:47):

All right, great. I'm just gonna check my, all right. So for people in the room, we have two microphones. We've been over this before. If you want your words to be in the minutes, make sure it goes into the microphone. So and the green light means you're good. Alright, so we'll start with commission members. Wanna have some questions for, for Seth? Nothing. Really? Very good.

(00:55:18):

I guess I was trying to see if you were touching on the full life cycle of the fuel what, you know, when the fuel is spent, what happens to it? That, that would be my question.

Seth Grae, Lightbridge (00:55:29):

Yeah. Okay. So a couple answers. One is this fuel is designed to be handled like current fuel. It is a uranium zirconium fuel that would go into the spent fuel pools that reactors into dry cask storage eventually into a high level waste repository or in, into interim storage or reprocessing this fuel because it's metal would need to not have the current aqueous reprocessing, but pyro processesing, which is more non-proliferative, keeps any plutonium in a stream with other isotopes that it's very difficult to separate. But you could get benefits of reprocessing. But really this fuel is designed to have many added advantages beyond just meet the baseline of what current fuels can do. this fuel produces much, much less plutonium than the current fuel and in an isotopic mixture that simply can't be weaponized, even if reprocessed. There was a paper published about a year ago in a major technical journal independently written and peer reviewed.

(00:56:49):

They concluded that only Lightbridge fuel with everything that they examined simply could not be weaponized by a subnational group, by a terrorist group. We recently had a paper published another peer reviewed paper that came out in the last few months that showed that Lightbridge fuel would consume plutonium at a rate of about 5.5 times that of MOX fuel per fuel rod, mixed oxide fuel, Lightbridge fuel. That study was aimed at weapons grade plutonium, but we expect it would be very similar for using Lightbridge fuel to get rid of reprocessed materials from, from the current fuel from reactors if it gets reprocessed. And we are examining this further benefits of Lightbridge fuel, both for our own fuel being reprocessed and using our fuel to assume materials from reprocessing other fuels. and the, the early indications are that there will be some some very good advantages there.

Rep Keith Ammon (00:58:05):

Very good. We have some questions from Representative Harrington.

Rep Michael Harrington (00:58:10):

Thank you. first a quick comment, your figure there of $55 a megawatt hour, average wholesale price seems pretty high to me. I mean, new England is famous for high prices and we averaged like this past January $50 a megawatt hour, so

Seth Grae, Lightbridge (00:58:23):

Right.

Rep Michael Harrington (00:58:23):

That's on the high side, but

Seth Grae, Lightbridge (00:58:25):

Yeah, that, I'm sorry, was just a quick answer to that was we look back over about a 15 year average that's some government agencies use and then look forward based on projections we're seeing. So yes, at any given moment we'll get comments that numbers we're using are either much lower than what's happening somewhere or much higher than what's happening somewhere. But on average it we're, we're trying to look at a hundred year program. What would, what would you expect?

Rep Michael Harrington (00:58:57):

Okay, well that's fine. That was just a quick require. My real question is, is that you piqued my interest with the load following capabilities, so mm-hmm. <affirmative>, a couple of questions on that. You're talking about using this in existing lightwater reactors, aka, like Westinghouse plant and at Seabrook and what's the enrichment percentage and how do you get around the fact that you still have this enormous pressure vessel in there that has restrictions on how fast you can heat it up and cool it down? And would that Right. Really evidently amount of load following you could do.

Seth Grae, Lightbridge (00:59:29):

Right, right. The load following you could do in the existing reactors would, would be better than it is now, but it would be very limited or the reasons that, that you're saying it really in a SMR designed with the equipment in the plants to handle the surges up and down in power would, would be much better. And that's really what I'm talking about that you could pair with renewables on a, on a zero when you

Rep Michael Harrington (01:00:01):

Follow up question. The one thing you didn't mention. And of course it's the, I'm I'm sure the next speaker will have something to say on this as well. Is Gordian knot article, I just finished reading. So where is the fuel gonna come from? You, you have your fuel, you're talking about testing it, but where are you getting the enriched uranium from because right, that seems to be the chicken and egg question. No one wants to invest in that until there's a market. There's no market until someone invests in it.

Seth Grae, Lightbridge (01:00:28):

Yeah, yeah, yeah. And first of all in your enrichment question, because it relates to this question too, for the pressurized heavy water reactors, like the can dos, our fuel uses less than 5% enrichment and that's what's available in the United States and around the world. for the high assay, low enriched uranium, which would be up to 19.75% enrichment, that's for the lightwater reactors, the PWRs, the BWRs. However, given that our fuel was made of zirconium with uranium and there's so much less uranium and in a current fuel rod it's the equivalent of uranium 235 atoms. If you look at it from a reactivity standpoint of about 7.3% enrichment of current fuel. In terms of the Gordian knot, one reason I mentioned we might, you know, be faster with CANDU fuel is that that enrichment level is available on world markets Now for the high assay, low enriched uranium we're using for our testing at Idaho National Laboratory, that is coming from US Department of Energy stockpiles that the government's making available to us.

(01:01:50):

And for the longer term, for larger scale commercialization, there would simply need to be more more uranium enrichment and conversion of uranium facilities in the world than there is now. As that Gordian knot article points out. And companies are very hesitant to build out that that capacity unless they see demand signals in the form of cash if people want to buy those enrichment services and conversion services from them. And we see for example, Urenco that has a plant in New Mexico very seriously looking at adding another cascade of uranium enrichment, but waiting for more demand to show up from industry. So, you know, you know, you're right, that is a problem. I don't think it's an insurmountable problem. I think it's gonna, it's gonna take time, but at least it doesn't require new technology. It's just building more capacity of what already exists in the world and we've known how to build for a long time.

Rep Michael Harrington (01:02:57):

Thank you.

Rep Keith Ammon (01:02:59):

All right. Any other questions in the room? Any questions online? Just use the raise your hand feature of the Zoom.

Daniel Goldner (01:03:07):

One question.

Rep Keith Ammon (01:03:10):

Yeah, I don't see any questions online. we're gonna go to Dan Goldner.

Daniel Goldner (01:03:15):

Yeah, you mentioned previously that you're your're patenting your IP. what, what prevents sort of foreign entities from, from copying your IP if it's out there and available via patents?

Seth Grae, Lightbridge (01:03:28):

Yeah. Well first of all, the foreign entities that, that copy our IP and use them probably would, would have abilities to get into computer systems and others and, and get some of this technology. Whether we wanted to patent it or not. We find that patenting it makes it a lot easier for us to deal with. There's a lot more we can talk about publicly and, and, and release data and get independent confirmation. And what's interesting though is that actually we haven't had problems in that area. We're always concerned about it, but it's not like there's a gray market in nuclear fuel. There are very few producers of it in the world and they're all sensitive about IP, whether they patent or not. And for example, even Russia and China have been getting more responsible in the nuclear area in how they handle IP as they're becoming bigger and bigger exporters and looking to to, to export markets.

(01:04:37):

And because they're looking to export markets and we patent around the world, like let's say Russia wanted to export something to a western European country say France a fuel for their reactors. Well, we're patented there, you know, they couldn't because we're patented in France. So our global patenting actually locks them out of exporting even if they wanted to violate patents. But as I said, I think they've actually been getting in this area, not all areas obviously, but in this area, a little more responsible as they're looking to invest billions themselves in capacity for export markets.

Rep Keith Ammon (01:05:25):

All right. Seeing no further questions we really appreciate Seth, you presenting that, that slide deck to us. I'm gonna go back through that deck cause it had a lot of information that I really wanna absorb. So appreciate your time and I think Matthew Abenante, I think I saw him on too. Aappreciate you guys both working on this.

Seth Grae, Lightbridge (01:05:48):

Thank you.

Matthew Abenante, Lightbridge (01:05:49):

Thank you.

Rep Keith Ammon (01:05:52):

Alright. And you're welcome to stay on. We're gonna move on Yes to yes, the author of the Gordian knot article that was mentioned. Matt, Matt Wald. And Matt, I'm gonna make you spotlight.

Matt Wald (01:06:03):

Very good. All right. Now you can see my nuclear tie.

Rep Keith Ammon (01:06:10):

There you go.

Matt Wald (01:06:11):

Very good. Thank you very much for having me here today. I'm not an engineer. I've been through about 30 reactors over the years. I have a broad view of the technology. I've been through Pilgrim in Maine, Yankee in Connecticut, Yankee to name some in your neighborhood that aren't with us anymore. Millstone two and Millstone three, Indian Point and Point Lepreau, CANDU. I've also spent a lot of time looking at new designs, kicking the tires on what hardware is available. And a lot of these things, there's not a lot of hardware yet to see. I've been down to Vogtle a couple of times been out to NuScale to see their mockups. I've written about Natrium, X-energy, and Kairos I should say that these days I write a lot for the American Nuclear Society and for the Breakthrough Institute, a non-governmental organization that advocates for advanced nuclear.

(01:07:03):

But I'm not representing either of those here today. I'm just giving you my own views. I'd like to give you a broad overview of how I see the emerging nuclear landscape and the energy landscape overall. And then, and take your questions. There's a lot of neat ideas out there. We should bear in mind that ideas that look promising are not guaranteed to be practical or commercializable. A few years ago, I went up to Ithaca, to the campus of Cornell to see the research reactor they had there. They were tearing it down in order to make space for a nanotechnology lab. Remember nanotechnology, it was the flavor of the month a few years ago. It's disappeared without a trace. I was skeptical of that one, but I will confess that I wrote enthusiastically about the potential of cellulosic ethanol.

(01:07:56):

A lot of money and brain power went into that. We don't have that either. Maybe the tooth fairy will bring us the recipe. so a lot of the advanced reactor ideas aren't new. They're just back in limelight because of our previous breakthroughs in energy. Notably fracking for shale in shale for fossil gas and hyper mechanized coal mining have brought down the prices for fossil fuels. But they're coming back to bite us because we are loading the atmosphere with too much carbon. Now there's a demand for nuclear, which has a much smaller carbon footprint than solar and is on par with wind. And Keith, if you could put up the first slide. Yeah, it's a, it's a chart. I'll talk about it while you, while you figure it out. it's a chart from my former employer, the Nuclear Energy Institute. I was there for six years as a policy analyst and as a spokesperson.

(01:08:51):

It's a compilation of utility pledges to decarbonize electricity production. It may overstate things because it's not clear that all of the utilities will achieve their goals but it also may understate things. If we think that a lot of the reactors aren't going to make electricity (there we go), or at least not make electricity full-time, they may make potable water or hydrogen or the heat needed to make steel and chemicals. So this, this is where the demand is coming from. All these folks have made promises that they can't keep today. They don't know how to keep them. And they're hoping for nuclear machines that will balance out the wind and solar and allow them to keep their public commitments. I think the biggest, if in the nuclear world right now is fusion. Everybody got hyped up about the recent breakthrough that the Department of Energy sustained a fusion reactor that after really careful pencil sharpening, they calculated, had produced more energy than was consumed in setting it off.

(01:09:55):

But that doesn't really mean very much. It means the house load for a fusion plant is now less than a hundred percent. The house load for a plant like Seabrook is in the low single digits in percentage points. In many advanced reactors, it'll be a lot smaller than that. The DOE facility produces one fusion every few minutes. A commercial plant would have to produce several per minute, maybe more than one per second. And fusion reactors run on two forms of hydrogen. That one that's rare deuterium and the other that's hard to make, tritium. Then the operation of fusion plant creates wastes that are highly radioactive for decades, not millennia as from fission plants, but still decades. Moving on to fission plants, there's a big number of technologies now getting serious attention. The number that will succeed is between zero and maybe seven or eight.

(01:10:51):

I'm hoping for seven or eight, but we'll see. I would like to characterize these on two criteria. The degree of innovation and the degree of nearness to commercialization. These are opposites. So you can stack them up and look at them in either order. They run in opposite directions. I'm gonna describe three that are close to what we have now, but smaller, smarter, easier to build, and more nimble. They're closest to being ready for prime time. These are, there's a dated expression, prime time, right television, prime time doesn't exist anymore. These are NuScale, GE Hitachi, the BWRX, and the Westinghouse AP 300.

(01:11:33):

And then I will describe two more that represent bolder, more creative thinking that have some attributes that are new and badly needed in the drive to decarbonize the economy. I'd say this is the second wave of new reactors. This is the X-energy XE 100 and the Natrium reactor. Natrium's a partnership between GE Hitachi and the Bill Gates company, Terra Power. My guess is that these are at this point, probably 10 years away. And then I'm gonna talk about machines we might see in the middle of the next decade that are also real departures from traditional technology, but are farther back on the development timeline, including Kairos. And I'll say a few words about micro reactors. I say a few words because under the best of circumstances, I don't think we're gonna see a lot of these in New England. The first of these things is going to be in remote set settlements or mining operations off the grid that are substitutes for diesel generators and on some military basis and computer centers that process credit cards and similar transactions where they have a very high need for reliability.

(01:12:38):

Oklo, Westinghouse, Ultra Safe Nuclear, X-energy, and maybe BWXT are candidates for making those. So to start with, the reactors most likely to be commercially available first out of the box, they have three things in common. They all three use fuel that's already commercially available and qualified by the NRC. They could move on to Lightbridge, but they can use stuff that's on the market now. They all use ordinary water called light water for two functions: for slowing down the neutrons that are liberated by fission to a speed, more likely to produce another fission, and for carrying away the energy as heat so that it can be turned into steam and then mechanical power and then electricity. And they're all smaller, which produces two categories of advantages. They're probably easier to manufacture. I say probably because nobody's done one yet. And they're also easier to design emergency core cooling systems for. I'll start with NuScale because uniquely it already has an NRC license. It's got a coalition of municipal utilities and other public power agencies in the west that are on the verge of ordering a plan. But to be completely honest, they've been on the verge for a while now. It's got good prospects in Europe. It's got a really interesting design. And Keith, if you can move on to the second slide.

(01:13:59):

Excuse me. This is one NuScale module, invented to be 50 megawatts, now upgraded to 77 megawatts. This is a reactor in a thermos bottle. All the reactors we have in power service now are water-based reactors. They all have the same design issues. At the top of the list is that the fuel is really good at generating heat even after the chain reaction stops. It's easy to stop the chain reaction, but the fragments of uranium atoms aren't stable and they want to continue giving off radiation, which means giving off energy. At the instant you shut down a reactor like Seabrook, it's still making about 9% as much heat as when it was running. That decays gradually. Excuse me, it's allergy season down here. I'm in Washington. And even if it's a cold, you probably can't catch it over Zoom. If you don't, if you don't remove that residual heat production, the fuel will melt.

(01:15:01):

That's what happened at Three Mile Island when they cut off the cooling system. So reactors like Seabrook have lots of water on the site, lots of pumps, lots of valves. They need lots of that stuff because the reactor vessel's under high pressure. It's hard to pump cooling water into a pressurized vessel. And if there's a leak, there's a lot of energy to push water in into the vessel. and there's a lot of energy in the vessel to push water out and in the related piping, it'll go into the containment where it will probably stay, but nobody wants to get that far. These cooling systems need electricity, they need water, and they need operators who make the right decisions in a bit. I'll tell you about reactors that don't have these constraints, mostly because they don't use water. But let me tell you first about these three water-based reactors that have very smart designs.

(01:15:53):

They don't need electricity, they don't need water that isn't already right at hand, and their walkaway safe, meaning they don't need operator action. NuScale is a reactor in a thermos bottle. If you look at that capsule shaped thing in between in inside the light blue field it's got an emergency core cooling system that consists of two valves. That's it. And to work, only one of them has to function. There's a reactor with a core that's the red part of the bottom. There's an evacuated space, a partial vacuum, like a thermos bottle, and there's the outer shell. If the cooling fails, then excess steam flows into the vacuum space, hits the cold outer wall of the shell and condenses to water. The water, as you can see, the sort of darker blue fills up at the bottom and naturally conducts heat away from the core.

(01:16:50):

The core is still in the vessel. The water is contained. The steam that's condensed to water is contained in that broken vacuum area in, in the annulus. And from there it is conducted naturally into the water outside. This thing sits in millions of gallons of water. The core is small. The maximum heated can generate after shutdown will flow out by natural convection. Natural conduction. It can't heat to the point of damaging the fuel. NuScale will sell you a four pack, a six pack, an eight pack, or a 12 pack. You sign here, they're ready to take orders. If you live in a neighborhood with seasonal renewables like lots of hydro in the spring, but not in other seasons, you can turn off a module or two and can, or convert it to desalinate water for a few months. The idea is that unlike Seabrook, where construction was sequential, you built the civil side, then the nuclear side.

(01:17:47):

In NuScale's case, you can build the giant pool and the other infrastructure on the site. At the same time, you're building the reactor in a factory ship, the reactor, this one comes in three pieces to the site, bolt them together and turn it on. Turn them on as they arrive one by one. When it's time to refuel one, you use a crane to pluck it out of the pool and move it to a refueling space. You never have more than one module out for refueling at a time. So your production over the course of the year is kind of flat, not like Seabrook, which is either on or off. As our climate becomes less predictable, this is a neat idea because we've run into unexpected hot spells in the spring and fall when we've got plants down for maintenance and suddenly people find they're short of generation.

(01:18:34):

The GE Hitachi, BWRX has an additional selling point. It's not built from scratch. BWR stands for Boiling Water Reactor which GEs been building for decades. X is a Roman numeral. This is the 10th version of the BWR. GE says that 80% of the parts that it will use are already in service in nuclear plants. And unlike NuScale, GE is an old hand at power plant construction. GE says the reactor is also passively safe, not require electric electricity or operator action and having all the water on hand. A key innovation of the BWRX is moving a lot of large piping inside the reactor vessel. As a result, the reactor can't suffer a large brake loss of coolant accident. That makes the emergency system a lot simpler. GE already has a customer, Ontario Power generation, OPG, which is a provincially owned utility, and TVA may be next.

(01:19:36):

The third of this trio is the Westinghouse AP 300 has some of the same advantages. Westinghouse is also an old hand at power plant construction, and it's reusing technology from the AP 1000, which is the model used by Southern Company at Vogtle in Georgia. Having had that experience under its belt and having a reactor that can be factory fabricated costs should be under control, Westinghouse says. And getting licensed by the NRC should be relatively easy. Remember that the AP series, which stands for AP Advanced Passive, started out at 600 megawatts, was licensed but never sold, then came a thousand megawatts, which they may sell in Poland and elsewhere in Eastern Europe in addition to Georgia. And now we're at 300. Again, it's passively safe. It uses gravity instead of pumps to move emergency water around. It uses passive heat transfer. These reactors are built with more flexibility, but there are two coming up behind them, heavily supported by the Department of Energy that have more elaborate capabilities.

(01:20:41):

One is the Natrium reactor, which Rocky Mountain Power wants to build in a town called Kemmerer, Wyoming. They're shutting down a coal plant there. Rocky Mountain Power actually wants two more after that. Natrium is a really interesting machine. All the reactors we have now are intended to turn out electricity 24 7 in what's called baseload power. Baseload is not a virtue it's or flaw, it's a characteristic, and I don't think it's well understood. So I'm gonna take a minute to describe it. Baseload means the minimum level of demand. If you have a system that say needs 10,000 megawatts in its off peak periods at like mild nights, but 20,000 megawatts of peak periods, then the 10,000 megawatts is your base load for that load. You want generation, that's low cost per kilowatt hour, although the plant itself may be expensive to build. That's a defining characteristic of the current generation of nuclear plants.

(01:21:38):

For intermediate and peak load, you can settle for machines that make kilowatt hours at a higher cost because they're not gonna run all the time. And actually those machines are cheaper to build. In our era, those are gas turbines and they're beginning to be the dirtiest things we run. But that analysis has gone out the window as we introduce lots of energy that comes on when it wants to not when it's demanded.

Wind can come on at night, sometimes threatened to overload the system. Solar peaks at noon, that's the definition of noon. Noon isn't a particularly high demand time, but what comes and goes quickly over the course of the day, depending on the weather. This creates. Keith, if you can move on to the next slide. This creates a need for energy that can scale up or down. Entered Natrium. It's the cure for the infamous duck curve.

(01:22:29):

The problem of balancing out the system as solar rises and falls. Ah, I see my reactor is moving up and down and left to right, but I don't see my duck. The Natrium reactor runs steady 24 7. There we go. Okay. This is not my slide. Whoever put it together, I gotta say has a sense of humor. What you're looking at is year by year. This is the demand the utility has to supply independent of solar. 2015, it was pretty flat. 2016, 17, its years went by more and more solar in the middle of the day. 2022, and especially 2023, you're now producing more energy from solar alone than the system needs. You've gotta export energy. Over generation will make the system crash. You gotta pay others to take it. This is, this is the California system. Now whoever looked at this the first time saw it as a duck.

(01:23:27):

Somebody with a sense of humor now sees it as this threatening looking dinosaur. But the belly is the problem here. and that's what Natrium wants to solve. Natrium does not send its heat directly to a steam generator and then a turbine. Instead, the reactor heats up a huge tank of salt. That's a kind of battery. It's a thermal battery. It's not the kind that has a positive or negative terminal. It's not the kind you put in a, in a flashlight, but it's a battery. A second set of equipment pulls the heat out of the tank and turns it into steam. And that makes electricity. As a result, the nature and reactor is designed to put out a steady 345 megawatts. It's a, it's a decent sized machine, but the turbines can vary from a hundred megawatts to 500 megawatts. So you tone it down to a hundred megawatts at noon, you let the salt heat up, and then it can run at 500 megawatts for 5.5 hours.

(01:24:29):

So the sun starts to go down at 4:00 PM but people are arriving home, plugging in their electric cars, cranking up their home air conditioners, turning on the big screen tv, cooking dinner in the microwave. Demand is soaring. Natrium says a plant can start discharging its battery to balance supply and demand in practice in places like California, which have an enormous problem meeting the demand, California has plenty of fossil gas capacity, but those machines simply can't start up fast enough. They're like a freight train. They take a long time to get up to full speed. Natrium fills in the gaps in a carbon-free way, generalizing generally minimizing the natural gas burn. Now, people who've looked at the electricity demand from a utility net of solar, say it, it say that the the duck is only gonna get worse. And I think that's true unless we change the incentives for deploying solar.

(01:25:30):

You put one more solar panel in California right now, and at its peak hour production, noon, 1:00 PM et cetera, its output is worthless. Its output is less than zero. There's a second characteristic to natrium. It's not water cooled. This has two big implications. One is that it can get a lot hotter. Water-based reactors are limited in the temperature they can get to because the hotter the water, the higher the operating pressure. Nobody wants to build a machine with higher pressures than what we've got now, which is in the neighborhood of 2,200 pounds per square inch. That's hard to build vessels and piping for. The other is that with no water, the reactor isn't moderated. That is the water isn't slowing down the neutrons as they're emitted from each fission of uranium or plutonium nucleus. They're flying around at an appreciable fraction of the speed of light that makes them much more energetic.

(01:26:26):

They can split a variety of atoms that today's reactors can't split. They can split uranium 238, the dominant form of uranium, of which we have vast quantities because we've been plucking out the uranium 235 for use in water reactors. They can split some of what we now call nuclear waste, stuff that's only slightly radioactive, but will remain radioactive for millennia and thus become more difficult to dispose of. If those atoms, which are fragments of uranium are split again, they'll give off even more energy and they will paradoxically become more radioactive. But that's good. It's good because they'll burn out faster. They'll be radioactive for tens of years, hundreds of years, not millions of years. That makes for easier disposal. These two, these are two factors that mean the natrium technology isn't going to be here immediately.

(01:27:20):

First, it needs uranium at an enrichment of approximately one part uranium 235 to four parts uranium 238. That's HALEU. The highest enrichment now commercially available is one part uranium 235 in 19 parts 238. That's about 5%. It's not com that's not completely correct. There's one commercial source of higher enriched uranium. It's a government owned company in Russia as, as Seth described. So let's take that off the table for now.

(01:27:52):

The other factor is the first of a kind projects always run into problems that weren't expected. The event is more likely as the project departs further and further from what's come before. Toyota can shift pretty easily from last year's Prius to this year's, even though the new one has a different battery chemistry and some other refinements. Shifting Toyota shifting to the Mirai, the, the, the, the hydrogen powered car is much more difficult. It's a little tougher. We're gonna find the same thing in reactors.

(01:28:24):

Also in this category of big departure is X-energy's pebble bed reactor. This is a gas graphite reactor on paper. This reactor is really attractive, partly because the fuel can tolerate very, very high heat, runs at low pressure and produces very hot steam, capable of doing a lot of different kinds of work. The pebbles are swapped out while it's running like a gumball machine with a kid taking gumballs outta the bottom and somebody dumping new ones in at the top. So it doesn't need to shut down for refueling. It will need to shut down now and then, but not for refueling. But again, it needs a higher enrichment and it's fundamentally a different technology from what we have now. It's also likely to start life in an interesting place at a chemical plant. The first customer is Dow at a place called Seadrift in Texas.

(01:29:13):

Now Dow has some advantages. One is that it's used to big projects. It's got in-house engineering jobs. It's also in a business where it can get a competitive edge by saying that its products have a smaller carbon footprint than its competitors' products. Dow may represent something new. A customer for nuclear that isn't a utility. Plants like the XC 100, the X-energy product can do more than make electricity. They can do work of the kind that, that a plant like Seabrook can't do. in fact, plants like this may cause a return to the 19th century system in of industry. In the 19th century, companies built dams on the Connecticut, Connecticut River, and then canals to tap the water. and for direct mechanical hydropower. Companies, manufacturers would cluster around these canals. At first, the power was mechanical. Later it was hydroelectric.

(01:30:16):

We may see industries that want process heat begin to cluster around new reactors like the XE 100. We may be approaching an era of energy parks. X-energy and Natrium both have major funding from the ARDP, the Advanced Reactor Demonstration Program. Following behind them are some companies create designs that have lesser levels of funding, probably farther back in the development pipeline. And I'll mention three. Kairos is also a pebble bed, although pebble is not the right word. Somehow ping pong ball bed doesn't have the same cachet, so they call it a pebble bed. Kairos uses salt, not gas to carry away the heat. So you've got the pebbles floating in a salt solution. Kairos is very low pressure, very high temperature. It's getting very close to permission to build a test reactor. This will be the first non-power test reactor for a commercial product since the 1960s.

(01:31:18):

Another entry is Moltex, which is a fast reactor using molten fluoride salt. It's got good support from the Canadian government, the federal government, Canadian federal government, and from Ontario Power Generation. Similarly, on our side of the border, Terra Power has a molten fluoride salt reactor, but, and also also a fast reactor. It's one of the ARDP reactors in the second tranche, given money to advance the concept, but not to bring it to commercialization, at least not yet. I'd like to mention three common characteristics of the emerging new reactors. One is not so obvious. They're black start machines. Black start means that in case of widespread blackout, they can start up without the power grid. Plants like Seabrook, can't hope to do that. Think of a plant like Seabrook as being like a gasoline powered car with a dead battery. Yes, it'll run, but you have to jumpstart it from an external source.

(01:32:15):

This analogy isn't perfect because Seabrook needs to be able to take power off the grid for all the hours it's running. But adding black start machines adds resiliency to the system. A plant like NuScale would start up off an emergency diesel generator, but it, the emergency diesel generator does not have to be safety rated. If it doesn't run, there's no catastrophe. So it's cheap. Second, many of these machines are higher temperature, but lower pressure, which means that in case of pipe break or other kind of rupture, the energy to push out the radioactive materials into the environment simply is not present. At least not to nearly the same extent. The 10 mile EPZ is not an issue here. Some may have a two mile EPZ, which is 25 times smaller. Some will have an EPZ that's limited to the fence line.

(01:33:03):

And third, and this is key, these plants are supposed to be built in huge components in factories. And Seth pointed out a number of, number of large reactors we'd need multiply that by three, four, or five. If you're gonna start building smaller reactors, we really would have to start stamping 'em out like 737s. This has two benefits. You get better quality and lower cost by assembling something in a factory. And while the factory is building the reactor, the construction crew can be simultaneously building the civil structures. This means less time to construction less time to deployment, and less cost. and that's about what I had prepared and I'm very happy to take your questions. And as you move on to the next slide I'm, this is last slide is just my contact information.

Rep Keith Ammon (01:33:56):

Here we go. All right, Matt. Thanks very much. That was content packed and it was a good overview of a lot of the companies that we've heard from so far. I think Moltex and Kairos we have not heard from, but most of the others you mentioned

Matt Wald (01:34:13):

Either one of those would be good candidates for your, for your group to hear.

Rep Keith Ammon (01:34:17):

Okay, great. Alright. And I'll start with questions in the room. And I just wanna Bart from with our commission member suggested that we get you as a speaker. So maybe you, you two could connect after questions. Alright. Representative Michael.

Rep Michael Harrington (01:34:37):

Yeah. Hi. I just noticed that Centrus now has got NRC okay to introduce uranium and a HALEU production demonstration plant. Can you provide any additional information on that?

Matt Wald (01:34:49):

Yeah, Centrus is the company 20 years ago the, the Atomic Energy Commission and then the Department of Energy, its successor, was making most of the enriched uranium. The government decided to sell it off. It turned it into a company called USEC, US Enrichment Corporation. They tried a variety of ways to modernize. None of them succeeded. They went bankrupt. They emerged from bankruptcy under the name of Centrus. Centrus has a design a really interesting design divergence. The over the years, the centrifuges have gotten taller and taller. The ones in New Mexico, the Urenco models, I don't know, but they're about 15 feet high. The ones that Centrus has assembled in a test assembly are much, much taller and have somewhat higher efficiency. The Russians meanwhile are building midgets that are three feet high.

(01:35:57):

And like most Russian engineering, they're not great, but they are indestructible. So Centrus has a, a, a preliminary cascade set up. It's not quite ready to turn it on. It just won't produce a lot. What it needs is a large amount of cash, which it could get either from the federal government, excuse me, or it could borrow commercially, if it had an assured market. It would probably take material that was enriched to 10% by Urenco in New Mexico and then boost that up to 19.75%, which is the maximum demanded by any of these new reactors. You get to 20%, it's no longer low enriched. It's then considered military grade. It's not quite reference grade, but you've done most of the work to get it to the level you'd need for a bomb.

Rep Keith Ammon (01:36:51):

Follow up.

Rep Michael Harrington (01:36:51):

Yeah. Thank you. so having said all this, we sort of still with the chicken and the egg question yeah. Who's gonna make the HALEU until there's a market for it? And who's gonna make the reactor until they have the HALEU? How do you see that playing out? Is it just gonna strictly be the federal government's gonna have to step in and fund huge amounts of money? Or do you think private industry like, like Dow Chemical, cause they're getting a lot of money from the feds as well on that project is gonna step in? How do, how do you see it playing out?

Matt Wald (01:37:19):

I have good news for you. If you paid your taxes, you are gonna help build these reactors <laugh>, the, the two ARDP reactors in the first trench Kairos, excuse me, not Kairos. X-energy prominently X-energy and Natrium get pretty hefty one-to-one matching from the federal government. It may turn out to be less than one-to-one if the builders have to spend more on it than they intended, which is in nuclear, not outta the question but they're getting pretty hefty subsidies. The government induced private industry to get into the nuclear business by making low enriched fuel available. And that was initially like 3%, not 5%. the government is gonna have to step in as a middleman and order x tons of HALEU and, and then sell it to break even.

(01:38:18):

Maybe make a profit. Who knows? but they're gonna have to, they're gonna have to be the middleman between the chicken and the egg. There's a different problem here, which is they fumbled Congress fumbled last year, didn't get anything done. This year, I really don't have high hopes for any kind of budget at all by October 1st. We're gonna be on a continuing resolution. The House is approaching complete dysfunction. And the Senate was never very good at consensus. And as a result, it's not just the nuclear stuff, it's everything. We're gonna have real trouble getting a budget together. So the answer is eventually it'll be the federal government. Don't ask me when.

Rep Michael Harrington (01:39:00):

Thank you.

Rep Keith Ammon (01:39:04):

Alright. if you're on Zoom and you have a question, use the raise your hand feature of Zoom. Any other questions in the room? I see see people thinking.

Matt Wald (01:39:18):

I got, I I wanna throw in one other comment, which is the government has a variety of resources but hasn't been very good about deploying them. For example, we have plutonium weapons plutonium that we promised - we made a deal with I think with Boris Yeltsin with the Russian Federation. We would destroy some of our weapons plutonium if they would destroy theirs. And we tried to build a plant to get that done, to turn it into MOX fuel. Turns out that the weapons plutonium is alloyed with an element called gallium. I'm not sure why it has something to do with stabilizing the plutonium so that the, the weapons have a long shelf life. But gallium has an unfavorable interaction with zirconium, which is what's used in clad today. And what Seth Grae's fuel would use as it's Seth can correct me, but it's sort of like the matrix of the fuel.

(01:40:17):

And they designed it, the, the DOE designed an aqueous process to get the gallium out of the, out of the plutonium but couldn't make it work. Or rather that the, the estimated cost to make it work got higher and higher. Some of the stuff could end up being used in fast reactors. if we could do that, we might be able to relieve the, the shortage we're we're seeing to develop in enriched uranium. The shortage developing because we now recognize the Russians are not a good place to buy this stuff from. They're not a stable source. Either we'll cut them off or they'll cut us off. It's not gonna end heavily.

Rep Keith Ammon (01:41:04):

Alright. You, you early in your talk, I, I believe I heard you mention the byproducts fusion reaction. yeah. I know fusion's kind of far out there, but I was surprised to hear that there are radioactive byproducts.

Matt Wald (01:41:21):

Oh, yeah. Yeah. Because what you're doing when you fuse two atoms, kinda like when you split atoms, you're liberating neutrons. Those neutrons go places. One of the places they go is into the surrounding metal elements. And this happens in, in fission reactors also. They activate, they're captured. They don't fission that metal. They're captured by a neutron, by a nucleus in that metal, and they become unstable. And they wanna return to stability by giving off a packet of radiation. So the, the metal parts in the vicinity of the fusion event become intensely radioactive. Now, fusion does not have residual heat production like Seabrook does, like other reactor like fission reactors do. But it's not correct to say it doesn't produce radioactive materials.

Rep Keith Ammon (01:42:19):

Okay. The, just to focus on fusion, the the heralded experiment that just happened. Yeah. Could you talk a little bit about the total energy input versus you know, what was at the core of the, of the experiment? Did, did they actually get more energy out that they put in?

Matt Wald (01:42:44):

Just barely. Yes. You, I mean, and you gotta start somewhere.

Rep Keith Ammon (01:42:48):

Yeah.

Matt Wald (01:42:50):

People say, oh, you know, the joke is it's 20 years away. It always will be. Fusion might work as a practical energy source. On the other hand, it might not. You can make cellulosic ethanol from corn husks from other wastes. You just can't do it in any way you'd want to. You can't do it economically. Excuse me. Fusion could be in the same category. We'll, we'll have to see. I wouldn't, I, everything in the nuclear business sounds better is an acronym. And I have an acronym for, for this category, it's called DHYB, which stands for Don't Hold Your Breath. there's no point in waiting a ran for fusion. We should probably put money into it, see what develops, but I wouldn't count on it.

Rep Keith Ammon (01:43:35):

Okay. All right. Last call for questions. All right, Matt, thank you very much. And my pleasure. If you have any further questions, we'll be sure to reach out to you and we'll be watching for future articles published by you.

Matt Wald (01:43:51):

Well, I got an, I got an editor, editor at the American Nuclear Society who wants the third piece in this two part series which is, what are we gonna do about fuel? Well, why did it go wrong last year? What comes next? And at the moment, I can't answer that question, but I'm working on it.

Rep Keith Ammon (01:44:07):

Right. Hopefully you let us know. Yeah. Top one. Thank you. Alright. Thank you. Thank you. And you're welcome to stick around. We have a little more commissioned business. we're gonna try to end up at 11 o'clock.

Matt Wald (01:44:18):

Very good.

Rep Keith Ammon (01:44:19):

Really appreciate it. Alright. Matt, can I put you on the spot? Sure. All right. Matt Lavander works at Seabrook and you know, I don't know if you can share everything with us, but Seabrook just went through a refueling and maybe you could just talk a little bit about that process and I think that'd be interesting for us here. Yeah.

Matt Levander (01:44:40):

So

Rep Keith Ammon (01:44:42):

So, oh, I'm sorry. Oh,

Matt Levander (01:44:49):

So Seabrook typically refuels every 18 months. The refueling timeline will range anywhere from probably like 18 days to you know, around 40 days, depending on what's going on for actual work during their refueling outage. They take that time to do a lot of maintenance on the plant that you can't do while the plant is running. During that period, they replace about one third of the core two thirds stays. And then that one third of the core goes to a spent fuel pool where it will cool for several years, and then it'll be transferred to an independent spent fuel storage installation that's also on the site. That's the dry cask storage. This last refueling outage of Seabrook was about 38 days give or take. And we did some major major work to try to you know, preserve the asset of Seabrook.

(01:45:38):

We did reactor vessel head peening, which is a process where they do it's almost like cavitation induced metal strengthening. Try to make the reactor vessel head last longer. So in case we go out to ask for another license extension out to 80 years that that reactor vessel head will be good for that. We did some steam generator bowl drain weld overlays. So there's some industry issues with dissimilar metals causing caustic stress corrosion. And this is something that the industry has done would where they do weld go overlays to, to make sure that you don't get any leakage. and then we also replace some of our low pressure feed water heaters just to help increase the efficiency of the plants. I guess just any, any questions on any of that?

Rep Keith Ammon (01:46:29):

You worked the night, the night shift?

Matt Levander (01:46:31):

Yeah. I was on night shift. I was the leader for the mechanical maintenance department. Typically I, I work in the regulatory affairs group, but it was a good opportunity for me to kind of see some, some of the, the craft working out in the plant. We probably bring in between, I would, I'm, I'm not sure, but several hundred contractors come in for that short window to do work. Companies like Westinghouse, Framatome and, and some others. so a lot of coordination and also a lot of like positive impacts for the local businesses around Seabrook with all those extra influx of people coming in and going out to eat, stay in hotels, that kinda stuff. Yeah. I guess we have a question on the line. Sure.

Rep Keith Ammon (01:47:17):

Go ahead. Just go ahead, Matt.

Matt Levander (01:47:17):

Go ahead with your question.

Matt Wald (01:47:23):

Thank you. I'm, I'm not obviously a member of the commission, but I, I always like to talk to experts and I realize this may not be in your direct department, but one of the benefits that Seth Grae was talking about was going longer between outages or increasing the energy output of the core. Is any of those under consideration for Seabrook?

Matt Levander (01:47:46):

I know it has been looked at in the past. I don't believe Seabrook is currently looking at going into two year fuel cycles. I think some of the other NextEra owned plants are. I, I don't know the, the reason why Seabrook isn't, but but I don't believe it is at this time.

Matt Wald (01:48:02):

Thank you.

Rep Michael Harrington (01:48:04):

I can assume it's a huge license cost associated with the switch over some new type of fuel with longer outages different physics characteristics. I mean, I just, that's tax, but the take years just to get approval from the NRC, so it's very expensive.

Matt Levander (01:48:23):

Yeah, I would think so.

Rep Keith Ammon (01:48:31):

At our last meeting, Doug Thomas suggested a tour of Seabrook. And maybe we can talk more about for the, for the commission members. Doug and I took the tour years ago when we were both on science and tech. And Mike, you've probably been there too, right? Oh yeah, there you go. <laugh>. But maybe that's something the commission might be interested in. We could do a, you know, a tour. The, alright. Yeah, let's talk about timing. is there, is there any time that's better than others? Like, okay. Yeah. When, alright just moving on in the, in the agenda, is there any public comment from either in the room or on Zoom? Now's your opportunity to just say how great of a job the commission's going. <laugh>, we have one in the room. Can you pass the other mic over? So, got two what I press just hold two favor, press Okay. And just,

Douglas Mailey (01:49:38):

Hi, my name is Doug Mailey. I have a question. People have talked a lot about load leveling and I does, is that pertain to demand or is it also if like your say a renewable system and if it's the latter, why even if you have to load level the renewable system, why not just have one system that does it all? Do you, do you understand my question? Is it, is it necessary to have, and this is directed to anybody, you know, why have whether it's a gas or nuclear system kind of picking up the load when a renewable can't do it, why not just go with whether it's gas or nuclear or what have you?

Rep Michael Harrington (01:50:18):

Well, I think what's also have a push across the whole country for renewable energy. And that's what's pushing it now to get massive subsidies, huge tax credits that are actually sold on the secondary market. And so as long as you are pushing solar wind, you're gonna have to have something to balance it with it because we simply can't turn on the wind when we want it to come on.

Douglas Mailey (01:50:38):

Well, that's kind of my question, right? It sounds like more of a political issue than a true technical issue.

Rep Michael Harrington (01:50:45):

I mean, you could have, I suppose you could have enough between a lot more nuclear reactors and then you'd want gas turbines for peakers because nuclear's too expensive for peakers for the most part. It could be done, but you'd have, you're talking hundreds of billions of dollars of costs for putting out new nuclear plants.

(01:51:03):

They're not cheap to make. And one thing we know is listed at the Vogtle plants down in Florida (Georgia), they're, I mean, I think two and a half times the original budget and three or four years over beyond schedule. So you know, it, it, there's a really a big risk until they start churning these SMRs out in factories and show that they can be produced dependably on time, you are gonna see a big push for, I mean, they're tracking, building all this offshore wind off the coast of New England, down New Jersey. They're building it, of course, solar of all over the place and terrestrial wind out in the rest of the country. So unless we come up with a real, real big, big breakthrough in battery technology you're gonna have to have something to put that you know, the power when there's no wind and no sun.

Rep Keith Ammon (01:51:52):

Mikael, are you on the wind commission as well? You wanna talk just a little bit about that? Just if you hold off. Okay. All right. Maybe just because that's something that's maybe not competing technology, but it's you know, another large scale generation. All right. So next time. Alright.

Rep Michael Harrington (01:52:13):

One, one thing I just comment on, we, on the subject we is, we as previous speaker brought up as you know, huge subsidies. It's the same thing there. Yeah. All this offshore wind. There has not been an offshore wind project even proposed in the United States that wasn't have guaranteed purchase power agreements with the utilities, now what they did in Massachusetts is the, the government basically told me, utilities said, go negotiate with the offshore winds. You will buy their output, though, have to sign a contract unless you can prove to us it's some really bad reason why you don't. They did sign a contract and the first wave is being built now. The second batch, the company building it have now taken the, the public utilities department in Massachusetts to court because they said they have to change the contract cause they cannot build it at the cost they originally agreed to because of mostly supply chain issues driven the cost over the last three or four years. So that's on hold in court, but there's nobody going out there that's willing to spend their own money. That's what I'm saying. There's no

Rep Keith Ammon (01:53:13):

Similar issue with nuclear.

Rep Michael Harrington (01:53:13):

With the saying this is similar with nuclear. People aren't, oh, other than Dow Chemical, of course they're still getting, I don't know how many tens of millions of dollars from federal government for that. But at least if someone's putting in some of their own money, which, and these other projects don't see it all.

Rep Keith Ammon (01:53:28):

The idea of the industrial power park that that Matt talked about is very intriging, which is I think Dow os kind of like the anchor, the anchor tenant or something like that. Not to put you on the spot again, are you also on the hydrogen commission center? Water. The Senator Watters. Okay. All right. cool. Cause that's another thing that I'm interested. Alright, so just getting through the business here letting you know, nuclear now is available on your favorite streaming service. It's kind of a it's a good, it's a good movie to, to sort of get your head around the the political and some of the technical issues with nuclear. I don't have any updates. So in our, in our statutes going back 40 years, there is a position that's supposed to be filled and it's the somebody that a commissioner for potential uses peaceful uses of atomic energy.

(01:54:31):

It's New Hampshire, RSA 162-B. So we're trying to resurrect that somehow. And you know, maybe that's something that we can modify to bring it up to current state. I'm in contact with someone in the governor's office. I think with the budget going through, they had other priorities, so I haven't forgotten about that. I'll give you an update as soon as I can.

(01:54:54):

Future meetings, this commission ends in December, so we only have, you know, July through November basically for meetings. I'm finding it hard that it'd be easier to schedule future presenters if I know the dates in advance because I have to scramble over the last two weeks to try to get our presenters lined up. So I know the legislative session is pretty much winding down. so that's Mike, I and, and Senator Pearl. We'll have a little more free schedule. Is there a day of the week that is off limits for anybody? you know, is there a regular day where you're busy doing something else that you can't attend?

Rep Michael Harrington (01:55:34):

No, not once we get out

Rep Keith Ammon (01:55:35):

Of June. I know you have some meetings. Okay. Okay. So Monday or Friday. So I might pick like the first Monday of the month or second Monday of the month. and just, just schedule the rest of them on that date. 9:00 AM does that work for everybody? Is that Cathy, would that work for this ring? So July we won't have a meeting, but maybe we'll do the tour of Seabrook. You know, it's voluntary if you want to come, but maybe we can do a tour of Seabrook in July. it's really neat to see the turbines and the, and the buildings and, you know, you can look at if you've ever seen a show Life After People, the, the second pad site of Seabrook looks like that. It's got the vines going on it, but it's you know, it's, it's an unused potential, you know, location that we can check out.

(01:56:29):

And then we'll do August through November. I have a list of subjects that I think we should, we should cover that we haven't really touched on. David couldn't be here today, but I was talking to him over the weekend. He's made some contacts with funding how to get funding from the federal government. He's got some contacts that are willing to present to us just to, so we can learn more about that process. You know, they, the the IRA, the Inflation Reduction Act and the infrastructure bipartisan there's funding in both of those. Seth's one of his slides covered all those sources, so we'll try to dig down into that. I have the, today, today's a federal holiday. So I, I have the US department of nuclear, I think the deputy, deputy Secretary I believe. But she couldn't make it today. It's a federal holiday. So but they're lined up and I thought maybe we could tie them in with our, some, somebody from our federal delegation and have that forum. So it'd be you know, a, a funding a meeting, focus on funding.

(01:57:55):

We should have a meeting focus on siting and I dunno how to, maybe Dan you, you could help with that offline. David has an idea. I dunno if I should share. I'll, I'll just give you a basic like, Where in the state could we have switches, you know, in interconnections with the grid? So Matt talked earlier about the industrial power zones. So where in the state could you put an interconnect? You know, where are those sites possible, right? And just put those on the map so we could figure out if it's even you know, logistically possible to have an industrial powerzone, you know, maybe in the north country with a large manufacturer. So that might be something interesting to check out.

Rep Michael Harrington (01:58:53):

Remember Seabrook was built, could have two reactors. Something.

Rep Keith Ammon (01:58:57):

Yeah. Right. That's that second pad. I have, I have two fusion companies lined up.

(01:59:03):

It's Helion, which is the company that just did a power purchase agreement with Microsoft. I see that. Yeah. And then a company called Zap Energy. and Zap's willing to present to us as long as we don't conflate fusion with vision. They're really they wanna make sure that we're, we're not mixing the two things up. Let's see, we have a few other manufacturers we haven't heard from. And then this idea of a large flexible load, I think we should touch on that cause it's so hydrogen production would be one, I think the molten salt energy storage would be one. so what, what kinds of large flexible loads can be partnered with a reactor.

Rep Michael Harrington (01:59:49):

A kind Storage system?

Rep Keith Ammon (01:59:51):

Yeah, storage. but that way, you know, we talked about load filing a minute, load leveling a minute ago. So those large flexible loads are tool for low leveling, but also to make the project financially more attractive. So and that's about it.

(02:00:10):

We may have, the fire alarm is going off. We may have to it's a perfect ending to the meeting. All right. Meeting adjourned. It is 10 58.