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DOUG HUNTER INTERVIEW

Q: Welcome to Grid Talk. This week, we're extremely pleased to have Doug Hunter, the Manager of UAMPS which stand for the Utah Associated Municipal Power Systems, talking to us from the middle of Utah, a remote hill country, I take it, about the whole promise about modular nuclear reactors, what the technology offers, and how it may utterly transform the utility sector. The significance of this is, as we move away from large generation stations and move towards more of the distributed generation to increase reliance on renewables, many wonder what the power source could be that will back up solar when the sun's not shining and wind when the wind's not blowing. Many thought leaders think that modular reactors have a role to play. Welcome, Doug. Tell us why you think modular nuclear reactors are going to be a game-changer for the energy sector.

A: Thank you, Marty. Yeah, I really do believe it is. Specifically, I can give you a couple of real quick points. (1) The size allows these nuclear reactors to move very, very

quickly, as quickly as combined-cycle gas or maybe even a little faster explained in certain situations which is way different than the existing fleet which does have problems due to the fission process of moving the reactor a lot. We have that; plus, they are also cost-competitive both on a marginal basis, very cost-competitive on a marginal basis, and the year cost-competitive on an all-in cost basis with gas, and they are much cheaper, if you will, less expensive all the way around than battery technology which could do a lot of the same thing.

Q: Now, you're a power wholesaler in the Plains area, covering many states, quite a bit footprint. What brought you to focus on this technology? Why UAMPS?

A: Yeah, that's a good question. We're a joint action agency, 47 members in 6 western states, very rural, municipal rural, electric cooperates of midsize aggregated up into a large group for economy of scale on a project basis and an all-power requirements basis. A number of years ago, [unclear] back to 2005. We started talking about the future of what the industry would look like in a regulated greenhouse market environment and started to educate ourselves as to alternative technologies that could replace fossil fuel in all of its attributes including cost as well as its

flexibility. Not to drag the story on, but we went through a long process to where we really decided that, if modular reactors could produce what they were promising, that that was probably the best thing to start to really focus on from a feasibility point-of-view, and an understanding to see if we could actually bring it to fruition, and that's what we're really doing. We've literally looked at every aspect of technologies that are commercially viable with a limitation, and it has to be somewhat cost-competitive if not very cost-competitive as to what we really saw as our alternative, if you will, in a modified or low-carbon environment which would be combined with, say, natural gas, so we picked the mid 50 dollar megawatt hour area as another criteria on to the grid and into that range to qualify. It had to meet those 2 adjectives. We ended up selecting New Scale as the technology provider for the modular reactors due to the attributes they have. They currently are the only ones in the licensing process, so I guess that helps out.

Q: Doug, bring us up to date, if you will, on your plans to build the first test facility up in Idaho on a DOE laboratory side. What are the time targets? When do you hope to have it operational?

A: Well, obviously, to be able to do planning, we'd like to

put down dates. Currently, we were anticipating '26 to 2027. We're still on an end of '26 commercialization date for the first reactor. The subsequent reactor-- we would put up to 12 of these in one facility, and just for modeling purpose, we assume they all go in in a 60-day interval process just for modeling. They don't have to go in that way. That will lead to the end of '27 if you will. We will have all 12 in place. They are, as you mentioned, going to be placed to site. We negotiated the site lease agreement. The Department of Energy has identified the sites specifically on the Idaho National Laboratories out there. We were in the process currently of locating where the footprint of the facility itself would be on this 1000 acres that we've been provided by the Department of Energy. We're working on that. Also, we're working obviously for internet connection capabilities. We are in the queue working with Pacific Corps, [unclear] Power Administration, and Idaho Power Company on internet connection because it's been a long wait item. We're quietly and intently watching New Scale go through the design certification process with the [unclear] regulatory commission which is moving just very well. There's been no upsets. The only unexpected thing that's happened is that that licensing processing is ahead of

schedule. That is something, from what I understand, not the end of this business event's first for the NRC.

Q: Is the plan to build 12 of these 16-megawatt units?

A: Yeah, you can house up to 12. If I could just give you a little hint though on how you look at this is one of the unique things about this technology that we like, these will be built in a factory and then hauled out. What we are doing is building--

Q: Where will the factory be, Doug? Where is the factory?

A: That's a good one. The first one is going to be a component-constructed concept out of numerous facilities within North America, and we now have approval to actually use large forgings overseas. The United States currently doesn't have a large forging capability, so Korea, Japan, or Poland are all due there, so there could be some pieces from the Department of Energy which controls that. It's been give that green light. We would hope that once there's enough orders down the road that that would then come back to the United States as large forging capability to come back in. What we're going to do is assemble them out in Idaho. Now, we don't have that very specific site. We're just starting to work on that, but I would speculate it would be, obviously it would be Idaho Falls area or the Blackfoot area due to

rail access as well as highway access.

Q: When these have to be refueled, are the units themselves taken away, or is it refueled the way conventional nuclear plants are?

A: Well, neither actually. It's a unique process. Inside what we call the reactor building where all 12 of these reactors will sit, below grade, in a pool of water which is the ultimate heat tank, there's a gantry crane, if you will, concept that will move the modules into individual bays, and then there's a refueling station that consists of underwater attachments to put in the modules so we move one module out every 2 years. The other 11 are operating, so we don't lose that production. That's why it's way different than a conventional refueling. We go in and do inspections. We can move the non-fueled area. We hunt both of the things. We move the non-fueled area for inspection purposes into a dry dock that's in the same building, and that process takes 10 days, and then it's put back in its bay, and it goes back to production. It's much, much different.

Q: Where is the waste going to be kept? Is it going to be kept on site? Have you figured out the disposal aspect?

A: Yes, yeah, so that's a good question. Currently, all the nuclear generating stations, you have to enter into a

contract with the Department of Energy. We call it the standard contract. It's all the same for everyone. It deals with the waste, spent fuel, if you will. The industry likes that term better, but waste is what the public calls it. That's what I call it. When we refuel, we are basically refueling 20% of each of these very small cores. Remember, these are very small reactors. They are 76 feet tall, 15 feet in diameter, a half-sized fuel rod assembly. We take 20% of that, stay in that same reactor building in the spent fuel area which is still in the same water sink, so it's over in a different part of the building until they are cooled down to a temperature which is relatively quick with the small amount, but it will continue to storm in there, and then they go out into dry cast storage on site which is a regulated, licensed pad. It's a concrete pad that sits outside on our property, and basically, we have enough room to take 60 years of 12 modules out there. We have more in there. We can do that for 240 years' worth. It's one acre of land as all we need to use for 60 years of operation of 12 modules on our spent fuel, on this one acre of land. We've got 4 set aside for that, so it will stay there until the Department of Energy comes and gets it. It's their responsibility to take it away from us, and in reality, the

DOE (Department of Energy) is actually paying rent to the reactors entities right now in the states to continue to hold that on their site. Eventually, they are supposed to do something. Now, that may be burying it like a yucca mountain proposal or that may be reprocessing it which would reduce the size by 90% of what we're doing to additional energy out there and also reduce the half-life significantly in terms of the half-life capability. Currently, in the United States, recycling is much, much more expensive than new fuel, and that's in part, just my personal opinion, due to the salt treaty negotiations with Russia or the Soviet Union a couple of years ago and the conversion of that weapon-grade uranium unto a commercial-grade uranium that's going on in Tennessee which has flooded the market.

Q: Doug, I know you've given a lot of thought about this technology. Beyond UAMPS, I think you're committed to small modular reactors as a concept. How do you see it spreading across the United States? Will they primarily be plopped down on existing nuclear facilities? At production, will they be potentially at factory sides and closer to urban cores? How do you see this playing out in the next 10, 20, 30 years?

A: Well, that's a very interesting proposal. I would say

initially due to the benign nature of this technology, the NRC has already put out the topical papers on the safety. It's profoundly safer than any reactor we've ever seen. I would think that the next iteration of this subsequent deployment would be on existing brownfield sites of coal plants or gas plants. We only need 35 acres. Now, UAMPS is also investigating dry cooling in each of these individual 12 generators, if you will, so that we don't need to use water, even if water were available, which it is available to us. It may be a more important use of that water than just to cool for generation. So, we would take a very small footprint. We could go to existing brownfield sites. Coal plants is an example, already have the transmission there, the lands there. The other unique thing about this is these things are very simple. They are run basically by a computer. Obviously, we have humans involved in them, but 85% of the workforce can be, if you will, a high-school educated level trained into this position. The work force would be there as well. I think that would probably be a predominant way to move forward. If the technology allows to have a singular modular if the economics are there, we could do a single module somewhere, and they could probably be closer to urban centers which would be beneficial in terms of

heat, desalinization of water. One of the research projects we're doing with the Department of Energy with the first module is to look at commercial-grade hydrogen gas production for the transportation sector.

Q: Are you finding a lot of interest among utilities in the United States and potentially even overseas to what you're up to? Are a lot of people knocking on your door talking to you about this?

A: They are. I mean, now obviously, UAMPS is still aggregating up a group of utilities out here to provide for all 12 modules if necessary. We're going through that, but there is an economy of scale of something less than 12. We are getting a lot of interest around the nation. We've got interest in Canada now; 3 utilities in Canada are looking at this technology very intently. You mentioned overseas. That is predominately what seems to be going on as they move off of carbon fuels in Europe even with the discussions you see there. I know they've been in Asiatic countries talking extensively, and I'd say there's a lot of fast forward behind this and looking for us to get this first one done, if you will. Then, I think you're going to see this. There's been a lot of interest. I speak constantly around the nation. Here, locally too, given public power, we have addressed this

with the public. We have had over 150 public hearings in 35 communities around the West on this topic. Currently, we have-- 35 represents communities that have decided to move forward at this level, continue to pursue. We've stepped this project up that we could curtail the development of it if, for some reason, we miss something or it looks like it's going to do something like what happened in Georgia or South Carolina. These are things we're very concerned about, but we continually see every day a de-risking of the project, if I can use that phrase. Every day, we learn more and more. Things get completed, and it seems to, you know, we're checking off the potential fatal flaws as we went forward.

Q: I believe it's on the New Scale site-- it says that there have been market analyses pointing to the potential market of this growing, for the small modular reactors growing to an in excess of 500 billion dollars. That's almost more than we spend on electricity in a given year. This could be a huge, huge new sector in the United States. Are you pretty excited about this? Do you think this is going to catch a lot of people by surprise when it finally takes off?

A: Yeah, I think it is a disruptor. They are starting to pick up on it. I am pleasantly surprised. Our communities are concerned on 2 concepts about greenhouse gasses. One is

climate change and the impact on our environment. The other thing is the impact of cost and the associated requirements by still providing power. Even with climate change on top of us with the work, we're going to need more electricity. We're going to need more power to have to deal with it if we're going to put it in that way. We are really proud. I think I can say this about our communities that have signed up. I know the staff and everybody at UAMPS, we think this is a game changer. We think this is a market-based solution for greenhouse gas in the electric sector around the world. It's deployable. It's available. It's inexpensive. It's floating-- like you said, we're in the mid 50 dollar range on our projections on to the grid right now, our [unclear] cost over 40 years, so we think it's fixed, and it's been, you know, we are, I think that's one thing people try to take pride in is it's tough being first. You know? I can tell you that. It's not the most pleasant position to be in, but it's also, it's rewarding to start to realize that we're holding a leadership position as well. I do think it will escalate and move itself forward.

Q: Talk a little bit about how these modular reactors are dispatchable unlike conventional nuclear that's up and running and running and running. How will this follow and

enable renewables to be used most efficiently?

A: Yeah, sorry, there could be some barking. I apologize. Somebody just drove into my driveway area, and they're going to start to bark here in a minute. Yeah, the way they work, because of the core size and the heat content, we can move 20 to 40, or 20 to 100% dispatch just by changing the heat content in the core. Now, normally, when you do that in a large reactor, you cause a buildup of xenon gas that starts to build up which is a neutron inhibitor, but because of the small size of this, anybody that watches the Chernobyl series will remember this concept in terms of the xenon gas. We burn ourselves off in that move. The other we can do is because we're at 60 megawatts (we're small), we can bypass the steam generator directly and descend the steam without changing the heat content of the core to a condenser. We get instantaneous movement. The final concept is we can both of those at the same time, either changing the heat content and bypassing the core, and we can do it on 12 separates shafts, so you can see the flexibility sitting inside of that to deal with problematic mode movements or resource movements. For instance, wind, the most difficult one to integrate. Solar is not so hard. With sunshine, we're getting solar. You can pretty much count on that. We can't always count on the

wind. If we go into a much more higher penetrative renewable world which we believe will be happening in the-- there are 4 states in the West that have adopted very aggressive clean energy standards that we would fit in. In a 60% renewable world, we would be, we could fit that and integrate that beautifully. I think we could even go higher. It just depends on how much we do it in there.

Q: Okay, well, it's fascinating, and we're going to check back with you from time to time to see how your project in Idaho is going. Thanks, all, for listening to Grid Talk, and thanks to our guest, Doug Hunter, for bringing us up to date on the state of small modular reactors in Idaho and beyond. Finally, we encourage you to give this podcast a rating or review on your favorite podcast platform. For more information or to subscribe, visit SmartGrid.gov. If you like this installment today and want to hear more, check out our next installment which will be Embracing Sustainability, a conversation with Ralph Izzo, the CEO of PSENG in New Jersey. Thank you, and have a good day.

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