

**MARTY ROSENBERG**  
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**CONSTANCE LAU INTERVIEW**

Q: Hi and welcome to Grid Talk. Today we have with us Constance Lau, Connie Lau, the President and CEO of Hawaiian Electric Industries, the parent of Hawaiian Electric. Do I have that right, Connie?

A: That's right; absolutely. You do.

Q: So, I guess what I need to say to start is aloha.

A: Aloha to you.

Q: Talk to us about what's new out in Hawaii and one of the things that I just studied up on is that you serve 95% of the electric needs of the state. That's pretty high. Is there any state that has as dominant a utility as you have out there?

A: You know I don't know if there are any more. Of course, previously, all the utilities used to be serving each individual state but we're kind of it out here serving all the islands except the island of Kauai, which is served by a co-op.

Q: So. We have a lot to cover and I want to start with EVs and the three goals that I'm focused on are 100% renewable ground transportation by 2045 at which time you want to be fully renewable and fully carbon-neutral. Do I have that right?

A: Yeah, and actually it's for the state goals and not just on transportation so for generation, it is the 100% renewable generation and then for the total economy it's carbon neutrality by 2045. Now, on the transportation side, what's interesting is that the mayors of our four counties here have also adopted ground transportation requirements that all go renewable by 2035 so that's an even more aggressive and nearer term goal on the transportation side.

Q: So, what does that mean for Hawaiian Electric? What do you need to do to get ready?

A: We have to get ready for a lot more provision of electricity because we'll be providing electricity not to just the normal parts of the economy but now if transportation starts switching over to use electricity as a fuel, we'll have to be prepared to provide that as well.

Q: So, I guess hand-in-hand with this, we have to talk about how you ramped up renewable production. How much renewable do you have today and will it be sufficient to this transformation that we're looking at by 2035 and 2045?

A: Yeah, so we just surpassed a goal in our state statute, a milestone that was set for 2020, which was to reach 30% renewable generation and we were...we recorded in at 35%. That number was a little inflated because of COVID and sales were

down a bit, but even if we adjusted for that, we would have been about 32%. We also have major renewable energy procurements underway—Stage 1 and Stage 2 as we call them—that would add close to another 650 megawatts of renewable energy and about three gigawatt hours of storage, which is pretty significant when you consider that the peak on our main island of Oahu is only about 1,200. So, we're adding quite a bit. We already have over 950 megawatts of renewable energy that's coming from rooftop solar, and you can imagine how our folks have really had to make sure that they can keep the grids stable and reliable with all that variable renewable coming. I mean, think about... everybody talks about virtual power plants where we've got close to 90,000 individual rooftop systems. That's about 20% of our customers on this island of Oahu where I live. On the main island, it's about 30% of folks who have single-family homes. But you really can't have a virtual power plant unless you can harness all the energy of those systems and make it work well with the grid. So, we've got...go ahead.

Q: I was going to say, what do you have in the way of utility-scale solar versus the rooftop? Is it power? Do you have more utility scale than rooftop? How does the ratio work out?

A: Yes, so you know a lot of the initial growth in renewables here actually came from rooftop systems because we had very

favorable net metering tariffs plus the state had added a very generous tax credit on top of the Federal credit so at times when oil prices had spiked, the payback period on some of the rooftop solar systems was as low as two or three years, so it made a huge amount of sense for those homeowners who could afford it to have rooftop solar systems. The utility scale and as I mentioned we're about at 950 megawatts there, but as I mentioned, we then for the utility scale, did now two major renewable energy procurements that are still in process so under our Stage 1, we have six; I'm sorry, eight projects that are being built currently and have been approved at the Commission. In Stage 2, another three, so a total of 11 projects ongoing. Six more are in the approval process at the Commission and then we've got a couple of self-build projects going as well. I will mention that we had a technology agnostic procurement so a lot of the winning bids were solar paired with storage but in addition, there were a couple of battery-only, grid-scale battery projects.

Q: So, just to recap, Connie, you have about 950 megawatts of rooftop on Oahu and a comparable amount of utility-scale in the wings?

A: Yeah, the ones in the wings total about six...a little over 650 megawatts and three gigawatt hours of storage.

Q: Okay, just to complete the waterfront here, does wind power play a role and is there any look to have offshore wind?

A: We do have some wind. I will tell you that a lot of the land...a difference by island because as you know, the wind turbines are a lot more noticeable within a community than a solar farm where the panels are ground level and visually are not...you can't really tell that they're there. And so, on the island of Maui, we have quite a bit of wind. On this island of Oahu, some of the wind projects run into community resistance so, while we love wind and we'd love to have more of a renewable resource...we can talk a little more about this, Marty. Land use in Hawaii on small islands; we're seeing very interesting discussions where competing land use policies are needing to be discussed and judgement calls made by our policy makers so you've got these very aggressive clean energy policies wanting renewable energy which means the building of windfarms and solar farms, battery storage, and then, you have land use policies where we still have needs for housing, even just open space is crucial in Hawaii because a lot of our water just comes from the rain and it collects percolating through the lava rock to create a fresh water lens under the islands that we can tap into for fresh water. You also asked about offshore wind and we've had a number of developers that are interested in doing that. The

topography of the oceans in Hawaii is a little bit different than what you might see, say off of the coast of New England. We don't have these large continental shelves. These are volcanic islands that come almost straight up off of the ocean floor so it gets very, very deep very fast. Now, there's technology from the oil industry that will allow for those offshore wind projects, but as often is the case in Hawaii, it's not about the technology; it's about the siting and if you know anything about Hawaii, we are the headquarters for the Pacific Fleet and so the largest base for submarines is here so you've got to contend with the submarines plus Hawaii is a favorite place for the whales to migrate to so...

Q: So, if we talk about a major commitment to be a hundred percent renewable by 2045, the bulk of that will be solar. Is that right?

A: At the moment it looks like that, yes.

Q: Okay, so as you ramp up electrification across Hawaii, what kind of challenges will that put on the grid and on your utility; that's part A and part B I'd like you to just address is; the vision that some car makers like Tesla have of integrating solar battery storage and car charging. Is that part of the scenario that you'd like to see develop in Hawaii?

A: So, yes to; let me take that question first. Most definitely and that has been something that Hawaiian Electric has really been on the forefront of is looking at all of the technologies that they have developed to integrate all of these distributed energy resources, whether they're rooftop solar system or they are batteries in cars to work together with the grid. That is, frankly, the only way that we can optimize the efficiency and the cost of delivering 100% renewable energy to our residents here and also work towards that carbon-neutral economy. So, lots of challenges in doing that because I think as you know, Marty, there's...the technologies aren't always there so that's one of the reasons that we track it very closely and we were one of the first companies to work with the solar companies, particularly the inverter manufacturers and NREL, the national lab system, to look at how inverter technology, advanced inverter technology could better help integrate the rooftop solar resources into the grid. That's the same thing with the car manufacturers. Very interestingly, Hawaii is one of those states and I hope that if there are any car manufacturers out there that are listening, we love EVs. There is a big demand for EVs here in the islands but we can't necessarily always get the supply of EVs when we're next to big California that has many, many incentives, so...

A: And, what changes do you have to make on your grid side to accommodate all these inverters and knit it all together, and what kind of capital investment does that require? What kind of new skillset do you need in your workforce?

A: So, we have a process now IGP, called Integrated Grid Planning that is meant to be a community-wide planning process now that we have to deal with all of these distributed resources, it's really important that all the voices of the many stakeholders who are involved now in energy in Hawaii are at the table and that we all kind of work collaboratively upfront to provide that plan for the future. So, the IGP is the one that's looking at the investments that have to go into the grid so things like Smart Meters and the sensing equipment, and those are in our typical capital plan. We tend to spend approximately \$400 million in CAP-EX a year and that includes these investments in the grid. So, for us it hasn't been one of these major investments beyond just planning for the grid in our normal way and including all of the grid modernization into our normal planning process.

Q: We've been living through a period of dramatic change in climate and things like the forest fires that have come to



California and the Northwest and the deepfreeze that came to Texas mid-February. This might seem outlandish but hypothetical. Let's say a volcano erupts on one of your islands and blocks a lot of sunlight after you've invested quite extensively in solar. Do you have contingency plans to deal with that or what happens?

A: Oh, that's an interesting question, Marty. I was going to say it's not hypothetical on whether we would have a volcanic eruption because just a few years ago in fact we did have a pretty major eruption that took out or didn't take out, an isolated geothermal plant on the Big Island so that we lost power from that plant and are only now just starting to get that back. But we haven't really seen...we see some vog-volcanic fog-on the Kona Coast on the Big Island periodically and sometimes that'll blow over to some of the other islands but we've got pretty strong trade winds here that I think would probably; I hate to say it but disperse that vog. That's also the reason why the capacity of the windfarms here is so high because if you think about offshore wind and how much more effective it is than land-based wind, but we're on these relatively small islands, you get that same kind of power from the winds coming across thousands of miles of the Pacific to turbines that are on land and just as you would with offshore turbines. So, I'm going to

have to think about, Marty. We'll have to add that to our contingency planning.

Q: Let me ask you, has much thought been given to the identify and the culture of Hawaii once this transformation happens to the point that when you're 100% renewable and 100% ground transport EV, that Hawaii becomes kind of an ecotourist destination?

A: You know, Marty, I think frankly we already are and always have been. This is just an amazing place. It wasn't until I traveled a lot myself that someone once said to me that Hawaii was so fortunate to have not only the amazing physical beauty but also the climate that is quite moderate. This north Pacific location gives us both of those whereas elsewhere in the world you might have a beautiful tropical environment but then you'll have high heat and humidity or vice versa, where you have cooler weather, you don't have this incredibly lush foliage and entire trees that look like flowers. So, I think that the folks who live here have always appreciated the beauty of Hawaii and when you talk about culture, remember that our host culture is an indigenous culture with native Hawaiians who very much respected the land. In fact, the story goes that the first child of the earth mother and the sky father was stillborn and he was buried in the earth and then when the second child was born, he was fed

off the body of the first child that became the taro plant which is the staple here. It's kind of like potato. And so, in our culture we tend to really respect the land as "kin" as opposed to a "thing." It's very much living and so I think we have always much been a place for ecotourism and this whole commitment of our entire community towards carbon neutrality and a hundred percent renewable is just a continuation of that.

Q: Connie, for the last area of discussion, I'd like to switch gears slightly or maybe not so slightly. Since 2012, you've chaired the National Infrastructure Advisory Council advising the President on security issues affecting a lot of our economy including energy, of course. And, you've been on the Electricity Subsector Coordinating Council. This move that you're making in Hawaii to renewables and carbon neutrality and increased electrification, is there an element of grid security that you see coming along with it?

A: Oh, absolutely and Marty, I will say that from the time that I joined the Council so, one of the biggest issues that we've talked about for all critical infrastructure is cybersecurity and think about the grid that now has to integrate so many more distributed resources, you're basically increasing the potential attack surface, so we are very, very focused on security issues and resilience issues for the grid. You know, I

mentioned that the Pacific Fleet is headquartered here but also, the U.S. Indo-Pacific Command that watches 52% of the world's surface including major countries like China and North Korea so, we are very, very focused on those security issues and it goes beyond just making sure that the grid is reliable, to making sure that it is very secure and resilient. So, big focus for us.

Q: So, distributed grid you think is inherently is harder to penetrate or bring down but also opens up more points for attack?

A: Yeah, I think it's probably more. It's that latter point where there are more opportunities for penetration and you know, frankly nowadays...originally everybody was talking out pen tests, right? Now, you just assume that you will be breached somewhere so I shouldn't use that technical term but people are pinging us all the time and you just have to have extremely active services and personnel that are constantly watching the grid and hone your ability to shutdown problems as quickly as possible. I really have to commend our industry which is often times held up as a model for other infrastructure sectors because we are so collaborative and so under the Electricity Subsector Coordinating Council there's the CMAG, the Cybersecurity Mutual Assistance Group just as we get together in mutual assistance for physical disasters like hurricane assistance, we also do

that on the cybersecurity side. And, the E-ISAC, the Electricity Information Sharing and Analysis Center really has become THE go-to point continually interfacing with the intelligence services government agencies to make sure that all of our technology professionals are aware of anything that's happening to any utility across the United States, so that we can share that information and share the mitigations and that's frankly something that is a huge focus of the industry and we continue to look for ways to build those partnerships. Cybersecurity for our industry isn't like some other sector where the primary reason might be a financial crime. For our sector, it really might be the takedown of the economy so to speak or take down the country. So, we are up against Nation States with lots of resources and capabilities so it's very important that we all work very collaboratively and it's great to have a strong risk management agency like the Department of Energy as a partner for our industry.

Q: Great.

A: And also, Department of Homeland Security. I mean, really, I'd say, through the Electricity Subsector Coordinating Council; you know, all the Federal agencies led by DOE and DHS come to the table to work on these issues together.

Q: You've been at Hawaiian Electric since 1984 so you must have started when you were ten years old; thirty-six years. What has been the single most important change do you think in that timeframe?

A: Well, within that timeframe we really did change from regulated monopolies that were vertically integrated to really being at the center of an energy ecosystem for our communities. Before, the regulated utility kind of provided it all for all of the citizens that they served. Now, there are so many other players including the independent power producers, the aggregators, the energy service companies, the tech companies, that we have to...I think we still have...well, I know we have the central role because we have the grid. We have that central role and we have a leading role and it's really important for us to make sure that all of these other players also come together collaboratively. The one thing that hasn't changed is that, I think folks who work for regulated utilities nearly...we realize that in many ways we're kind of quasi-public, and we have a really important role to make sure that we keep distributing and keep providing the electricity that keeps our communities and the country running, and so, we have this much more collaborative mindset. All those mutual assistance groups that I talked about and that mindset is something that we have to also

impose on everyone, all those other newer players that now are part of this whole energy ecosystem that has to insure that we deliver clean, reliable, resilient power to our communities.

Q: Great. Thank you, Connie.

A: Okay, well, thank you, Marty. Always a pleasure.

Q: Likewise. We've been talking to Connie Lau, who's the President and CEO of Hawaiian Electric Industries and she's been sharing her insights about changes to the industry out in Hawaii and across the country. You can send us feedback or questions at [GridTalk@NREL.gov](mailto:GridTalk@NREL.gov). And we encourage you to give the podcast a rating on your podcast platform. For more information or to subscribe, please visit [SmartGrid.gov](http://SmartGrid.gov)

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