

NEXTERA ENERGY – STUDENT QUESTIONS

Guest Speaker: Buck Martinez

Is there any future plans for any type of water energy?

For what kind of energy?

Water, for water generation.

I don't think so. I mean, in your lifetime? Absolutely. The only reason I hesitate is we've been working with FAU since 2009 or '10 to get turbines out in the ocean. And they've had a few different issues. I think the technology's finally there. I mean, those of you understand salt water and what it does to equipment is pretty tough. But basically, part of the issue, candidly, was a huge debate between our own federal government; between the Department of Interior and other departments. So they were trying to all lobby for their jurisdiction.

Some of it has finally been resolved. So FAU is putting a prototype out in the ocean. So it's going to be really neat. We'll see how it does. And now, you know that things are going to get serious when you start to see some of the private players get into the game, so Lockheed is getting in, which is a big boy or big girl. I mean, Lockheed's huge. So you're starting to see some of that.

They have put some of the turbines in the rivers back a few years ago and totally dismantled the turbines. The currents were too powerful. But these are very slow moving, so I think it'll be fine. I think the big issue's going to be how do you get the power from the ocean to the shore? The simple answer is, you put cable and you get it to shore. Well, no, there's a ton of permits. The environmental community is going to have major hiccups with it.

I've always told somebody that if you had a guy scuba diving out there, gets caught in the turbine, nobody cares. I hate to say it, but nobody cares. But you get one turtle or one porpoise, they will shut that thing down for years. So it's reality, I mean. It's part of the cost of doing business or how much risk you want to take.

And now, the good news is these turbines, as I mentioned, move very slow. So the reality is, it's going to be tough to-- I don't think a mammal will be caught in these things. But, like for example, we tried to build six, actually nine at one time, nine wind turbines on our nuclear site. We own the property. It's our nuclear site. And we couldn't get the permits. So we had to do all kinds of testing. Hutchinson Island.

So we had to do bat studies. The bat studies took three years. And if there's one specific kind of bat, then you never build there. And then ultimately what happened was they wouldn't give us a height variance. They didn't want the turbine so they flew in people from all over California to protest, yada, yada. Well the beauty was, to me it was interesting. So you had a nuclear reactor sitting there and that was OK, but nine wind turbines were not OK. I'm like, oh, god, OK.

So that got shut down, and got shut down by local not state or federal. So those are things that just because it's renewable, doesn't mean that the environmental community likes you. Some of those heliostats that you were shown, now they're showing that birds that are crossing a path get basically zapped in midair. They just disintegrate. That's so much heat going through there. So that's going to put an interesting perspective.

And then obviously, building on federal lands in California now, they've been basically put a restraining order on that, too, because there's different types, snail kites, and there's different kinds of animals that are on the radar list. So any type of permitting is a real challenge. Like when we built DeSoto, I had to physically move tortoises. We had gopher tortoises. So you have to physically remove them during the whole construction, and then physically move them back. Each tortoise was \$25,000.

I used to do labor contracts, and we used to pay our people \$5,000 for relocating them. Now the tortoise gets \$25,000. And he gets to come back. So there's a lot of issues associated with this. So if you want to get to the development business, each technology will require x-amount of different permits. So I would caution you to make sure you really understand that business.

Water is going to be huge huge issue. Air's going to be huge issue. So the beauty of natural gas, it's clean. So that doesn't have the issues that you had before with oil. But there's so much concentration that you can use with natural gas, too. If you're near an Everglades or if you're near environmental places, there's so much concentration. But look I think solar is going to be here for many years. I think solar with storage is going to be huge.

The fact that Elon Musk is building a huge battery factory in New York is huge. I mean, that guy's brilliant. He's the guy that, you know-- Tesla. So his vision is basically to drive the cost of batteries down, just like PV panels, to whereby it's a very affordable issue. So if you want to buy an electric vehicle, it doesn't cost you a zillion dollars for batteries, and then with a five year warranty.

It's obviously possible, because of the differences in latitude, the amount of sun that hits that spot verses spots closer to the equator. So if you all found those affordable, do you think that the range of solar is maybe a little larger or will develop more than what was originally thought in the past?

I think the answer, and I hate to say this, but it's true, it's political. So what they did in Canada to basically stir solar development and wind development, they did a, what they call, a feed-in tariff, so they guarantee a certain amount of money for building these things, regardless of the irradiance, regardless of the technology, very similar to what they did in Germany. So people will say, oh, my god, Germany, that's the model. We should all be like Germany.

Well, when Germany did what they did, they basically put in what they call a renewable portfolio standard that said 20% of all Germany's production had to come from renewables. They did it when solar was like at \$8 a watt-- insane. The other thing about Germany was the sun doesn't shine in

Germany. So it's got worse the radiance than New Jersey so they put a tremendous amount of solar that really couldn't be used.

And then the other thing happened was Fukushima hit. So then they panicked and they said, OK, we'll shut down nuclear, too. So now solar, they're not getting the production, nuclear's not getting production, so what do they do? They start up a bunch of the old coal projects. Their emissions today are worse than when they started the whole solar movement. So you've got to really think about your policies.

So what happens is parties get into power and they make all these different adjustments without really understanding the technology, without checking with their engineers, without checking with the scientists. They just do it because at that time there was a Green Party, and that's why they did it. But there was no real rationale for doing it. It's cost then a bazillion dollars. We did the math, and somebody said, why don't you do what they did in Germany? It would've been a \$51 billion knock to our customers. So you got to be smart.

Now they'll argue that, yeah, but our customers don't use power over here, because you don't really use air conditioning that much in Germany. Not the right answer, but.

I didn't quite catch the distinction between the green energy and the clean energy?

So we view energy, nuclear, based on emission profiles. The environmental community will never, ever agree that nuclear is green. We view natural gas as clean energy. The environmental community will never agree to that. However, we view, no offense-- no offense over here. Please don't get hurt. But we view a lot of the waste management and a lot of the biomass projects as very dirty. But yet, it's renewable. It's green, but it's very dirty.

So when you look at the emission profiles coming out of a waste management facility, it's pretty terrifying. We view that as-- we're not opposed to it. We view that as, guys, that's more of a garbage solution than an energy solution. But I think you got to be intellectually honest and say, how do you really want to define clean? Is it based on emission profiles or is it based on your political views? And that's the challenge, because there's nothing cleaner than nuclear, but people have major issues with it for different reasons. I mean, we could debate that all day long, but it's clean.

Natural gas is very clean. But people have a real problem with how you're getting some of those natural gas out of the ground now. And then, the opponents of solar will tell you that solar, at some point, is going to be very dirty because what you do with all those panels? What do you do with the silicon when you have to dispose it?

And in China, it's very scary. In China you have piles and piles of silicon waste everywhere, and kids are running in these piles. Obviously, it's a carcinogen. They're just running in these piles of silicon. So it's like, I think, the beauty of the US, for example, is that I think people want to do the right thing. But I think it's good to have debate. I mean, I have my own views on all this stuff.

But at the end the day, I truly believe that you have to have some kind of diversification, some kind of a portfolio, because, for example, what works in Florida might not work in New Jersey or Montana or California. Try to put solar in Oregon or Washington, where it rains 300 days out of the year, it probably doesn't make a lot of sense. But yet you have beautiful hydro in those parts of the country, too, even though there's a lot of environmentalists that are very upset with the hydro industry because of the whole issue with the fish and the salmon and all that kind of stuff. We used to have hydro in Maine.

So I think you have to have some kind of diversity in your portfolio, and you have to understand why each of those technologies and what they're going to accomplish for your portfolio, because the politics in the energy world are thick. No good deed goes unpunished. When we tried to clean the emissions profile with gas, oh, my god, the anti-gas crowd. Now when you follow the money, I've always found that when you follow the money, it's really interesting who these people are. I'm convinced that the coal industry was the one behind trashing the gas industry. It wasn't the environmental community. It was the coal industry masked as the environmental community.

Because guess what's happened to coal? Guess what's happened to coal? It's become the toxic thing of our-- This administration will never let you permit a coal plant. Coal used to represent 2/3 of the energy in the United States. Back when the Gulf caught on fire, we had the big oil spill, I was sending pictures of solar plants to our legislators saying, isn't it right now for solar? The oil lobby was [SOUND EFFECT] coughing money left and right. So you know, follow the money and see where it's-- it's fascinating. It'll upset you, though. You guys are young and you guys have a lot of ideologies, so get them. Don't get polluted by the politicians.

Yes, I have a follow-up. I'm understand a little bit about the distinction between clean energy and green energy, however, if you classify you nuclear as clean energy-- I thought I read about 1,000 nuclear plants or over that in the United States. What happens to them after the end of their life cycle? I mean, how do you call that clean, when I know it's not going to be easy to just break down a nuclear plants like the other coal plants and everything?

That's a great question. So what happens to all these plants when they run their lifecycle? Now I'll tell you this about nuclear, we've had nuclear plants since the '60s, and they keep getting upgraded. We just upgraded Saint Lucy to another 30-year cycle. And it went totally unnoticed. We added over 450 megawatts, or something like that, to the nuclear plants, called an up-rate, which makes it another 30 years. Under budget, saves bazillions of dollars for so many years, but nobody said anything about it. If we would have gone over budget or if we would have done something wrong, oh, my god.

Nuclear's got a major issue, and it's a political issue. The utility industry has done a miserable job of explaining and resolving the nuclear waste issue. So the whole issue had been predicated on, OK, so you're going to take the nuclear waste and you're going to put it in the Yucca mountains, and you're

going to drive into the ground bazillions of-- and guess what? The people on Yucca Mountain said, like hell you are. We changed our mind. So we've been storing it in our own power plants.

But at some point, somebody's got to make the decision. What are you going to do with this stuff? I'll tell you, you're going to have the same issue with solar. What are you going to do with all those manufacturing plants in China? That's all silicon. I mean, that's toxic as toxic can be. So each of these things have a major issue. Wind is very clean. But guess what? Most of the wind is at night when there's no load.

Ocean is going to be perfect, but how are you going to bring the power to shore? Gas is great, but people hate fracking. It creates earthquakes, God knows what. I mean, that's what people say. Oil, dirty, but it's very cheap now. I mean, I could act the debate either part of the equation with you, and either side would make sense to me. So that's why I've always been very cautious about it, because I do believe that you have to factor in the economics. You have to factor in the technology. You have to factor in the politics of it.

And then, obviously, you have to factor in what's going to happen to our next generation. Are you doing the right thing for the next generation? And I'm a big legacy guy. I totally believe that you've got to do what's right for the next generation. I wish I knew what the answer was. But until we truly understand each of these different technologies, I think you have to diversify.

So, if for a class like this, who will be getting a master's degree in sustainability, becoming what has now been termed sustainability officer's, where do you see our placement within a company like yours, especially when some of us here do not have any type of finance or scientific background?

So great question. So on the renewable side, you have development, you have asset management, and you have operations. And then ancillary to all of that is that you have your banking, your financing, your environmental, and all your engineering. I will tell you that the renewable industry is not that difficult. The technology is fairly simple. So if you're not an engineer-- in our company, to work in a power plant like a gas plant, nuclear plant, oh, my god, engineer, please. But on the renewable side, when you're dealing with wind technology and you're dealing with solar, you really don't need that heavy-duty technical engineering degree.

Where the engineering degree's going to come into play is the people that are trying to figure out how to integrate all this into an existing grid. And that's, I don't know if you're going to the FESC integration, but that's a huge issue. So for you guys, I think, having the ability to truly understand the scale, basically, across how a project is developed, how it's financed, how it's engineered, all the permitting, all the issues, social issues, political issues, legislative issues.

I'll tell you that the industry has risen here not because it makes sense technically, not because it makes sense economically it's because it was political. They put in artificial subsidies in different states that allow people to go and build a lot of these projects. If we didn't have all those incentives

and subsidies, we would never be building wind in Texas, because who's going to buy the power? So a lot of it has been political. So you have to understand the makeup of that.

So I think you guys have a unique advantage that you can cross many different boundaries. In our company, most of our wind developers, traders, are actually military guys. We have a very conscientious effort to hire military guys coming back from the field. So our logistics department, our supply chain department, a lot of military personnel. I love their discipline. A lot of our developers on the wind side, believe it or not, are there because-- and this is political-- are there because they fought on the fields and lost a lot of people that were very dear friends of them to fighting a war that they perceived to be a war for oil. So now they're passionate about weaning the United States of foreign oil, and they're passionate about it.

So they're here to make renewable energy here to stay for many years. So you can't have a more passionate group of people than those folks that have seen the negative side of chasing the oil overseas. I think just as you guys are sitting in this classroom, there other students here, China, India, all over the world that are finding new technologies. So if somebody were to ask me, what's going to be the preferred technology 20 years from now? I'd say, it doesn't exist today. It's somebody's working on it.

I mean, cruise ships, why do they have to use regular fuel? Why don't cruise ships use hydrogen that you can actually use in the middle the ocean? You could have the black box, the fuel cell black box, at six cents a kilowatt that basically eliminates the need for all central power generation. If you have the next evolution of lithium ion batteries and replace it with a different kind of battery, which there's a lot of ones being worked on today, combined with a more efficient solar panel, you don't need a grid anymore.

I mean, there's all kinds of fascinating things going on out there. I would encourage you guys to visit Entero one day. I'd encourage you guys to visit some of the different labs. Some of the stuff they're doing is amazing. When the Department of Energy, I got to work on this, said, we're going to build all in. Our race to space, our view of getting to the moon is going to be \$1 a lot all in for a solar project. We all went, are you kidding me?

That was in 2012. Today, we can probably build solar for about \$1.60. And that was a 2020 goal. And we're at 2015 and we're almost there. So at \$1 a watt, this whole industry changes radically. So it becomes fascinating. .

That's a good point actually about national labs. That's a good place for jobs, internships. It's fascinating. I worked at Entero for seven years. And we had the same place-- solar, different types of solar, wind, biofuels, hydrogen, [INAUDIBLE]. It's a great experience, and if you have the chance, going with [INAUDIBLE] scheme, go visit Entero in Denver. So it's a good experience.

How many of you guys know what's Scripps is? One hand, two. So Scripps, most people think of Scripps as the biomedical entity. That's gone. It's a research lab that's going to eliminate cancer.

They do an incredible job on the medical research side. Scripps also has an energy lab, I don't know if you realize that, at Palm Beach Gardens. So your colleague Roy Periana, his view of eliminating cancer on the energy side is he believes that you can basically take carbon out of the atmosphere, CO2 out of the atmosphere, and basically process it and turn into a liquid fuel. And that's what he's working on. He's passionate about it. And whether it happens in 10 years, 20 years, 50 years, somebody's going to make it happen.

Put your A game on, because everything he says is a chemical compound or a chemical equation. He's just all chemical, la,la,la,la.

[INAUDIBLE].

But there's a lot of neat stuff happening on the energy side. And I will challenge that you guys are going to see things in your generation that nobody's ever even imagined. We were just with a guy who he's like the futurist. He works for Google. He's a futurist. And he works on all these different technologies. And what's happened in the last 10 years, as far as change, there's been more change in the last 10 years than in total mankind before that. Think about that.

And he was talking about, amazing, he was talking about, in essence, a sensor. Because this whole industry is going to be driven by sensors, including ourselves. So it's a sensor that basically it's a chip that you can program into your body, that will genetically go after any deformity in your system. So if you're predisposed to cancer, diabetes, whatever, that chip is basically going to eliminate that from your system. Think about that.

So basically they take DNA out of your system, put a sensor in it, put it back into your system. So he was saying your generation, you guys, should live to be 180 with no problem.

That's not good.

Well, it depends.

No, that's not good.

My point on that was I save my whole life to retire at say 60, if somebody says hey, you've got to work another 120 years, I'm like, wait a second, everything hurts. But no, think about so you're in the sustainability world, so you're a sustainable guy. And someone says, you're going to live to be on 180. Now think about sustainability from the economy, the infrastructure, the resources, the food. I mean, it's insane, right, the food alone. But it's fascinating to hear these people debate that. It's really cool. A world without sickness.

We were working with five companies like Verizon, Ericsson, ourselves, others and we were working on the automated vehicles. So think about it, if you're in the insurance business, you're in the automotive insurance business, and now there's no more vehicle wrecks for the next 100 years.

There's no wrecks. The cars all have sensors. They all know when to stop. You're out of business. It's going to eliminate a number of things, but it's also going to create fascinating new ventures.

So what they were telling us is if I go like this, and I count to 20, the car's picking me up wherever I'm at, 20 seconds. That's the longest you have to wait for a vehicle, because they just keep going around. It's a taxicab system without drivers. It's a sensor, so you never have to worry about them crashing..