

Broadcasting from the University of British Columbia where students work in the Bike Kitchen, this is Blue & Goldcast. [music] I'm Sam Fenn, a UBC staff member, alumnus, and one of the producers of Blue & Goldcast. Today, I'm filling in for Jennifer Gardy and will be joined by Santa in one minute. Today, we're going to be talking about sustainability and, specifically, using engineering to confront our climate challenges. Santa is going to speak with Dr. Walter Merida who is a UBC mechanical engineering professor who specializes in clean energy and urban transit. Walter will tell us about how UBC is a Living Lab for sustainable solutions. Students and professors at UBC experiment with buildings and cars and our energy grid to develop and scale up new technologies. So let's go to our conversation with President Santa Ono and Professor Walter Merida. [music]

Walter is a mechanical engineering professor here at UBC. He's also the director of the Clean Energy Research Centre, or CERC, and the associate dean of Research and Industrial Partnerships for the faculty of Applied Science at UBC. He also currently leads the Transportation Futures Group at the Pacific Institute for Climate Solutions. So Walter, tell us a little bit about what a Living Lab is.

Well, thank you for the invitation to be here. It's great to be able to share some of the research that we are doing at UBC. A Living Lab really is more than just a physical place. It's a way of doing innovation, and I think UBC is one of the leaders around the world in this area. In specific terms, it means using portions of our campus to deploy and demonstrate city-scale projects that explore the next generation of solutions for a number of challenges around the world.

What is it about UBC that has made it an ideal location to test sustainability issues and questions and approaches?

Well, part of it - you hit it right on the nose - is location, location, location. If you look at the map, UBC, despite being next to one of Canada's largest cities, UBC, the Vancouver campus, is in many respects a remote community. Now that may be a funny thing to say, but what I mean by that is that we are out in the peninsula. We are at the end of the natural gas grid and the end of the electricity grid. We operate those grids in very much the same way that a municipality would. So on the one hand, we are one of the top research universities in the world, and we have all those challenges and opportunities. But at the same time, we have to offer city services. There's a whole village south of the campus with permanent people living there, and by 2025 I think the estimates are that we will have 30,000 people living permanently on the peninsula. So the reason that becomes a great opportunity is that it has forced UBC to really face the challenges that cities around the world are facing head-on. So for example, UBC was the first university in Canada to have a sustainability policy. And the Vancouver campus reached the Kyoto targets in 2007 ahead of schedule. While at the same time-- so we have had about 30 percent reductions from those levels since then. And at the same time, we have grown in population by about, I think it's, 20-something percent in the student population and about 16 percent in floor space. So UBC has already demonstrated that this challenge of clean growth with concurrent reductions in environmental impact is possible. And one of the reasons we have been able to [inaudible] is this formula of the Living Lab.

Right now individuals like to say that we're about the size of Nanaimo and project that not in the distant future we'll be the size of Lethbridge. So we're quite a large town already, a small city, you might say. Tell us a little bit about how the scale of construction on this campus permits experimentation, that flexibility of always building something is helpful.

That's a critical question because many of the, certainly the clean, energy technologies, until they reached the point where the magnitude of the energy transactions were at the scale where utilities would be interested, the solutions were not really scalable, or it was difficult to extrapolate from the demonstrations to real solutions in cities. So I would say that you have identified a very critical area. The fact that we can explore solutions at the city scale makes our research transferable, not only to other jurisdictions in Canada but internationally. So the project that we are working on here at UBC, for example, could potentially be cloned, if you like, in many cities around the world. And this is why one of the most important initiatives in my faculty, and I believe at UBC at large, has been to improve our connections to municipalities. And to really, from the very beginning, develop these technologies with the idea that this is not just to demonstrate them on the campus but to also convert them into products and services that become a channel for Canadian innovation in Canada and internationally. [music]

I'm Sam Fenn, and you're listening to the Blue & Goldcast with Santa Ono. We've been hearing Santa talk with Dr. Walter Merida about how UBC experiments on its campuses to create clean energy technologies. Just before this interview, I met up with Walter to check out one of those experiments: a proposed new power grid right near the UBC Skate Park.

Could you tell us a little bit about where we are for the people on the radio who can't really see?

Well, right now we are sitting in the skate park on Thunderbird Boulevard which is one of the most popular places, I think, at UBC.

Okay. So you say that you have sort of a special plan for this area in the university [inaudible]. Tell me a little bit about what is going to happen over here.

Specifically, the main idea, I think, is to start looking at the city assets, or infrastructure assets, and try to figure out how they can fulfill multiple purposes. So if you look--

Walter points across the skate park to a nearby parking lot. He tells me that UBC is going to transform it.

Yes. So we are going to take this parking building, and we are going to add an array of solar panels on the roof, not necessarily because solar energy makes a lot of economic sense in British Columbia at 4 to 6 cents a kilowatt hour, but because we are working on the high-voltage conversion hardware to take renewable electricity and connect it to smart grids.

So it's less about what is going to be viable in BC and more about proving this concept, like figuring out how to do this thing where you transfer the energy to the grid.

Exactly. The whole idea is to figure out ways to develop channels for Canadian innovation in international markets. And solar panels will be providing electricity to electric vehicles in the [inaudible] which will be bidirectionally connected to the grid, which means they are capable of absorbing electricity when they are being recharged. And when they are not, when they are not being used, they can also send electricity back into the grid.

Do you remember where you were and when it was the first time you had an inkling about this idea or you heard about this idea?

Well, I have been working on this since my graduate student days, so I've been at this for a while. And different pieces of this have been done around the world. So

Germany, Japan, South Korea, they have hydrogen refueling infrastructure. They have solar energy obviously. But I think UBC will be the first place where we will be integrating all these technologies in one place, in one city block. As you can see, the parking garages at the corner of Thunderbird Boulevard and Wesbrook Mall, kitty-corner to that is our campus energy centre. And right in front of us right now, we have the substation that could be connected to a smart grid. This city block will combine a lot of the emerging technologies. I mean, we haven't even talked about the communications technologies required to integrate all these technologies together. And the idea is to deviate from the approach of just building individual buildings and individual pieces to the idea of thinking of integrated districts and trying to incorporate as many different functions to the spaces as we can. So parking garages are not the most glamorous buildings anywhere in the world. But I think we have an opportunity to change that.

So maybe we'll step just slightly out of here in case our skateboarder wants to hit us with his skateboard. That would be exciting. [music]

Let's go back to President Santa Ono's interview with Walter Merida.

Tell us a little bit about how you became passionate about sustainability and a more efficient regional transportation network or energy or all the things that go into a city or a town. How did you get involved in all this?

I am originally from Guatemala, and so I still remember as a kid when we didn't have running water or pavement or electricity. And I then saw the incredible impact that energy access could have on the lives of people. In terms of the specific transportation project that we are working on, transportation is one of the most serious challenges as we grow in population in cities around the world, not only in terms of climate change which could have dramatic global disruption consequences but also in terms of health. Urban air pollution is one of the main causes of premature deaths around the world. So personally I remember as a child chasing the bus to go to school and seeing the diesel smoke coming out of the bus and the impact that it could have not just on me but on the people around me. And from a very early age, I felt there must be a better way of doing this. And that's really, I think, how things started.

Well, I think that there's a lot of youngsters and adolescents and young adults who feel exactly the same as they see what's happening to the earth. And so we're really very fortunate that this is a passion of yours. But your pathway to being in academia was not direct, right? Tell us a little bit about that.

The plan was actually that I was going to alter my degrees. I was going to join a company, and we, in fact, started a small company, called General Hydrogen, which was subsequently merged and acquired by another company. So my path to academia was not the direct path, if you like. However when I was in the middle of this company business, the opportunity at UBC came up, and I realized that not many universities around the world have this way of thinking where our research can become an integral part of our community and our very municipalities, if you like. So I made the decision, a very conscious decision, to abandon the private corporate path and come to UBC.

Tell us some examples of your favorite approaches or experiments that have worked in the Living Lab and how you've actually translated that to other municipalities in the lower mainland or elsewhere in BC or elsewhere in Canada.

So at the moment we are working on this transportation project that has five pillars of activity. And one of the pillars of activity is what we call low or zero-carbon fuels. And the critical distinction there is that when people talk about energy, we have to be extremely careful to distinguish between electricity and energy. So energy is more

than just electricity. So while we can generate clean electricity from a number of sources - solar, wind, [inaudible] - it is very difficult at the moment to generate chemical fuels cleanly. So one of the projects where we have already transplanted, if you like, the innovation at UBC to a municipality is a project we have in the Squamish. And that project is looking at the production of synthetic fuels from carbon capture. So we capture the carbon dioxide from the air, add a little bit of hydrogen, and you create a synthetic fuel. But in this project, I am quite happy about it not only because of the technologies that we are looking at but because this project involved the municipal government, the provincial government, the federal government, and the First Nation, the Squamish First Nation. And quite independently of the technology project, the breakthrough too, in my mind, is not so much about the technologies but about getting different communities working together. And I think UBC's a very good place to make that happen.

Well, I agree with you, and certainly we have a very special relationship with the University of California system that will intensify this summer when many of their leaders come to Vancouver for a summit. And we also, as you know, in recent years have launched the Cascadia Corridor Initiative that has backings of both provincial and state governments and has really focused on data technologies as platforms for strengthening the competitiveness of multiple sectors. But there's no reason why we can't build upon that foundation to come together to try to tackle these very challenging problems. And respect to the large sums that are going to be required for substantive infrastructure change, I guess what I always ask myself is, "What's the alternative?" If we don't invest in paving the way for a sustainable future, what is the alternative?

That is right. Absolutely. And the reality is that I think for the very first time we are looking at the possibility of reducing our impact and actually creating some very interesting business opportunities. One of the most interesting things about the projects that are being deployed at UBC is not only the technologies but the business cases that we will be able to demonstrate. [music]

I'm Santa Ono, and you're listening to the Blue & Goldcast on CiTR 101.9 FM, UBC's campus radio station. Back in one minute.

Hi. You've reached the voicemail box of the Blue & Goldcast. We can't come to the phone right now, but if you're an artist or musician at UBC, please leave us a message telling us about your work right after the beep.

Hi. I'm Grace McRae. I am the lead singer and guitarist of the band, If Not, Winter. Our musical style is-- I've heard it described as "indies folk quirk pop." Probably generally we're indie pop. [music] If Not, Winter, that came from the name of a collection of poems. These poems are by an ancient Greek poet named Sappho. I had encountered this book in my first year at UBC. I'm an English Lit major, so I was doing a lot of reading, and this particular piece of text really entranced me because all these poems were found in fragments. And the sort of input that goes into songwriting is just fragments of all our stories kind of going into the creation of this body of work. [music] All right. Bye. Take care.

Welcome back to the Blue & Goldcast. I'm Sam Fenn filling in for Jennifer Gardy today. On the last part of today's episode, President Santa Ono will continue to talk with Dr. Walter Merida about how UBC's campus is a Living Lab for sustainability solutions.

Jeremy Rifkin, when he was here as part of the UBC Connects series, felt that Vancouver, British Columbia, and, specifically, UBC really had an opportunity to serve as a beacon towards positive change in thinking about smart cities and about clean

energy and sustainability. If there's one thing that keeps you up at night in keeping us from being that beacon, what would it be?

I think what keeps me up at night-- I have a 10-year-old daughter as you know, and what keeps me up at night is that we may not have enough time. I think we will find solutions, but the transition may not be smooth. And it is location, economic, geopolitical, and otherwise may not be insignificant. As we compete for these increasingly scarce resources and as we grow, if you look at the numbers, we are growing something like 65 million people per year. That's like seven Chicagos every year. Or to put it more in perspective, it's like creating a city of one and a half million people every week. And this is the scale of the challenge. And on the other hand, we don't have a lot of time because a lot of this evolution would have taken place anyway. But these added pressures of the small window of time really requires us to change our educational system, our innovation system, our financial system. Again, one opportunity - I always try to think in terms of the challenge but also the opportunity - Canada has a very well-respected financial system. We went through the financial crisis more or less unscathed. And if you look at some of the developments in the big institutional investors, some national and sovereign wealth funds have been divesting from fossil fuels, for example, Ireland, state of New York, city of New York. As these start to happen, large pools of capital are going to become available for investment, and there's a very nice match between the amount of capital required to solve some of these challenges and these pools of capital.

In the Climate Change in Marrakech, I was very pleased to see a lot of the multinational companies being represented there. And for the first time, some of the figures were estimated. So how much money will we need to change the energy system in 30 years? And numbers like 40 trillion dollars were thrown around. Now that might seem like an exorbitant amount of money until you start to list the top 10 or top 20 sovereign wealth funds and pension funds and insurance companies. And you quickly realize that, if you add them all up, it is like 90 trillion dollars floating around the world for investment. The problem is that the error bars for those investments, the risks associated with those investments, are higher than perhaps other investments. So we need to change the way that those institutional investors can deploy those capital pools. Now Canada and BC and UBC, in particular, we have the Vancouver School of Economics. We have places like the Clean Energy Centre. We have the sustainability initiative. We have a lot of the ingredients to provide very agnostic and expert advice in some of these challenges. And on the other hand, if you drew a 100-kilometer radius around Vancouver, you will notice that you have one of two serious, in my opinion, fission energy companies, one of a few quantum computing companies, one of two or three serious carbon capture companies. You have one of a few hydrogen companies. The innovation ecosystem that can happen here is very unique in the world. So we're in a very privileged position, I think, and we have a good opportunity to lead the way into the new low-carbon economy.

Now, Walter, what's happening every year is pretty remarkable here at UBC. Every few months I have a chance to listen to you speak, and there's always something new. And the public is very, very interested. But I personally am very interested because you have a long-term view. And the challenges that the world faces are very significant. And so, if you don't mind, I'm going to try to look into your long-term view of what's possible. If you look 10 or 20 years from now, and someone were to ask you, "What would success look like? What should be coming out of UBC 10 or 20 years from now, and how will it make for a better world?" What would you say?

Well, that's a really broad question and is something that I ask myself almost every day because things are changing so fast. But I would say from my small niche area of energy, I think if UBC can become the place that develops solutions for an energy

system, that can do three things: minimize environmental impact, ensure economic diversification, but also promote geopolitical stability. Because the connection between our energy system and our services and the geopolitics around the world is becoming more and more stretched. So part of the challenge is that things are accelerating dramatically around the world. The energy system, if you look at what has happened since the industrial revolution, has been improving even before climate change or environmental concerns were in the public domain. We moved from coal to oil to gas, but it has taken about 100 years to make each of those transitions. The challenge we face is that we don't have 100 years. The latest reports tell us that we need to make things happen in 10, 12, 30 years. So this is why universities can play such a critical role. [music]

That does it for the March edition of Blue & Goldcast. You can find links to our [guestwork?] as well as previous editions of the show at blueandgoldcast.com. You can also subscribe to our podcasts on iTunes or anywhere you get your podcasts. Just search Blue & Goldcast. While you're there, give us a rating and review. It helps more people discover the show. If you have a topic you'd like us to cover, an artist you'd like us to feature, or you want to ask Santa a question, send us an email. You can find the address on our website. You can also send us a tweet. Santa is @ubcpres. We're back with a new episode next month. Thanks for listening.

You have been listening today [inaudible] production. [inaudible].

It is not sonic [crosstalk]. There you are. And same thing for you [crosstalk].

That's better.

Sonic idealism [laughter]. Sonic. Sonic.

That's what I strive for.