Good afternoon everyone and thank you for choosing Across the Fence. I am Will Mikell in this afternoon for Judy Simpson. Over the past few months we presented to you a series of educational programs on the new smart grid and meter technology. Now thousands of Vermonters have had the meters swapped out and it was just a couple weeks ago that customers in Burlington began to get their new meters installed. So our focus this afternoon is on electricity generated from small scale solar, wind and hydro projects and how those new renewable resource energies fit into the evolving smart grid. So joining me are a couple of guests. I want to welcome Gabrielle Stebbins who's the Executive Director of Renewable Energy Vermont; thank you. And alongside Gabrielle is Laura Burnham. Laura, you've been with us before, you're with Sandia National Laboratories based here in Vermont, and we will find out a little bit more about Sandia and what you do. Again thank you both for being with us.

Gabrielle.: It's great to be here.

Laura.: Great to be here, and great to be here with you, Gabrielle.

Will.: Let me start with what seems for a lot of people what will be a basic question but it's the foundation of what we're going to talk about today. Gabrielle what do we mean when we talk about renewable energies?

Gabrielle.: What we mean are types of energy that come from a source that has an infinite supply. So for example the sun always, well it doesn't always shine, sometimes it rains, but generally there's a renewable supply there. Same thing with the wind. With hydrafacilities in terms of the running of the water and biomass and finally with geothermal. Tapping into the earth's constant temperature for providing heating and cooling inside one's home or inside one’s business. Essentially unlike fossil fuels which definitely have a finite resource these other resources have an unending supply. That's what we in mean by renewable.

Will.: Some of them are still being discovered. I don't want to hijack the conversation but just the other day I saw a piece about tidal power up in Maine. All kinds of things that are still evolving.

Laura.: Yes. Perpetual innovation. I would throw out that the sources of renewable energies can be used to generate electricity can be used for heating and cooling as Gabrielle said but also to produce fuels as a
substitute for gasoline, ethanol may be an example of that bio-fuels from algae. We really have the potential to have a profound impact on the economy.

Will.: Especially here in Vermont too, as we're going to talk about the biggest part of our energy usage is transportation, correct?

Gabrielle.: Indeed.

Will.: A huge piece. Just beginning conversation here are a lot of buzz interest excitement people talk about renewable some were some of the factors that go into that interest?

Laura.: Well there is a lot of interest, and we can see in our own community of more and more PV arrays on rooftops coverage in the news that there are number of reasons that explain that buzz and to begin with there's a real need for renewables. The reason we have a need for renewables has to do with the fact that we're at a very pivotal point in human history in terms of unprecedented climate change brought on by the carbon emissions from burning fossil fuels we are heavily reliant on--petroleum from the Middle East which is politically unstable and facing the prospect of disruptions to the supply.

Will.: As if we haven't learned that over the past 50 years.

Laura.: Exactly, but we still are very reliant on foreign sources of oil and as Gabrielle said we are dealing with a finite resource. At some point we are going to run out of oil so if our nation is going to achieve Energy Security we have to move away from fossil fuels and look toward renewables to meet our energy needs. That's one reason for the buzz, we have to have this need to shift to renewables. Another is that we have a great opportunity created by the smart grid are about to modernize transform our electric grid bring intelligence into a system that will make it possible to integrate a large percentage of renewables. Without that intelligence, without that smart grid we will be severely limited in our ability to incorporate those renewables. It's a great opportunity and an opportunity for real paradigm shift in how we think about energy. We're also at a very interesting point because thanks to two technological innovations and manufacturing strategies the costs of renewable energy is dropping precipitously. Particularly in terms of PV. One study by the national…

Will.: Just to be clear for our viewers that's photovoltaic equivalent or solar?

Laura.: Yes I'm sorry yes. Solar technology.

Will.: Now there's different scales if I can move us into that idea some of the fastest growing pieces of that would be the smaller scale. I know we have some pictures that you guys shared with us that explain some of that. Some of the small scale so first. Here's a neat use involving an agricultural operation.

Gabrielle.: Yes there's a wide variety of scale. This is a great example of how we are re-envisioning a working landscape and how we use our natural resources. I think there are so many win-wins for renewables and Laura touched on so many of them. This is a solar hot water system so as a little different from solar for electricity this is solar for heating your hot water. We also have a small scale wind turbine here which would also produce power as opposed to what Laura was discussing in terms of biodiesel that would be more for transportation. In terms of economic security the other factor of renewables is that I really once built you don't have uncertainty in terms of how much renewables will cost. It doesn't go up $4.00 or down $4.00 if you look at just when you go fill up your tank at the gas station. You don't have that uncertainty. In terms of economic security in terms of national security in terms of the potential for
job growth or the potential to impact climate change there are so many fantastic opportunities as Laura said we have been facing this paradigm shift and transforming to a new way that we embrace energy.

Will.: We're seeing examples of small scale does that mean somebody's going off the grid? What is I really mean?

Gabrielle.: Not necessarily small scale has more to do with just the size of the system. We're smaller scale which is more usually for residential or for small business. This just has to do with the size of the system. It can go off grid. Off grid is more when you're not connecting into the grid and this again is power focused electricity focused. If you go off grid that requires having that are a backup. It's slightly different for example my house is connected to the grid and if I put up photovoltaic solar panels for electricity? If I put photovoltaic panels on my house what that would end up doing is if I'm overproducing and not using as much energy as those panels produce it will feed into the grid and if I'm not producing as much I might pull energy from the grid. Small scale can be both off grid but it can also be just for normal residential customer. Large scale has more to do with the megawatt size projects. Typically more photovoltaic panels larger wind turbines so it's more power. This is a great example actually of a large scale wind project and ultimately that you have more power from the larger scale systems.

Laura.: And that would feed directly into the grid.

Gabrielle.: Yes so would be part of the electric supply.

Will.: You hinted at this now that we have this discussion of renewables. And we're talking about transforming the hundred year old 120 year old electric grid how do we emerge is the simple question and I know the answer is not easy how do you bring renewable energies into this smart grid system?

Laura.: That's where the intelligence of the system comes into play. One of the issues with renewables is that they are intermittent. The sunshine is when it shines wind blows when it blows and it is difficult to predict any patterns with respect to those. It's the equivalent of weather forecasting people try to predict how much wind a wind farm might produce and the variability is enormous. Wind gusts it depends on topography depends on local weather patterns.

Will.: Laura just to jump in, but it's one of the things the old grid likes correct is reliability. It's basically balancing out you feed it in and somebody consumes it or you create more. I know you're getting there but how do they work how do you get this new renewable that's intermittent to work in the system that seems to want reliability?

Laura.: Okay so let's go back to the reliability factor. One aspect of our electric grid is and operates in real time so you turn on your power plant and you generate electricity that matches the need and there are forecasters who work for the utilities who are very good at predicting what the demand for electricity is at any point in time. The look of a whole host of parameters ranging from time of day time of year that particular clientele whether it's industrial based residential and they can match anything almost perfectly the demand with a load. Another analogy is you put more wood on the fire to warm a house you do it in real time and storage and conventional fossil fuel generation plant is all in fossil fuels that's where you have storage night shift to renewable where you have all this intermittent see an lack of predictability. How do you integrate that without having too much electricity dumped into your grid at once or without having enough when you need it? So there are couple approaches to that one is how do you add storage into the system? There are many technologies related to storage from chemical batteries compressed air to forced hydro.
Will.: And those are being developed more and more.

Laura.: They are being developed there are many challenges related to storage and large scale storage. It's expensive but the beauty of the smart grid is that it has this intelligence system so the grid begins to operate like our nervous system does where the brain communicates with our neurons and neurons feed information back to the brain so that there's as greater situational awareness and the utilities will have finer control over the renewables they are feeding into that grid. They can adjust the blades on a wind turbine for instance to ratchet it back... They can change the direction of a PV array to maximize or minimize its input into the system. They can redistribute electricity better throughout the whole grid. Without those controls and without those sensors and without that intelligence renewables simply will not become a significant part of our electric sector.

Will.: So this merger this development of smart grid right this time is really I'm hearing use a somewhat perfect for the next phase or something of renewable energies?

Gabrielle.: Indeed if you can even zoom out right now with live in a system where it's really one way communication it's as if I'm just talking to you only and one I flip a switch I get my power and then turn off by switch and it is done. The utility doesn't know when I need it and what I need. They have their forecasting but it could change where we are moving the smart meters in with smart grid we're moving to this real time where you can pull some wind shear pull some solar here you can plug an electric car here pull the battery power from the electric car. Charge alone we don't need it. It becomes a lot more valuable and become something that can integrate the interim in renewables in a way that's really powerful.

Will.: We're talking about various types of forecasting particularly energy electrical forecasting. Any predictions on what Vermont’s energy landscape looks like in 10 of 20 or even 50 years from today?

Gabrielle.: We have a thriving renewable industry here in the state we have turbine manufacturers they have solar manufacturers. We have hundreds and hundreds of installers that do hook up solar hot water systems. We have comprehensive energy plants that just came out by the state's past fall that makes a goal by 2050 we would have 90% of all thermal transportation power and all of it would be based off of renewables. There are plans in place and we're moving forward right now at the State House as well.

Laura.: Vermont as political will across the board to transform our energy sector to make it sustainable long-term.

Will.: Which is also a key reason why you Sandia has partnered with the University. Specifically Gabrielle you folks have a website at Renewable Energy Vermont? What can people find there?

Gabrielle.: Yup there are many things you can find there including yellow pages so if you want to contact the solar hot water installer go to www.revermont.org you can also find out updates in terms of the legislature, you can find out how geothermal works and everything--soup to nuts.

Will.: I do need to stop us there because we're just about out of time I want to thank you both for being with us this afternoon.

Gabrielle Laura.: Thank you so much Will.
Will: We know you have choices so thanks for choosing us; I am Will Mikell inviting you to join us back here each weekday afternoon for another visit Across the Fence.

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