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What is the technical efficiency required?

There is no hard and fast number. What we are looking for is an improvement in technical efficiency over the state-of-the-art technology. So that is what you should describe. If you have particular questions about what state-of-the-art is on efficiencies, diesel generator systems or wind systems, I suggest you look at the Alaska Energy Data Gateway for a 10,000 ft view of that based on the data that is presented there for 200 of our remote microgrids.

What is the maximum size of a microgrid in MW?

There are many definitions of what makes a microgrid. We don't have a hard and fast size, maximum for a microgrid. The largest grid that we consider a microgrid in Alaska is 25 MW. That's Kodiak Island. The smallest ones are probably on the 50 kW scale. The typical size is probably somewhere between 500 kW and 2 MW. That is the area where we also think that things are a bit harder than anywhere else.

What kind of company should apply for the technology seed award?

In our first round we funded very different companies, or consortia. On the one hand, we funded a clear start-up that hasn't been around for too long, which is called DONuT, which is a group of graduate students from Stanford and they are working with Homer Energy on building a plug-in that helps improve load estimates for remote Alaska or for any kind of remote microgrid in Africa or in Alaska. On the other side, we are supporting efforts by Ocean Renewable Power Company and Intergrid in developing a controls approach for a remote grid with a diverse portfolio with renewable energy and energy storage. So, some of you might know ORPC. They have been around for quite a while. They have done quite a few projects around Alaska. This time they stepped into an area that they hadn't worked on, so this is a new product for them. The company itself doesn't have to be new, the product should be, because if it's already commercial, and you have already sold a bunch of them, we are not the right venue to help you out under this particular competition.

What are the technical inefficiencies in remote microgrid that are a problem?

There is, number 1 the fact that you are burning diesel fuel at about 30-35% energy harvest out of the fuel when you are making electricity. So a highly efficient diesel engine at the sizes we are generally looking at produces about 13-15kWh/gal of diesel fuel. What we are looking for is system efficiency, how many kWh can you provide with how little diesel? So by increasing

renewable contribution, you can increase efficiency. Of course there is also then technical efficiency issues there in terms of power conversion, e.g., you are operating a direct drive wind turbine; you are rectifying the power output to DC and then you are converting it back into an AC power signal and put it back in the grid, so you have inverter inefficiencies generally. Particularly at low loading compared to nameplate capacity. Energy storage as well; any energy storage system has energy losses associated with it; and roundtrip efficiencies that can be quite detrimental if you look for example at flywheel energy storage; you have often very high losses which could reduce the value of the flywheel. And then lastly one of the big points is how you distribute your power and how you manage your distribution system can directly affect how well you are providing electricity and how you are handling things like line loss for example and how you are handling things like phase imbalances that reduce efficiency. Those are things that could be looked at in terms of looking for improvements in technical efficiencies. This is definitely not a complete list.

Do you have interconnection experts?

That depends on what you mean by that. If you are looking for an expert that can tell you how to interconnect a microgrid and a large transmission grid, then no. If you are looking for an expert on connecting your electrical widget to a microgrid, than yes, we are the guys to help you with that, both on the physical power connection as well the communication side as well as the control interaction with the other equipment on that grid.

Is reactive power needed?

Yes, reactive power is generally needed in these remote systems, particularly if you have wind power connected then you need to correct the power factor. We also have a subset of grids that have underground distribution systems which generally exhibit leading power factor. So yes, if you have for example a 4-quadrant inverter solution and power factor correction can be a secondary service, that is a very useful thing.