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IN RE: ENERGY COMMISSION
INVESTIGATION REGARDING THE STATE
OF PUERTO RICO'S ELECTRIC SYSTEM
AFTER HURRICANE MARI7A

CASE NO.: CEPR-IN-2017-0002

Subject: Request for Public Comments.
Issue: Implementation of regulatory actions to facilitate the tasks of restoring electric service and encourage the deployment of new technologies.

Dear Sirs:

HOMER Energy is exclusive distributor and support organization for the software, Hybrid Optimization of Multiple Energy Resources (HOMER) developed at the U.S. Department of Energy's National Renewable Energy Laboratory and used by over 180,000 microgrid developers, suppliers, and researchers in 193 countries. It has established itself as the global de-facto standard for designing microgrids and is required for proposals to funding organizations, such as the World Bank. We would like to collaborate with the Puerto Rico Energy Commission to assist in the recovery effort. For example, given the scale of the need, there is a lack of personnel trained in the design of microgrids, so the Commission should sponsor training courses, both in the design (where we can help), but also in other aspects of microgrid development, such as installation and management.

In answer to specific questions:

1.2: Our experience with hundreds of microgrids around the world has shown that local involvement in the design and management of a microgrid is essential to its success. This does not preclude a role for outside finance, management, and ownership, but does imply a substantial role for the actual beneficiaries.

1.4: We are in contact with many finance organizations eager to invest in microgrids, but who complain about the lack of knowledge on the part of microgrid developers of the requirements for financing. This calls out for training workshops. Furthermore, due to the relatively smaller size of microgrids compared to conventional power projects, it is easier and more efficient to finance a package of similar microgrids than to finance them one at a time.

1.5: We provide training in the design on microgrids and have partner organizations that can provide complementary training in installation, management, and finance.

2: The highest priority should go to making sure that every community has at least one location where power is available, so people can charge their cell phones, communication links can be guaranteed, and first responders can function. These do not need to be large systems if the main loads are electronic communications and LED lighting. Water treatment and commercial refrigeration are larger loads that should also be prioritized.

One of the beauties of microgrids if they are properly designed is their modularity, so a small microgrids installed quickly to provide emergency relief can be expanded later as funding allows and after the higher priority needs are met elsewhere.

In addition to solar plus storage, Combined Heat and Power (CHP) can be a very attractive source for microgrids. Its applicability depends on a steady need for thermal power, such as many industrial loads. Cooling loads are another possibility in conjunction with absorption chillers. Although absorption chillers are a mature technology, they are less common and well-known than electric compressor-driven chillers, the Commission should look for ways to promote their use.

2.4: One of the greatest obstacles to the development of microgrids has been the local utilities, themselves. Although understandable from the perspective of creating competition to their monopoly provider status, the Commission is the appropriate forum to make sure that there are no unnecessary obstacles to microgrid development. For example, the Commission could develop standardized interconnection agreements, rather than allowing PREPA to require bespoke agreements. The charges for interconnection and tariffs for backup power and sales of excess power need to be fairly regulated.

3.1: Some jurisdictions have created a serious obstacle to microgrids that serve multiple buildings by forbidding them to cross rights of way, such as roads.
3.4.1: Pricing is a critical issue. In many parts of the world, microgrid development has been prevented by required tariff structures that would not cover the costs of maintaining the microgrid. We are strong proponents of a two-part tariff, so that consumption above a regulated threshold has a much higher price than the first increment of consumption. This allows all consumers to be able to pay for essential service, while limiting the fiscal burden of any related subsidy scheme. It assures that the bulk of the subsidy goes to low income recipients. It also preserves the incentive for consumers to buy efficient appliances.

There are four different types of microgrids, depending on whether they are connected to a larger grid or not and whether they sell retail energy or serve a single customer, even if that single customer is a campus or municipal government with multiple buildings. These four types require different regulatory treatment. Furthermore, the cost structure of a solar plus storage microgrid is substantially different from one based on CHP, so that would imply a different tariff structure.

The adoption of microgrids will be greatly facilitated if they are not treated simply as mini-utilities, particularly where customers have a choice of whether to rely on PREPA or the microgrid.

3.4.3: Some microgrids have had a lot of success with prepay meters where customers don't have a credit history. New types of smart meters have been developed specifically for microgrids. We can provide more information about this on request.

3.5: Metering is essential. Lack of metering has been one of the most common causes for the demise of pilot microgrid projects.

3.6: Microgrids can come in a very wide range of sizes and configurations, so the challenge for regulators is to not unnecessarily limit these options.

4.1.1: There are substantial power conditioning requirements, but it is technically possible to add a diesel generator and additional power electronics to the wind farm to create a microgrid. This is a non-trivial design challenge, but similar to other applications of the HOMER software. In all likelihood, the best solution would also include storage, but that could be phased in.

4.4: The answer to this question is similar to 4.1.1. Much depends on the specific technology and design of both the wind turbines and the hydro facility.

4.5: We have designed hundreds of microgrids. All but the very smallest ones (<10kW) benefit from having some fuel-based backup. This allows better management of the storage systems and allows a dramatic down-sizing of the system with substantial savings in capital costs. Frequently, the fuel-based backup is only needed for a few hundred hours per year, but the alternative is an aggressive load management that curtails non-essential loads. This is a challenge from both the contracting, communications, and customer relation perspective.

5.2: A CHP system can be designed to operate in either islanded or connected mode. That ability has to be designed into the system.

5.2.1: A CHP system can be designed with black-start capability. That ability has to be designed into the system.

6: It would be extremely helpful if the Commission or PREPA could provide a list of priority areas for service restoration. That way alternative providers could focus on the areas that would otherwise have to wait the longest for service. We have heard anecdotally that there may be as many as 200 communities that will never be reconnected to the main PREPA grid. If true, making available a list of those communities would be enormously helpful.

6.2: Microgrids can be useful everywhere, but there is a substantial difference between a grid-connected microgrid that enhances the reliability and resilience of the main grid and a stand-alone microgrid that eliminates the need to rebuild the connection of those loads to the main grid. The design of these two different kind of microgrids is radically different.

8: HOMER Energy is very interested in providing its software and training to all entities in Puerto Rico that want to design distributed power systems and microgrids.