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Puerto Rico Energy Commission

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Good morning!

I have lived in Puerto Rico since 1971. For the past 30 years I have had no intercourse with PREPA other than as a residential customer. I work with industrial manufacturing and have long been concerned that a reliable and reasonably priced electrical supply is one of the top priorities for any company manufacturing or contemplating manufacturing on the island. This is also true of any other company in or coming to Puerto Rico.

In the 1970s and 80s I worked for a pharmaceutical manufacturer as Manager, Facility Operations. At that time PREPA's inability to supply reliable power, at any cost, was a major problem. It was so major that it led me to develop one of the first microgrids in Puerto Rico, though we did not call it that at the time. Due to legal opposition by PREPA we never put it into operation. It did give me an opportunity to learn a lot about PREPA and Puerto Rico's electrical system. I have maintained a layman's interest in energy in general and PREPA in particular ever since.

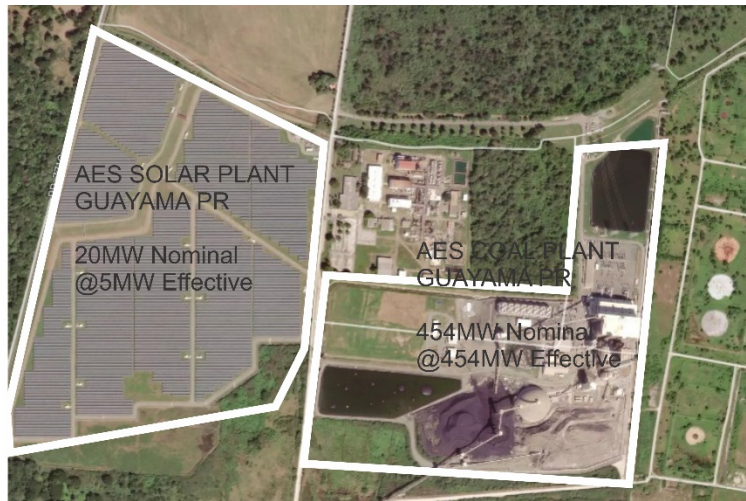
I am very happy to see the microgrid initiative and I think this is just what Puerto Rico needs. A great deal of thought has obviously gone into the microgrid regulations and I congratulate you on a job well done.

I have a few comments that I would like included in the record.

1. There is excessive emphasis, in my opinion, on solar. While solar has some applications in Puerto Rico, I do not think it should be permitted to be a major source of energy.
 - a. It is fragile. As we saw in Maria, it does not stand up well to hurricanes. This installation in Humacao is a good example.



- b. Solar occupies far too much land for the amount of power that it generates. AES has solar and coal at their Guayama site. Each occupies roughly similar amounts of land. The solar facility generates about 5MW effective or about the equivalent of a truck portable diesel plant. The coal plant generates 454MW.



- c. AES has mentioned building 10,000MW nominal, 2,500MW effective of solar in Puerto Rico. Allowing 5 acres per nominal MW, this would occupy almost 80 square miles of land. That is a lot on our small island. The yellow box on this picture shows 80 square miles relative to Puerto Rico.



The solar will not be built in a single installation, of course. It will be distributed in smaller blocks across the island. It is still 80 square miles total. Some will be built on rooftops, parking lots and so on. A lot, probably most, will displace existing flora, even if just weeds and will make the land unavailable for any other use. These plants absorb CO2 so the impact on CO2 emissions of this much vegetation being destroyed needs to be evaluated.

- d. Solar power in Puerto Rico is expensive. Is there any assurance that it will be less expensive in the future? PREPA has 20 year contracts to pay 18c/kwh for solar power with AES, the Humacao solar facility and others. In contrast, it purchases power from AES (coal) and EcoElectrica (natural gas) for between 9 and 12 cents/kwh over the past 4-5 years. Solar should only be encouraged if the power is competitively priced.
2. Reliability of power must be a major concern of the regulation. Solar, and to a lesser extent wind, power plant outputs fluctuate from maximum to zero over the course of a day. Cloudy weather or low winds will cause fluctuations. Output also varies seasonally.

Battery storage will help smooth this out. However, most of the systems in use and contemplated provide limited backup power for 6-12 hours generally. This leaves solar customers without power at night and during multi-day cloudy periods as are common in Puerto Rico. A succession of still days will leave wind customers without power as well once the batteries run down. Currently this is not a problem because PREPA provides, in effect, an infinite battery or standby power. This may be a legitimate strategy for wind/solar generators but it is not free. PREPA must constantly maintain hot capacity ready to make up any shortfalls. If the wind/solar generators do not pay the full cost of this excess ready capacity, the costs will fall on the ratepayers or on Puerto Rican taxpayers.

Any microgrid regulation must require extended time backup power to be paid for by microgrid customers. If it can't be provided by PREPA, the microgrid owner

must be required to provide a diesel, gas turbine or other power supply that can run for an indefinite time, subject to fuel and maintenance.

3. Cogeneration/CHP is mentioned as a potential generation source for microgrids. I think that currently this is Puerto Rico's most important potential power source. One problem with CHP in Puerto Rico is how to use the waste heat. Combined cycle plants, generating electrical power from both main engine and waste heat are getting smaller and smaller. There are many and many applications in Puerto Rico in the 0.5 to 1MW range. It is not clear whether or not these are included in the microgrid regulation. I believe that the regulation should be clarified to explicitly permit combined cycle CHP.
4. Wheeling should be encouraged. This would allow microgrids to sell power to other microgrids. As I understand the proposal, they can do this but only if contiguous, transferring directly between microgrids. I believe that PREPA should be required to allow microgrids to sell power to each other, over PREPA lines, even if non-contiguous. A microgrid in Mayaguez should be permitted to sell power to a microgrid in Fajardo. The microgrid must pay a fee to PREPA sufficient to cover all costs and perhaps a bit extra. This would help PREPA recover some of the revenue lost from microgrid generation. It would also aid in disaster recovery as most hurricanes hit the eastern part of Puerto Rico hardest.
5. Nuclear power should be included as a potential microgrid energy source. We are likely to see, in the next 10 years, packaged nuclear power plants in the 1-100MW range. Nuclear is the ultimate clean, renewable and sustainable energy. These could be ideal power sources for large microgrids, or as some call them, minigrids.

Again, let me emphasize how welcome these regulations are and how they will go a long way to providing for Puerto Rico's energy future. Thank you for your efforts and consideration. Please contact me if you would like any elaboration on the comments above.

Cordially,

John R Henry