

A Distributed Energy Amenable Grid

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Summary

Puerto Rico has the opportunity to rebuild its grid in a manner that makes the island more resilient. We find that PREPA can take action now to lay a strong foundation for distributed energy resources (DER) to integrate with the transmission & distribution system by making the right kind of capital equipment investments as it is being rebuilt. The future grid should be designed to accommodate far greater penetration of DER and ought to have the functionality to utilize DER as dynamic assets, supporting the grid. If PREPA fails to take actions to accommodate DER and beneficially utilize their grid support capabilities, it could face grid defection, and forego opportunities to significantly improve grid performance, productivity, and system resiliency.

Puerto Rico has the opportunity to develop an electrical grid that is amenable and supportive to more diverse and resilient distributed energy resources (DER). In the wake of Hurricanes Irma and Maria, Puerto Rico has the opportunity to invest in a fundamental shift towards distributed energy resources and integrating microgrid systems with the Island's existing grid. Augmenting the utility compensation structure and energy production to achieve the desired range of grid capability will support the economic development of the island. Propelling Puerto Rico's grid into the future of resilient, dependable, smart, integrated grid system.

The Puerto Rico Electric Power Authority (PREPA) and the Puerto Rican government can mitigate the impacts of extended power outages and expensive fossil fuel-fired centralized power plants by building a grid amenable to distributed energy. Developing a transmission and distribution (T&D) system that enables coordinated microgrids that leverage renewable and high efficiency generation with energy efficiency, demand response, and other DER will reduce power outages, the associated costs, and increase reliability for customers. The Puerto

Rico Energy Commission (PREC) is already taking a critical step toward a more distributed and resilient grid by issuing proposed regulations governing microgrids (see [Regulation on Microgrid Development, Proposed Rules](#)). In conjunction with that effort, PREPA must manage microgrids and other DERs as dynamic assets serving the grid. By working in close coordination with private developers, PREPA can thoughtfully incorporate DERs as resources that enhance system performance, improve asset productivity, harness capacity utilization rate inefficiencies, reduce grid interruptions, and lower capital expenditure costs. This is how PREPA can increase overall efficiency and reliability of the electrical system and better serve customers.

Power quality and reliability is a social and economic development imperative. Attracting and retaining industry and high-tech, high-wage sectors demands a dependable power supply. An inconsistent power supply and long running power outages will drive industry and economic investment away from the island, but building a reliable grid that is quick to recover from interruption could attract high wage industries

that cannot risk the price of lost production or service interruption consequences. Continuity of power supply is a socio-economic imperative as well. Public health and safety costs will increase if the magnitude and the duration of outages grow. Outages also amplify the burdens on vulnerable populations—low income residents, the elderly, and environmental justice communities—making access to a dependable power supply a social justice matter as well. Building a distributed energy amenable grid that supports the socio-economic needs of the current population and the desired population is an investment in the ongoing development of Puerto Rico.

Those with the resources to do so may take development matters into their own hands by building and operating their own on-site distributed energy power systems. It would be an enormous lost opportunity for all parties if new distributed energy systems are operated isolated from the grid by industry and business establishments. Depriving both PREPA's customers and the DER investor the benefits coordinated and interdependent operation will cause unnecessary inefficiencies in the electric system. Adopting a passive, ad hoc, or "connect-and-forget" approach squanders significant opportunities for harnessing customer-sited investments for cost savings, reliability, and system performance improvements. PREPA can be incentivized to facilitate customer-sited DER investments to the right geographic locations, at the right time of day, season of the year, and in the right manner (e.g., power injections and power withdrawal for grid support) to optimize system operations, investment, and capacity utilization by changing their compensation structure to reflect these values.

Today's extraordinary circumstances call PREPA to a new and critically important challenge! PREPA should provide a platform to optimize connections between energy producers, consumers, and those who can do both, rather

than focusing exclusively on the role of building and operating a power transmission and distribution system. PREPA can be an innovative facilitator of this new paradigm of platform provider by focusing on building a system that is amenable to distributed generation. This new structure will facilitate Puerto Rico shifting its energy mix in a fundamental way towards renewable and locally produced energy.

The worst-case scenario, PREPA is unable or otherwise fails to align its policies and procedures to facilitate and expedite DER interconnection and utilization leads to grid defection. If defection takes hold in meaningful numbers, PREPA risks losing high load factor, higher credit quality customer investment. This will likely lead to higher costs and poorer quality of service for those customers who are less able to pay and who are left behind on the existing grid, which is already in dire need of capital investment. Industry and business lose out in such a scenario as well. If PREPA optimizes DER integration, the grid can serve as a reliable, low-cost supply of backup, supplemental, and emergency power supply to customers who invest in DERs and self-generate. In most instances, a DER host site will benefit from having the option to procure stability services from the grid, rather than having to bear all of the costs of maintaining stability within its own system. Coordination of DER amenable policy and procedure will enhance the resiliency and reliability of the Puerto Rico utility grid.

PREPA, working in close collaboration with key stakeholders, can play a central role in reinventing the Island's energy system. Ideally, the yardstick by which PREPA is measured and rewarded ought to increasingly consist of system efficiency, performance, productivity, service quality, and environmental metrics. DER amenability is not simply measured by the number of interconnections, or even increases in a utility system's capability to host DERs, but by the growth in the number and scale of T&D

system services that high efficiency clean DER provides to the T&D system.

Transmission and distribution capital equipment and structures are very long-lived assets. Capital expenditure decisions made today will have depreciable lives of 20 to 30 years or more. The compensation metrics, determined by international best practices and stakeholder valuation, will not depend solely on built infrastructure, but reflect the greater value of a flexible, dependable, and resilient grid. PREPA should invest in a grid that is demonstrably more amenable to the penetration of and interaction with renewable, clean, and high efficiency distributed energy systems on an annual, 3-year, and 5-year timeline. PREPA ought to be rewarded for a proactive posture towards the identification and integration of private DER investments that serve as a less costly substitute for traditional T&D investments, that alleviate grid congestion, improve capacity utilization of the grid and provide at lower cost grid stability services.

The destruction of the in place electrical grid opened the opportunity for Puerto Rico to be innovative and forward thinking as they can build a grid that will support growth and reliability into the next twenty to thirty years. The functionality of equipment put in place today can act to facilitate or to constrain the growth and development of future electric system products, services, and markets. As Puerto Rico rebuilds its grid, the investment plan ought to implement a range of desired capabilities that enables its ability to host future alternatives and options, even options not yet imagined.