

July 30, 2017  
Mayagüez, PR

The Financial Oversight and Management Board for Puerto Rico  
P.O. Box 192018  
San Juan PR 00919-2018

“...to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment...”<sup>1</sup>

Members of the Board:

We, the signatories of this letter, are professors and researchers of electric power systems and power electronics<sup>2</sup> who have accepted “a personal obligation to our profession, its members and the communities we serve”<sup>3</sup>. We write to present our collective and personal vision of a sustainable energy future for Puerto Rico; hoping this strongly supported input will help in your decision-making process.

We propose distributed rooftop photovoltaic systems, solar communities, and microgrids, combined with effective demand response programs and energy storage, to transform the electric infrastructure in Puerto Rico. Keeping the same type of electric system and simply transferring it from public to private hands will not resolve our electricity challenges. Until affordable storage arrives, we will need traditional generation but these fossil fuel-based generators must prioritize enabling the maximum use of renewable energy. Replacement of fossil fuel-based generation must be made within existing power plants, in sites that are already environmentally impacted, and where Puerto Rico has leverage to negotiate better agreements with private investors.

Our electric infrastructure is essential for the socio-economic development of Puerto Rico. We currently own a traditional power system; based on large generating plants connected to clients through transmission and distribution networks. This centralized generation model requires large financial investments. Years of deferred maintenance and minimum investment on the transmission and distribution systems have resulted in worse than average electrical losses and severe blackouts when cascading failures occur. The same lack of investment and vision towards a new type of electric system has saddled us with old, and sometimes new, but polluting power plants. In 2016, the Puerto Rico Energy Commission approved a modified integrated resource plan (IRP), and ordered the utility (PREPA) to improve revenue and load estimates; to implement energy efficiency, demand response and energy storage; and to enhance emissions monitoring. However, the modified IRP contemplates H-technology generation, units that are too large for the relative size of our system. The replacement generation must be agile and smaller than the units to be replaced in order to maximize renewable energy use.

Puerto Rico requires a new electric power infrastructure that provides electric energy at reasonable cost, with greater efficiency, and with minimum impact on our environment. Renewable energy is economically competitive in Puerto Rico. Rooftop photovoltaic (PV) systems constitute a

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<sup>1</sup> *Code of Ethics of the IEEE* (Institute of Electrical and Electronics Engineers), <http://www.ieee.org/about/corporate/governance/p7-8.html>

<sup>2</sup> See Attachment 1.

<sup>3</sup> *Code of Ethics of the IEEE*

better alternative than utility scale solar installations, which require large amounts of land, and are not cheaper than rooftop PV since all our power purchase agreements (PPA) for utility scale solar have resulted in very expensive contracts<sup>4</sup> with escalating costs during the life of the project.

PROMESA, and the majority of the Financial Oversight and Management Board members, propose to privatize the power generation in Puerto Rico to achieve greater efficiency and lower electricity prices<sup>5</sup>. We contend that it is not enough to retain the same type of system and simply to transfer it from public to private hands. With declining energy demand, the construction of large, new gas power plants, even by private investors, would tie the Puerto Rico electric grid and economy to 40 years of continued fossil fuel dominance. Thus, we propose and are working to develop a citizen-owned, thus private, electric power system based on rooftop solar PV. This approach is the best and most forward-thinking electric power system: a reliable alternative that will take full advantage of local resources and innovative market-based opportunities. Our previous work (e.g., renewable energy, streamlined rooftop PV processes, maximizing the benefits from energy use), and our current work on microgrids and solar communities support our vision<sup>6</sup>.

A rooftop solar-based electrical grid could leapfrog a centralized, hierarchical system to a distributed prosumer<sup>7</sup> transactive energy market in which public policy facilitates citizens' investments in the electric system mainly through rooftop solar, distributed energy storage and smart meter technology. There are precedents to our proposed undertaking, for example: distributed energy resources are being strongly pursued in New York<sup>8</sup>; and Hawaii, having weaker electric systems than Puerto Rico, has a goal of 100% clean energy by 2045. We seek the integration of renewable energy, conservation strategies, and efficiency measures in solar communities to harness market forces in a transactive energy framework for the benefit of consumers and investors<sup>9</sup>. Puerto Rico will benefit from a reduced dependence on fossil fuels, the emergence of electricity markets (e.g., transactive energy), an improved environmental health and local socio-economic development.

An analogy may help explain this alternative future: personal communications and connectivity have changed dramatically in two decades,<sup>10</sup> unleashing vast economic opportunities (e.g., the Internet of Things) and obliterating or seriously changing many well-established industries in the process (video rental, music sales). Electric power generation and consumption are undergoing a similar revolution. The cost of a clean, silent, inconspicuous, rooftop solar PV residential generation system continues to drop with a U.S. national average of \$3.16 per installed Watt. In Puerto Rico, as in Florida and Colorado, the average is between \$3 and \$2.80 per installed Watt. At \$3 per installed Watt, the average solar rooftop electricity costs, without storage (with net metering) in Puerto Rico is \$0.11 per kWh<sup>11</sup>. In recent months the cost from the grid has been around \$0.20 per kWh, with a 98% dependence on fossil fuels (oil, natural gas or coal-based generation). An increasing number of PREPA clients are privatizing their electric energy needs: individual families and businesses are buying their own PV systems or buying energy from private companies that install PV systems on the clients' rooftops. Through Act 133-2016, low-income communities will be able to develop their own private community solar systems.

<sup>4</sup> The cost range for actual utility scale solar projects in the IRP was \$0.178/kWh to \$0.197/kWh (Table 4-2, page 4-3, PREPA's IRP, vol. I)

<sup>5</sup> See Wall Street Journal article - <https://www.wsj.com/articles/puerto-ricos-broken-promesa-1499638891>

<sup>6</sup> See Attachments 2, 3 and 4

<sup>7</sup> A *prosumer* is both a *producer* of electricity and a *consumer*.

<sup>8</sup> "Reforming the Energy Vision," <http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument>

<sup>9</sup> Through projects funded by the U.S. National Science Foundation and the U.S. Department of Energy.

<sup>10</sup> The first concepts that eventually led to the invention of the smartphone date back to the 1970s. The first smartphone (a Palm PDA) with internet connectivity capabilities was released in 1999. Apple's iPhone was introduced in 2007.

<sup>11</sup> *Improved Permitting and Interconnection Processes for Rooftop PV Systems in Puerto Rico*, based on a DOE SunShot project report, 2013.

The “smartphone equivalent,” the game changer that will multiply private rooftop PV systems, will be the integration of affordable energy storage, smart controls and efficient communications. A transparent integration of these components, most probably accessible through a smartphone, will unleash energy markets at the distribution level (e.g., transactive energy). *Lazard*, a leading financial advisory and asset management firm, recently published a study indicating that industry participants expect storage costs to decrease significantly in the next five years. The cost decline is driven by the increasing use of renewable energy, government policies promoting energy storage and the unfulfilled client expectations from an aging power grid. Energy storage will be key for the utility to guarantee a stable and reliable system that is able to manage renewable energy variations.

Until affordable storage materializes itself, traditional generation will be needed; but these fossil fuel-based generators must prioritize enabling the maximum use of renewable energy. Replacement of fossil fuel-based generation must be made within existing power plants, in sites that are already environmentally impacted and where Puerto Rico has leverage to negotiate better agreements with private investors. This replacement generation must be agile and smaller than the units it will replace. We cannot afford traditional power purchase agreements with guaranteed energy sales. With declining electricity demand and cheaper rooftop PV, investors considering large, private power plants would face a high-risk scenario: financing expensive facilities with no warranty of long-term sales to provide the payback and rates of returns they are used to from Puerto Rico. The business model of any organization that seeks to be part of the electric energy sector in Puerto Rico must go beyond merely selling electricity; it must provide competitive energy services in support of an increased use of local resources: conservation, efficiency and renewable energy.

We expect you will give this vision an opportunity to come to fruition.

Sincerely,

[Redacted]

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c. Hon. Laura Taylor Swain, News Media

Attachments (4)