

To: Resilient Power Colleagues
From: Lewis Milford, Clean Energy Group
Date: September 2018
Re: A Plan to Use Federal Recovery Funds for Resilient Power in Puerto Rico

As we all know, Puerto Rico has suffered through one of the worst human disasters in U.S. history. In the last year, hundreds of thousands of people were left without power, forced to suffer through gross indignities and unnecessary loss of life.

Now the Commonwealth is faced with a difficult choice: how to rebuild the electric power system to provide more resilient power to customers so they can withstand the next storm.

There have been numerous excellent reports on *what* the island should do to provide more customer-sited, solar+storage systems in homes, businesses, community, nonprofit and government buildings. But what is needed now is a plan for *how to pay* for such systems in time to protect people in desperate need.

Toward that end, Clean Energy Group (CEG) has developed a proposal for how Congressionally-approved *Community Development Block Grant–Disaster Recovery* funds could be used to develop a dedicated solar and storage incentive program on the island. The draft paper, *A Resilient Power Recovery Plan for Puerto Rico: A Proposal to Use Community Development Block Grant – Disaster Relief Funds to Create a Dedicated Solar and Storage Incentive Program*, is attached.

As you can see, we propose something quite ambitious:

1. A new *\$1 billion storage incentive* spread over five (5) years that would buy-down the cost of battery storage and solar systems, which could result in hundreds of thousands of such systems on homes, businesses, community, nonprofit and government buildings.
2. In addition, we propose an additional *\$100 million financial guaranty payment product*, funded with CDBG-DG funds; this would backstop solar and storage installations and allow for access for lower credit score customers.

In the paper, we explain how such an incentive is critical to get widespread adoption of solar and battery storage throughout the Commonwealth. The proposal is crafted in response to the Commonwealth's final *Recovery Plan* that was filed with the federal government in early August 2018; that plan requested comments in a public process.

This proposal is designed so government officials, NGOs, and other parties on the island can consider some new approaches to resilient power financing. In the end, we note that a transparent program design process where all voices on the island are heard is needed to decide on specific incentive details.

We offer this proposal to inform that conversation. We welcome your input and reaction as we share it with key people involved in the island's energy future.

Sincerely,



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**A Resilient Power Recovery Plan for Puerto Rico:
A Proposal to Use Community Development Block Grant – Disaster Relief Funds to
Create a Dedicated Solar and Storage Incentive Program¹
September 2018**

Introduction

The recovery process in Puerto Rico provides an opportunity to build a cleaner, more resilient, and cost-effective electricity system. Investment in clean, distributed generation like solar with battery storage will help reduce the impacts of future grid outages in Puerto Rico, provide essential power for critical facilities, and protect vulnerable populations in extreme weather events.

But there are numerous market failures that prevent the widespread penetration of resilient solar and battery storage systems throughout the island. The most important obstacle is the still high upfront cost of these systems that deliver customer-centric energy resiliency. (Battery storage is needed to provide reliable backup power when the grid is down, as grid-connected stand-alone solar must shut down and cannot produce electricity during a power outage, as occurred during the recent hurricanes.)

The simple fact is that Puerto Rico now lacks a dedicated incentive program to bring down the cost of battery storage systems paired with solar for energy resiliency. The Commonwealth now has an historic opportunity to create such a resilient power, battery storage and solar incentive program through its implementation of the Community Development Block Grant – Disaster Relief (CDBG-DR) funding approved by Congress. This memorandum proposes that such an incentive program be considered.

¹ This is a draft recommendation prepared by Clean Energy Group (CEG), a nonprofit that has worked on numerous solar and storage systems and policies throughout the US; CEG does not accept any corporate contributions but is funded solely by foundations and government agencies. See www.cleangroup.org. This memorandum constitutes public comments to the Government of Puerto Rico’s solicitation for public input in its Preliminary Draft Recovery Plan. See “*Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico*,” (Preliminary Draft for Public Comment, July 9, 2018) at VII. See <http://www.p3.pr.gov/assets/pr-draft-recovery-plan-for-comment-july-9-2018.pdf>. The Commonwealth filed that draft as a final plan with the federal government with substantially the same content in early August 2018, “*Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico*,” at <http://www.p3.pr.gov/assets/pr-transformation-innovation-plan-congressional-submission-080818.pdf>. Hereinafter the draft plan and the final plan collectively referred to as the “Economic Recovery Plan” or the “Plan”.

Summary of New CDBG-DR Storage Incentive for Resilient Power

This memorandum describes the purposes and structure of such a new incentive program for behind-the-meter solar and battery storage that could be implemented through the CDBG-DR program by the Government of Puerto Rico. Such a program has been contemplated by Congress with its passage of the first round of \$1.5 billion in recovery funds as part of the requirement to construct or rehabilitate homes that are energy efficient. It was endorsed again by Congressional appropriators for the renewed round of \$18.5 billion in CDBG-DR funding, when they requested that at least \$2 billion be used to provide enhanced or improved electrical power systems.²

A CDBG-DR funded incentive would put into action the commendable energy goals announced by the Government of Puerto Rico’s Economic Recovery Plan.”³ For critical infrastructure, including energy infrastructure, the Plan, among other things, calls for “rethinking its design and reconstruction to 1. be more modern, sustainable, and resilient than before the hurricanes, 2. effectively support people, industry, and the economy.”⁴

While the Economic Recovery Plan contains many such important goals for a more resilient power system, it is not an action plan. Most importantly, it does not set out what might be the most effective strategy for such an energy transformation—a dedicated incentive program using CDBG-DR funds to support widescale installation of solar and battery storage in homes and businesses on the island.

As part of any recovery strategy to use CDBG-DR funds, the government should consider an action plan that includes such a storage and solar incentive. It is our recommendation that:

1. An annual funding level of *\$200 million a year in CDBG-DR funds for five years—or \$1 billion*—is needed to support a storage and solar incentive that would jump-start the customer-sited solar and storage market in Puerto Rico and provide a meaningful and measurable level of resiliency to many vulnerable populations in need of protection on the island.⁵
2. In addition, we propose adoption of a *backstop finance guaranty of \$100 million* for solar and storage projects, also funded by CDBG-DR funds, to allow for greater access to such systems by people and organizations with less than optimal credit scores.⁶

² *Bipartisan Budget Act of 2018*, Pub. L. 115-123 (<https://www.congress.gov/115/bills/hr1892/BILLS-115hr1892enr.pdf>).

³ *Supra*, note 1. The energy provisions of the final plan start at page 218. The page references that follow are to the final plan.

⁴ *Ibid*, at Executive Summary, page XX.

⁵ We understand that CDBG-DR funds typically should be used during a two-year period, so a waiver might be necessary to implement this longer-term initiative. As with many issues in this memorandum, the program details should be worked out in a public, transparent program design process. Similarly, the level of funding is another issue to resolve, and it is understandable that different levels will be proposed. Our funding level assumes that a dramatic change toward a more resilient, customer-centric power future requires an equally dramatic level of funding.

⁶ There is precedent using CDBG funds for loan guarantees, for example, the Section 108 Loan Guarantee Program, <https://www.epa.gov/sites/production/files/2015-09/documents/sctnprofile.pdf>.

State-side, such incentive programs typically are administered on a state-wide basis to reduce overhead costs and to ensure uniformity. We do not make any recommendations on that issue in this memorandum.

The CDBG-DR Process for Resilient Energy Projects

As discussed, Congress enacted the *Bipartisan Budget Act of 2018* earlier this year. The law provides \$2 billion in federal funding for “enhanced or improved electrical power systems” in Puerto Rico (p. 41).⁷

The law also amends the *Stafford Act* to allow for better reconstruction of facilities than the status of construction before the hurricanes that hit the Commonwealth. The statutory language states that repairs to “critical services” can be built “to industry standards without regard to pre-disaster construction of the facility or system” (Sec. 20601, p. 22).⁸

This language means that Congress authorized CDBG-DR funding for Puerto Rico to support more resiliency with both individual customer-sited and microgrid solar and storage systems, even where those energy systems were not in place before the disaster. That is, in the first round of recovery funding, Congress made CDBG-DR funding available for more than status quo rebuilding of the electric power system, beyond grid hardening measures and central power plant upgrades.

As required by law, to distribute the first \$1.5 billion in funding, the government of Puerto Rico submitted an action plan to HUD for this expenditure that was ultimately approved by HUD.⁹ The plan did not contain any funding for resilient electricity production with solar and storage systems.

From the \$28 billion of CDBG-DR that Congress appropriated for HUD during February, 2018, HUD allocated \$18.5 billion to Puerto Rico’s recovery during April 2018.¹⁰ Of that \$18.5 billion in CDBG-DR funding, Congress specifically ordered that, “of such amounts allocated to such grantees affected by Hurricane Maria, \$2,000,000,000 shall be used to provide enhanced or improved electrical power systems.”¹¹ The \$18.5 billion second allocation of CDBG-DR has been divided in two tranches, one of \$8.2 billion and a final of \$10.3 billion. It is our understanding that the \$2 billion to be dedicated to

⁷ *Supra* note 2, page 41.

⁸ On February 9, 2018 the Housing and Urban Development (HUD) issued the rules for the distribution of the first \$1.5 billion in CDBG-DR funding. See <https://www.gpo.gov/fdsys/pkg/FR-2018-02-09/pdf/2018-02693.pdf>. It made clear that this tranche of money was to primarily meet “unmet housing recovery needs.” (Federal Register, Vol. 83, No. 38 at 5844, July 9, 2018.)

⁹ Government of Puerto Rico, “Disaster Recovery Action Plan,” approved by HUD on July 29, 2018. See <http://www.cdbg-dr.pr.gov/wp-content/uploads/2018/08/2018-08-27-Plan-de-Accion-con-Aprobacion.pdf>. The only energy related expenditure is for residential home heating and cooking systems. (See p. 136, Home Energy Resilience for a \$6,000 per residence subsidy for home heating and cooking equipment, expected to reach 6,000 homes.)

¹⁰ See *Bipartisan Budget Act*, HR 1892, *supra* note 2. See also <http://www.fortaleza.pr.gov/content/hud-awards-record-185-billion-puerto-rico-hurricane-recovery-disaster-recovery-funds-help>.

¹¹ *Ibid.* at p. 41. The law also allows for \$15 million in funding to support capacity building and technical assistance in the distribution of CDBG-DR funds. See at p. 43.

electrical power systems will be part of the \$10.3 billion. The rules for the use of the \$8.2 billion tranche were already published.¹²

The Government is currently working to amend the \$1.5 billion Action Plan to include new initiatives that will utilize the next \$8.2 billion tranche of CDBG-DR, then after HUD's approval, the funds are expected to be available around January/February 2019. Therefore, currently there is an opportunity to include a solar and storage incentive program such as the one described in this paper.

In an April 20, 2018 letter to HUD at the time of the funding release, the bipartisan Congressional group that authorized the funding called for the Commonwealth of Puerto to use some of the \$18.5 billion in additional CDBG-DR funding to specifically include:

- “A diverse mix of energy resources to allow for generation sources such as wind and solar.”
- “Distributed energy resource technologies, such as microgrids and energy storage and investments in both grid-located and customer sited technologies.”
- “Reduced dependency on generation sources that face potential fuel supply constraints in emergency situations.”
- “Continued market-based efficiency measures that will result in less consumption, reduced emissions and lower energy bills for residential and industrial ratepayers.”¹³

Therefore, there is no doubt that future use of CDBG-DR recovery funding by Puerto Rico should include support for distributed, resilient solar and storage systems, as it was specifically intended by Congress. This use of CDBG-DR funding for more resilient power systems, such as distributed solar and storage, should now be permitted as part of the next tranche of \$8.2 billion and the last tranche of \$10.3 billion CDBG-DR funding for Puerto Rico. It should be a key part of an Action Plan to implement the Economic Recovery Plan.¹⁴

Such use of funds would follow the practice of states that have used federal CDBG-DR funding on a special exemption basis to support solar and storage systems after a disaster. For example, the [New](#)

¹² See <https://www.gpo.gov/fdsys/pkg/FR-2018-08-14/pdf/2018-17365.pdf>. The notice states that “[a]lthough the Prior Notice requires each grantee to primarily consider and address its unmet housing recovery needs, grantees under this notice and the Prior Notice **may also propose an allocation of funds that includes unmet economic revitalization and infrastructure needs that are unrelated to unmet housing needs** after the grantee demonstrates in its needs assessment that there is no remaining unmet housing need or that the remaining unmet housing need will be addressed by other sources of funds.” (emphasis added).

¹³ See <https://energycommerce.house.gov/wp-content/uploads/2018/04/20180420HUD.pdf>.

¹⁴ See <http://www.fortaleza.pr.gov/content/hud-awards-record-185-billion-puerto-rico-hurricane-recovery-disaster-recovery-funds-help>.

[Jersey Energy Resilience Bank](#)¹⁵ was set up with CDBG-DR funds to finance critical facility resilient power systems including solar and storage technologies.¹⁶

These programs are consistent with other storage incentives in use in other states. The most successful dedicated storage incentive in place is the California Self-Generation Incentive Program (SGIP). SGIP began as a solar incentive, but it now devotes 80 percent of its budget to support the deployment of behind-the-meter energy storage technologies, with 13 percent of the energy storage category carved out for small residential projects less than or equal to 10 kW, and 25 percent of the entire budget set aside for disadvantaged communities and low-income customers. SGIP has committed more than \$500 million in incentives to date.¹⁷

Need for Solar and Storage Incentive in Future CDBG-DR Action Plan

For Puerto Rico, there is no existing, dedicated solar and storage incentive to promote adoption of resilient, customer-based systems that can protect homes and businesses during a storm when power goes out. That incentive is critically needed to get resilient solar and storage widely adopted on the island.

The Economic Recovery Plan issued by the Government of Puerto Rico contains many commendable recommendations to create more resilient energy systems. The Plan calls generally for \$139 billion in future recovery money, with detailed focus on energy and other systems.

However, the Plan only suggests a series of goals on energy resiliency, without the detail needed in an action plan that would best describe how to use the CDBG-DR funding for energy resiliency—to get solar and battery storage systems installed in many critical infrastructure facilities, businesses, and homes.

For example, the Economic Recovery Plan makes many general energy-related recommendations that in total would cost about \$30 billion in future CDBG-DR funding;¹⁸ each recommendation has funding levels associated with its implementation:

¹⁵ See [https://www.njeda.com/erb/erb-\(1\)](https://www.njeda.com/erb/erb-(1)).

¹⁶ See NJ Resilience Bank at <https://www.state.nj.us/bpu/commercial/erb/> (“The State launched the New Jersey Energy Resilience Bank (ERB), the first public infrastructure bank in the nation to focus on energy resilience. Utilizing \$200 million through New Jersey’s second Community Development Block Grant-Disaster Recovery (CDBG-DR) allocation, the ERB supports the development of distributed energy resources at critical facilities throughout the state that will enable them to remain operational during future outages.”) In contrast to the bank approach, we believe a dedicated technology incentive is a preferred strategy for widespread technology adoption, which is needed in Puerto Rico.

¹⁷ California Self- Generation Incentive Program, <http://www.cpuc.ca.gov/sgip/>. The incentive proposed here is primarily based on the successful structure of the California storage incentive program.

¹⁸ *Supra* note 6, Economic Recovery Plan, at 218.

- “Improve emergency preparedness infrastructure and develop the government workforce so that all residents and businesses are better protected in advance of a future disaster.” (Executive Summary at XX.)
- “Transform the energy system... (and) repair and rebuild resilient residential housing.” (Executive Summary at XIII.)
- Create an “islandable grid.” (Plan at 220.)
- “Create and enforce policies requiring certain private facilities, such as hospital and communications towers, to maintain backup generation.” (Plan at 223.)
- “Maintain electricity delivery to priority loads – water, communication, manufacturing, health services, schools, airports and seaports – to ensure the sustained delivery of public services in the absence of the bulk power system. This course of action could include targeted energy solutions for households with electricity-dependent medical needs and prioritization of backup generation for facilities that provide the greatest public benefit.” (Plan at 223.)
- “Creates a response plan that will allow the electric supply to be restored faster after future major power loss events.” (Plan at 224.)
- “Prioritize strategies to reduce prices and volatility faced by consumers.” (Plan at 225.)
- “Design and Build Capital Assets to Reduce Restoration Time and Cost... that could include... (5) installation of additional assets to reduce failures (e.g. battery storage) (Plan at pages 90 and 224.)
- “Ensure that critical facilities that serve as congregate shelters and resilient community services hubs... have the appropriate energy and water infrastructure...” (Plan at 223.)¹⁹

What is missing to accomplish these resilience goals is what most states have done to promote resilient solar and solar systems in their own electrical systems: *a solar and storage incentive program to accelerate adoption of these resilient systems.*

There is no reason for Puerto Rico to reinvent the wheel when it comes to use of public funding programs for resilient solar and storage systems. There is a great deal of experience for the types of funding and policy programs to get these new technologies into the marketplace. The only difference here is that the Commonwealth can use federal funds to implement such a program.

That gets us to our basic recommendation—a new storage and solar incentive from CDBG-DR funds that would provide a reliable, financeable incentive over a period of years to jump-start resilient energy markets on the island. It would be designed to directly benefit residential, commercial, and community consumers who could use behind-the-meter battery storage to lower energy costs and provide backup power in case of grid outages, while simultaneously providing benefits to the island’s electrical grid.

This specific proposal is broadly consistent with the energy sector recommendations released recently by the Resilient Puerto Rico Advisory Commission, in its *Reimagana* report.²⁰ Among other things, the

¹⁹ These recommendations are contained in Chapter 12 of the Plan.

²⁰ Resilient Puerto Rico Advisory Commission, *Reimagana* Energy Report, July 20, 2018 (See <http://www.resilientpuertorico.org/wp->

report calls for solar, storage, and other resilient power at critical facilities. But while it recommends *what* should be done, it does not appear to contain any specific recommendations on *how* such proposals could be financed with federal CDBG funding.

To achieve these transformational ends, Puerto Rico should consider adoption of the following resilient energy incentive structure.

Details of Proposed Energy Storage Incentive for Puerto Rico

Summary

For solar and battery storage systems, up-front capital costs are still a barrier for most of the island's ratepayers. To overcome this barrier and make the program accessible to low-income customers, the island needs a simple technology incentive for solar and storage that would reduce the up-front costs of solar and storage systems for most customers.

We understand that some solar and storage companies will lease systems through a third-party ownership (TPO) structure or provide power purchase agreement (PPA) financing, while other vendors will pursue cash purchases where they are possible. As a result, we propose a series of options for use of CDBG-DR funds to support solar and storage system cost reductions for all business models that might emerge to deliver such systems to customers on the island.

Therefore, such an incentive should be available for solar and storage systems that are leased, financed, or bought outright by customers.

Size of the Incentive

The amount of the total rebate program is an important threshold question. We recommend a \$1.1 billion incentive program that is divided into two parts:

1. A new *\$1 billion solar and storage incentive* spread over five years that would buy-down the cost of solar and battery storage systems.
2. An additional *\$100 million finance guaranty payment product, also funded with CDBG-DR funds*, that would backstop solar and storage installations and allow for access for lower credit-score customers; such a backstop would be in place for the lifetime of the system installed.

[content/uploads/2018/06/20180619_AECOM_PR_ENERGY_REPORT_ENG_FINAL.pdf](https://www.psc.state.pr.us/energy/2018/06/20180619_AECOM_PR_ENERGY_REPORT_ENG_FINAL.pdf). The Commission is an independent consortium of NGOs and foundations that are working for the island's recovery. (See pages 46-61 for a set of energy related recommendations.)

The \$1.1 billion amount for resilient energy is a great deal of federal funding. We realize it might, at first, be met with some opposition given the competing financing needs on the island. But a strong argument can be made that it is justified for several reasons.

First, it is essentially a recommendation to spend 50 percent of the congressionally dedicated \$2 billion from the April 2018 allocation of CDBG-DR funds for resilient, customer-sited electricity systems – this would be on an equal footing with the remaining \$1 billion that could be allotted for central power plant upgrades. Or this amount certainly could come from the remaining \$18.5 billion in the second tranche (\$8.2 billion) or the third tranche (\$10.3 billion) of CDBG-DR funding, if a significant portion of the \$2 billion energy allocation has already been dedicated to other energy related purposes.

If the island truly wants to “transform the energy system,” it should budget seriously for that transformation—that customer-sited, distributed resilient power will be the new complementary standard for resilient electric delivery. The island will begin to move beyond the central generation, legacy system model, which must be maintained but might no longer be the primary source of electricity to much of the island over the long term.²¹ Such an impressive level of funding is needed for a dramatic transformation of the island’s power system.²²

Second, Congress specifically intended that a substantial amount of the \$18.5 billion in CDBG-DR funding should be dedicated for such distributed generation systems, as noted expressly in the appropriators’ letter accompanying the enactment. A status quo, disproportionately low level of investment in distributed generation would not be consistent with the clear congressional intent behind the appropriation of this CDBG-DR funding.

Third, such customer-sited solar plus battery storage installations can be made now, with sufficient federal support. They need not wait for long-term, central generation planning processes to unfold over the next several years, or the money dedicated to those systems to be distributed. An immediate infusion of hundreds of millions of dollars in federal funding for solar and storage systems on homes, businesses, and municipal buildings would produce enormous short-term, social and economic recovery benefits. A

²¹ This 1:1 funding priority of customer sited resilient systems versus legacy central plant stands in contrast to the different budget allocations recommended in the “Build Back Better” report of the Puerto Rico and New York governments. See “*Build Back Better, Reimagining and Strengthening the Power Grid of Puerto Rico*,” 2017 at <https://sepapower.org/resource/build-back-better-reimagining-and-strengthening-the-power-grid-of-puerto-rico/>. Among other things, that report recommended about \$18 billion in power system investment: about \$16 billion for central power system upgrades and about \$1 billion for microgrids. That is a 1:16 ratio, or about 95 percent of the future CDBG-DR funding for central system upgrades and only 5 percent for distributed resilient systems. While the plan’s goals are well intended, it is our view that if the government of Puerto Rico wants to transform the future electrical system, it needs a more balanced investment plan than the comparative levels proposed in that report. We do not have any opinion on the type of investment needed on central generation plant upgrades and we can understand grounds for opposition to this view from central generation experts. But something approaching an equal investment between central and distributed systems is a strong policy prescription for a transformational energy system.

²² The Economic Recovery Plan contains this admonition about the level of energy funding needed for energy resiliency: “Investing too little could result in a system that is no more reliable than it was on September 19, 2017.” See final plan, *supra* note 1, at 91.

long-term, five-year plan of \$200 million a year would guarantee a ramp-up of more resilient facilities, which could build and sustain a strong workforce in this space.²³

Fourth, a deep subsidy for behind-the-meter solar and storage is needed to overcome the prevalent low-income barriers to widespread technology adoption of still relatively expensive solar and storage systems. Strong federal support is needed now to reach those customers, and to accelerate a “leapfrogging” of systems from central to distributed resilient power among low-income residents, businesses and government facilities struggling with the after effects of the storms.

Fifth and finally, such a level of investment is needed to reach hundreds of thousands of customers across the island—to get to the needed scale to make resilient power a reality. We understand there are approximately 12,000 stand-alone solar systems now on the island, while there are no more than a thousand or so companion battery storage systems in place. This represents a wide resiliency gap between what is installed and what is needed for broad protection of electric power to the hundreds of thousands of residential, commercial, and community customers in Puerto Rico.²⁴

Incentive Proposal Details

There have been numerous studies about what needs to be done to bring resilient power to the island. However, what has been missing from much of the conversation is how to pay for it. This proposal is meant to begin the necessary conversation about how to fund Puerto Rico’s resilient power transition.

What follows is a proposed structure for a solar+storage incentive for Puerto Rico.

While we propose various approaches for an incentive program, the ultimate adoption of any of these suggestions must come through a consensus process on island that includes the diverse positions of all parties committed to its energy future. This proposal is based on our years of experience working on solar+storage policy in other states, but the details for Puerto Rico might well be quite different, depending on the island’s circumstances and future policies.

- CEG proposes an incentive ranging from 30 percent to 70 percent of both solar and storage installed costs.²⁵ The percentage would ratchet upwards based on customer credit or income,

²³ Some organizations that have reviewed this incentive proposal have asked for it to also support a dedicated workforce development and training program. That might well be a good policy idea, but it is outside of our expertise to propose or design such a program.

²⁴ Another way to look at the budget level is to compare it the total of the disparate energy-related programs budgets recommended in the Economic Recovery Plan. Many of the energy goals and measures outlined in the Plan have significant budget levels associated with them, totaling hundreds of millions, if not billions of dollars. This single incentive level, in contrast, is a policy measure that can solve many of the energy problems outlined in the recovery plan. It is a systematic approach that says that solar and storage, resilient power systems are the principal solution to many of the challenges facing the island, and such a broad-based incentive is the preferred strategy, rather than sector-specific measures that, in the end, will likely try to get the same type of systems installed, perhaps less efficiently, under different programs.

²⁵ Here we present a percentage-based incentive for simplicity. However, it may be prudent to establish a per kilowatt-based incentive for solar and a per kilowatt-hour-based incentive for battery storage. These incentive levels could be established through a market survey of installed costs for various market segments: residential, small commercial, and large commercial.

with lower-income customers getting a higher percentage incentive.²⁶ This is designed to reduce financing risk for lower-income customers, and to increase equitable adoption of clean, resilient solar+storage systems. Notably, we do not recommend a 100 percent subsidy, as proposed in the *Build Back Better* report; we believe a smaller incentive would be sufficient to leverage private capital, create more effective customer buy-in for maintenance of such systems, and create a more attractive business environment to raise private capital for such systems going forward. It will also result in many more systems being installed.

- To encourage resilient energy systems at critical facilities (fire stations, emergency shelters, hospitals and the like), we propose an incentive adder and a carve-out for solar+storage systems installed at these facilities. There are numerous lists of critical facilities already developed by states that have existing resilient power programs that could be adopted by Puerto Rico.²⁷
- To ensure equitable distribution of incentives, we propose for consideration some minimum incentive carve-out for low-income residents and public and private facilities serving low-income communities.
- To ensure a balance between commercial and residential installations, we also propose for consideration a minimum carve-out of funds dedicated to residential incentives, so that higher priced, larger projects do not crowd out the incentive pool.²⁸
- The proposed incentive should cover residential, commercial & industrial, and community facilities.
- It also should cover both third-party owned (TPO) and customer-owned (turnkey) systems.²⁹
- The proposed incentive should cover both new solar+storage installations and the addition of battery storage to existing solar installations. It should not cover stand-alone solar installations.³⁰

²⁶ Whether to rely on credit scores or income, or some combination of them and other factors, is a program design issue to be resolved if this incentive strategy is pursued. This memorandum simply notes the options available to make those decisions, which will depend on local lending practices.

²⁷ Adders and carve-outs are a common program design feature of other solar and storage system program designs on the mainland.

²⁸ We do not make a percentage recommendation, but they should be adopted in these program elements. In this case, residential systems must have a high priority for incentive eligibility so that they are not forced to compete for incentives against larger, more expensive commercial and industrial systems that, given their high capital costs, could qualify for a disproportionately high percentage of the total incentives available. Any minimum residential incentive carve-out should be resolved through a more detailed program design process.

²⁹ People in Puerto Rico do not pay federal income taxes. Therefore, end use customers are not eligible to take the Federal Investment Tax Credit (ITC) to reduce the costs of their solar and storage systems if they purchase them outright; however, vendors based on the mainland may be eligible for the ITC, and they could share savings with customers with third-party owner (TPO) systems. This raises the question of whether an incentive should be structured differently for TPO versus customer owned systems. One could argue for a higher or lower incentive depending on the business model of the vendor. The key principle should be the impact on customer economics—which level of incentive will produce the most projects to protect the most people at an acceptable cost, not the business model of the vendor. We do not take a position on that issue, but it might well be a contentious one that will likely arise in a program design process.

³⁰ One organization that reviewed this memorandum also recommend a modest, additional flat administrative fee (say, \$500 per installation) payable to PREPA upon the timely processing of interconnection and net metering applications, to defray the cost of these services. We have no position on that notion.

Anticipated Results

At these incentive levels, with \$1 billion in funding and at an average incentive rate of approximately 50 percent of installed solar and storage system costs, we would expect that such an incentive could support these levels of projects across the Commonwealth:

- 64,516 residential solar+storage systems, or
- 14,184 small commercial solar+storage systems, or
- 4,255 large commercial solar+storage systems, or
- Most likely, some combination of the above.³¹

These calculations regarding numbers of installed systems that could be incentivized under this proposal are based on the following average installed costs of solar and storage (without factoring in a possible investment tax credit (ITC) or soft costs):³²

- For residential systems, with a battery of approximately 10 kWh (5 kW over 2 hours), coupled with a solar PV system of about 6 kW, the estimated installed costs are \$7,000 for the battery and approximately \$24,000 for the solar components of the system.
- For small commercial systems, with a battery of approximately 30 kWh coupled with a PV system of approximately 30 kW, the estimated installed costs are \$21,000 for the battery and approximately \$120,000 for the solar.
- For large commercial systems, with a battery of approximately 100 kWh coupled with a PV system of approximately 100 kW, the estimated installed costs are \$70,000 for the battery and approximately \$400,000 for the solar.

In 2016, PREPA had nearly 1.5 million utility customers, with total sales of approximately 17,439 GWh. Clearly, \$1 billion in rebate funding will not support resilient solar+storage systems for all customers on the island. However, by focusing on the most vulnerable residential, commercial, and nonprofit customers, as well as critical infrastructure, the benefits of such a resiliency incentive program would reach tens of thousands of customers directly, as well as providing benefits well beyond its immediate beneficiaries.

It is also noteworthy that our proposal for an incentive to cover less than 100 percent of the installed cost of a system would fund many more projects than the few hundred larger microgrids proposed in the

³¹ Obviously, these projections are based on many assumptions that are preliminary and tentative at this stage of the market in Puerto Rico. They are simply designed to provide an illustrative example of the potential project scale that could be developed with a dedicated incentive. Many unpredictable, future market conditions will influence the actual results.

³² These projected costs are based on a small sample of some average installed costs and on informal conversations with installers operating in these Commonwealth markets. We should add that battery costs noted here might well be lower than that offered by some companies. In any case, these costs are also a snapshot in time, and should reduce over time with expected economies of scale. Therefore, these cost numbers should be considered now only for illustrative purposes. Obviously, any future implementation of a serious incentive program should be based on reliable, updated and confirmed technology cost estimates from a cross section of installers and providers on the island, and should incorporate variables such as tax incentives and soft costs.

"Build Back Better" report. This incentive's ability to foster rapidly increased social, economic, and health benefits is due in part to the greater private-sector leveraging of such an incentive program, and in part to the fact that small, individual customer systems installed behind-the-meter are often faster and much cheaper to develop than big, multi-facility microgrids. Typical residential solar+storage systems can be installed in 1-2 days. Faster and more widespread deployment of resilient power systems is important in a region subject to recurring disruption in the form of annual storms.³³

Rates and Carve-Outs

Elements of this rebate proposal are based on existing state programs, including the California SGIP incentive program, which is the most successful to date. Rebate rates for the SGIP program are shown in the following table:

Table 1 – California SGIP Energy Storage Incentive per Watt-hour (Wh)

	Step 1	Step 2	Step 3	Step 4	Step 5
Energy Storage General Budget	\$/Wh	\$/Wh	\$/Wh	\$/Wh	\$/Wh
Large Storage (>10 kW)	\$0.50	\$0.40	\$0.35	\$0.30	\$0.25
Large Storage Claiming ITC	\$0.36	\$0.29	\$0.25	\$0.22	\$0.18
Residential Storage (<= 10kW)	\$0.50	\$0.40	\$0.35	\$0.30	\$0.25
Energy Storage Equity Budget					
Non-Residential Equity	N/A	N/A	\$0.35	\$0.30	\$0.25
Non-Residential Equity Claiming ITC	N/A	N/A	\$0.25	\$0.22	\$0.18
Residential Equity	N/A	N/A	\$0.35	\$0.30	\$0.25
Residential Equity Claiming ITC (>10 kW)	N/A	N/A	\$0.25	\$0.22	\$0.18

SOURCE: California Self-Generation Incentive Program at https://www.selfgenca.com/home/program_metrics/ and <https://energycenter.org/sgip/incentives>.

Note that there are some important differences between the structure of the California SGIP and the structure of the incentive we propose for consideration in Puerto Rico:

- *The SGIP program relies on substantial customer savings, for example from demand charge management for commercial and industrial customers. We understand that some of Puerto*

³³ We also are aware that the Commonwealth has issued an RFP for large microgrid projects. This incentive certainly could apply to those projects, once developed.

Rico’s commercial and industrial customers may face utility demand charges. While the rates in Puerto Rico may not be as high as typical demand charge rates in California, those customers subject to demand charges may be able to realize additional bill reduction savings through demand management strategies with battery storage.³⁴ However, if demand charge rates are low, any bill reductions achieved are likely to be modest. We also recognize that savings are likely a secondary goal for most customers in Puerto Rico, with resilience being the primary objective; therefore, a higher incentive level may be justified in Puerto Rico as compared with California, even if some demand charge savings are possible. The calculation of the incentive will need to be made based on several variables, including the cost of imported batteries, labor rates, financing costs, available tax incentives, and the retail cost of electricity. The incentive level of 30 to 70 percent of installed costs suggested here is used to provide a starting point and a basis for calculations. It might need to be higher for certain customer classes.³⁵

- *The SGIP also features a declining incentive level, which is meant to incentivize early adoption.* However, the situation is much different in Puerto Rico, where there are many other priorities that might delay deployment. For example, buildings and electrical infrastructure may need to be repaired before a solar+storage system could be installed. Therefore, a declining incentive might only further penalize the island’s poorest residents and those who have been hardest hit by the recent storms, as they would likely be the least able to take immediate advantage of an incentive. There are other arguments that can be made for a declining incentive, which should be considered in the design process, but the merits, in our view, favor a fixed incentive rate that does not change over time.³⁶
- *The California SGIP program features a 25 percent carve-out for “equity” deployments, but it does not provide a higher incentive level for low-income customers.* As noted earlier, we urge Puerto Rico to establish both a carve-out for low-income communities, and a higher incentive level for these communities. Given the large percentage of the island that would fall into this category, the largest portion of the incentive should be devoted to low-income deployments, including critical infrastructure serving low-income communities. In other words, it is worth

³⁴ We have come across tariff sheets for PREPA that suggest demand charges at the \$9-\$12 per kVA range. See <https://www2.aeepr.com/Documentos/Ley57/Tarifa/03%20Attachment%20B%20-%20Schedules/J%20Schedules.pdf> . Assuming they are correct and in force, they would provide another support for the deployment of energy storage at commercial facilities. While these rates are lower than the conventional target of \$15 per kilowatt as a metric for the economic use of storage for demand charge management, some cost savings may be attainable and could support additional storage deployment in Puerto Rico. For a summary of how storage works to reduce commercial demand charges, see a recent CEG/NREL report, “Identifying Potential Markets for Behind-the-Meter Battery Energy Storage: A Survey of U.S. Demand Charges” at <https://www.nrel.gov/docs/fy17osti/68963.pdf>. It does not appear that, in any of the reports we have seen on resilient power on the island, the economic potential of demand charge bill reduction – in addition to resiliency – has been considered as another reason for storage deployment among commercial and industrial customers.

³⁵ As with other specific program design features mentioned elsewhere in this note, how the incentive should be set for low-income customers will required further analysis. As a matter of policy and especially so given the emergency nature of the problem, it is preferable to have a system that is easy to administer and is not burdened by overly complex financial reporting requirements.

³⁶ Obviously, if dramatic cost declines become evident or other market conditions suggest otherwise, or if competing program design considerations arise, this assumption should be reexamined.

considering a higher incentive level for certain low-income customer applications, as well as providing a significant carve-out for projects serving low-income customers.

Other Requirements and Considerations

Some other considerations for this incentive might include:

1. **Eligible systems.** Given that the main goal is to provide resilient power behind the meter, there should be some requirements around the capacity of the solar PV and storage resources, and the duration of discharge of the storage. However, it is not necessary that systems support the full load of the host facility (and in most cases, this could be a bad idea, as it would mean oversizing systems). The goal of the program should be widespread deployment of solar+storage systems to support only critical electrical loads and provide long term discharge from the battery after the PV is no longer generating. PV should be sized, if possible, so that it is able to power the facility's critical loads during the day while simultaneously charging the battery for discharge in the evening. In terms of technologies, only standard, commercialized battery chemistries should be eligible. Also, if the ITC is to be taken, batteries should be set up so that they charge only from solar, not from the grid or non-renewable sources.
2. **Roofs and electrical infrastructure.** To install solar+storage in most facilities, a roof of sufficient strength is required to support PV panels. Likewise, there may be ways in which electrical systems in buildings may be made "resilience-ready," for example rebuilding with "solar-ready" electrical panels (or racking and pre-wiring for solar systems) which allow for a dedicated solar input, and separate critical load panels for resilience. Industry professionals may be best positioned to propose such standards. This could greatly reduce costs and increase uptake of resilient solar+storage systems in new and reconstructed buildings.
3. **Grid Services.** In addition to resilient power for homes, businesses and critical infrastructure, behind-the-meter solar+storage can provide important grid services such as peak load reduction. The provision of this service generally requires a price signal, such as time of use rates, on-bill demand charges, or a utility demand response program.³⁷

In addition to a resilient power rebate targeted at solar+storage systems as described above, we also recommend a finance guaranty program. This would be funded through an additional \$100 million of CDBG-DR funds. The proposed program elements for consideration are described below.

³⁷ Some parties might argue for a required minimum number of battery discharges during peak hours, which would help to lower peak demand across the island. Such a requirement could be modeled on a similar requirement in the Massachusetts SMART solar program, which includes a storage adder. But without an appropriate price signal, which is complex, requiring such discharges might well conflict with the most efficient use of the system. We feel that any peak discharge requirement should be secondary to the basic energy provision and resiliency purpose of these systems – and in particular dispatch for peak load reduction should not take place at times when batteries need to be fully charged in anticipation of outages.

Solar+Storage Finance Guaranty Program

As important as CDBG-DR funds are for providing direct incentives to help buy down the cost of solar+storage systems, incentives alone may not be a sufficient or optimal means of scaling resilient power in the new electric grid in a place where incomes are quite low and credit risks are prevalent.

To further overcome those challenges, CDBG-DR funds should also be used to address the credit risk and financial challenges faced in developing solar+storage projects for the broader low- and moderate income (LMI) population and municipalities providing critical services. A well-designed finance guaranty program backed with CDBG-DR dollars would also leverage significant new private investment, particularly if harnessing TPO products that are also leveraging the federal ITC.

Financing guaranties reduce risk for third-party financing parties and beneficiaries, and by doing so, increase access to financing for projects that would otherwise be unable to be built or installed. In many instances financing guaranties can also lower the pricing on financing and/or the minimum required credit rating needed to obtain financing, thus broadening the pool of residents able to qualify for loan and TPO-financed solar products.

What are the risks inherent in solar+storage projects for LMI markets? The major risks facing this new technology for this market include performance and customer repayment risk, regulatory/policy risk, and construction period risk (e.g., unforeseen over-budget expenditures including those that arise from delayed construction schedules).

These risks are subsumed within the broad category of payment risk. Lenders and other financing parties care primarily about repayment of their principal and interest. Because of the multiple ways that financing payments can be impacted by these various risks, credit risk for LMI projects is best addressed with a broad *payment guaranty* that helps maintain financing repayments and helps avoid material financing defaults and accelerations.

Government-backed finance guaranty programs are an efficient and proven means of leveraging private investment and scaling community development financing transactions. This proposed 75% guaranty is comparable to other guaranty programs, including the USDA Renewable Energy Systems and Energy Efficiency loan guaranty program that provides an 85% loan guaranty, and the SBA loan guaranty program that provides up to a 75% guaranty on loans over \$150,000 and up to 85% on loans equal to or less than \$150,000.

In general, the recommended finance guaranty program would provide a payment guaranty for solar+storage project loans and other third-party financing that would backstop up to fifty percent (50%) of the payments allocated to financing the solar+storage portion of the project financing. Cumulative prorated payments would not exceed seventy-five percent (75%) of the original amount of the solar+storage portion of such financing.

The proposed elements of the guaranty for consideration are as follows:

- The Guarantor (Puerto Rico Department of Housing or its designee) would retain the finance guaranty program funds (plus earnings on the idle funds) until demand was made under the guaranty agreement, at which time only small transfers would be made to help keep the financing current.
- Payment under the guaranty would be requested when financing payments were 60 days past due. The mechanism for supporting financing payments would be for Guarantor to transfer three (3) months of partial financing payments (not to exceed 50 percent of financing payments allocated to the solar+storage portion of the project financing) to a bank account in the name of the participating lender or investor.
- Requests for payment under the guaranty would be requested no more frequently than quarterly. Unused guaranty funds at the end of the initial program term could be repurposed.
- In the event of a material financing default resulting in acceleration of the project financing or any foreclosure of project financing collateral, then a demand for payment under the guaranty will be paid in an amount not to exceed seventy-five percent (75%) of the original amount of the solar+storage portion of the project financing, net any prior guaranty payments made under the guaranty of the project financing.³⁸
- This finance guaranty program, structured as a payment guaranty, would reduce the cost of financing and enable LMI borrowers and those with weaker or no credit history to qualify for financing they would otherwise be unable to obtain.
- How much credit exposure would be retained by the Guarantor in each transaction would be a function of the level of incentives (which reduces the amount of financing required), and the FICO score or credit rating of the borrower/lessee.
- Eligible projects could include single family and multifamily properties, commercial properties, municipal services and community facilities. Solar+storage systems could be directly owned and financed by the property owner/tenant or owned by a third-party entity that provides resilient power under a lease or power purchase agreement/energy services agreement.
- The finance guaranty program would be funded at \$100 million.

Conclusion

Puerto Rico has an opportunity to transform its energy system to protect its citizens with more resilient power. In addition to other strategies, it should consider use of the federal recovery funds to support an incentive for new customer-sited, solar and battery storage systems out of the second tranche of federal recovery funds.

Without such an incentive, the path to a more resilient energy system for Puerto Rico will be difficult, if not impossible.

³⁸ An alternative would be for payment under the guaranty to be paid in an amount not to exceed seventy-five percent (75%) of the remaining amount of the solar+storage portion of the project financing, net any prior Guaranty payments made under the guaranty of the project financing.

Indeed, if mainland states believe dedicated incentives are needed to move solar and storage markets for greater energy resiliency, which they do, the much more precarious situation in Puerto Rico certainly calls for a similar strategy to be put in place soon by the Commonwealth. Learning from the energy resiliency incentive programs in other states is a smart and prudent strategy to pursue.

Clean Energy Group strongly urges the Commonwealth to consider adoption of a robust and long-duration incentive of \$1.1 billion for behind-the-meter solar plus battery storage systems in any action plan for future use of CDBG-DR funding.

Of course, the proposed \$1.1 billion figure is a considerable level of federal funds where there are other important needs that compete for those dollars. But as history of the disaster there shows, everything else depends on resilient power. It is a critical and compelling need.

We propose these admittedly high incentive levels to achieve the widest reach for a durable and meaningful energy recovery. Other budget needs are not considered here, and we appreciate the complexity of the recovery and funding challenges ahead.

But enormous social problems require bold solutions. A co-founder of Google once told graduating students that we need a “healthy disregard for the impossible” to find solutions to tough problems.

So, we offer these comments with humility and hope and a slight disregard for the impossible, as we recognize the enormously difficult energy choices facing the Commonwealth.

Clean Energy Group stands ready to assist the Government of Puerto Rico to consider such an approach in what will be a complex, but potentially transformative energy recovery process. It is timely and urgent to act soon so many more customers across the island have resilient power before the next storm.