AEG PUERTO RICO ENERGY WEEK

April 20th, 2023

United States Department of Energy (DOE)
Grid Deployment Office
PuertoRicoGDO@hq.DOE.gov

RE: Request for Information (RFI) on the Puerto Rico Energy Resilience Fund;
Addendum from AEG Task Force Work - Vulnerability Mapping and Existing Data to RFI

I. Background

During the Puerto Rico Energy Week held at La Concha on February 22 through 24 of 2023, over 100 stakeholders gathered to present, prioritize, and find solutions to the most pressing energy equity challenges that Puerto Ricans face. Marisol Bonnet from DOE, Maretzie Diaz from Puerto Rico Department of Housing (PRDOH), and Manuel Laboy from COR3, led the conversations at the island-wide level. These leaders along with participants highlighted the need for collaboration on capturing existing vulnerability data, maps, and tools to help DOE best address and prioritize disbursement of the $1B Resilience Fund. As a result of stakeholders aligning on the aforementioned challenge, a task force was created, and this group convened on a weekly basis to research and share findings and recommendations as part of this RFI.

The group finds that the work contained in this RFI relates but is not limited to the following punctual questions from the RFI guidelines:

Beneficiary & Community Considerations

5. As per the Consolidated Appropriations Act, this fund should focus on low- and moderate income households and households with individuals with disabilities. Recognizing there is more need than funding, how should DOE prioritize possible beneficiaries? Are there existing criteria, screening tools, databases, or definitions that DOE should incorporate in program design?

6. How can DOE encourage/require engagement with local stakeholders and organizations during program implementation?

II. Objectives of the task force

- Identify and collaborate with entities already working on similar initiatives to learn about current vulnerability data, maps, and indexes as these pertain to energy.
- Highlight limitations of existing resources in helping prioritize energy burdened and vulnerable communities that could benefit from DOE's Resilience Fund.

- Submit findings as part of the Puerto Rico Energy Resilience Fund RFI, by April 21st, 2023.
- Support any follow up work with DOE or other community based organizations tackling vulnerability data scarcity.

III. Results and Findings

A. Existing tools, resources and organizations that map vulnerability for Puerto Rico

As an initial exercise, the task force identified existing resources and interactive dashboards with data for vulnerability mapping and indexing, specifically useful in Puerto Rico. The following resources include the organization that developed and owns the tool, a brief description as to how each tool is relevant to this work, and contact information where available.

1. ReNCAT

Organization: Sandia National Labs

Contact: Amanda Wachtel

Tool Description / Use Cases: Software application that suggests microgrid portfolios that reduce the impact of large-scale disruptions to power, as measured by the Social Burden Metric. ReNCAT examines a power distribution network to identify regions that can be isolated into microgrids that enable critical services to be provided even if the remainder of the study area is left without power. The team found that this is the most comprehensive tool to prioritize community solar and microgrids. The prioritization exercise is done via a very sophisticated social burden simulation, a new metric for resilience and equity that measures how hard society is working to meet their basic needs. Such a level of social burden comprehensive simulation was not found in any other tool the team evaluated.

Drawbacks and/or Limitations pertaining to Mapping Energy Vulnerability: The tool cannot be easily accessed and used by all stakeholders; it requires training. As a suggestion to the developing team, the addition of distributed energy generation (DEG) in all sectors (residential, commercial, industrial) should be continuously updated.

2. Access Terminal

Organization: BCMG

Contact: Thomas McOsker

Tool Description / Use Cases: GIS interactive platform with validated Hazard,

Water, Geology, Weather, Real Estate Data, primary services, PREPA/LUMA infrastructure, Industry Locations, EPA Brownfields, etc. Was developed initially for collecting property taxes but has powerful applications in vulnerability mapping. BCMG has spent many resources validating the geospatial accuracy of the data which could help teams supporting DOE with cross-checking back-end data used in tools like ReNCAT.

Drawbacks and/or Limitations pertaining to Mapping Energy Vulnerability: The main drawback is that the tool is proprietary. Missing data layers include social and demographic indicators, energy burden, length of power outages after hurricane Maria, LUMA feeder hosting capacity for DEG, households with DEG.

3. CDBG vulnerability maps

Organization: PRDOH

Contact: Teresa Morales, HORNE

Tool Description / Use Cases: Interactive maps with indicators that affect the natural and environmental resources of Puerto Rico. It is open source and allows for communities and the public to use this data to support any planning process at the local level.

Drawbacks and/or Limitations pertaining to Mapping Energy Vulnerability: Geospatial granularity could be improved. Missing data layers include energy burden, proximity to critical services, length of power outages after hurricane Maria, LUMA feeder hosting capacity for DEG, households with DEG.

4. Puerto Rico Hazards and Risks Dashboard

Organization: PRDOH

Contact: Teresa Morales

Tool Description / Use Cases: This dashboard summarizes the average risk score and the risk score by hazard type in two ways: by municipality and by map extent. Great example of what geospatial granularity looks like.

Drawbacks and/or Limitations pertaining to Mapping Energy Vulnerability: The tool is limited to the environmental and weather-related hazards and risks in Puerto Rico; does not consider social and energy burdens or sociodemographic data.

a. VMAP

Organization: University of Central Florida (UCF)

Contact: Chris Emrich, Ph.D. GISP
Tool Description / Use Cases: Geospatial framework to optimize the deployment of solar-plus-storage for the most vulnerable and at-risk communities in Central Florida and the Florida Panhandle. It could be based on translating the team's understanding of the spatial and temporal aspects of hazards across Puerto Rico to a Power Loss Scenario.

Drawbacks and/or Limitations pertaining to Mapping Energy Vulnerability: Not yet adapted for Puerto Rico but could be in the near future if collaboration is fostered.

The following list includes resources that focus on specific aspects of vulnerability and not necessarily are a comprehensive alternative of a vulnerability and/or risk map. Thus, no specific drawbacks were highlighted.

5. Hosting Capacity Dashboard

Organization: LUMA

Tool Description / Use Cases: Esri-HERE based dashboard that provides guidance to developers and customers to understand the impacts of connecting distributed generation to the system.

6. Puerto Rico Homeowner Assistance Program Report

Organization: IEM/CDBG

Tool Description / Use Cases: Document that includes maps on Forbearance Rates across Puerto Rico which could also be an indicator of vulnerability, Pages 29-33; IEM has supported the efforts.

7. Public Geodata Portal

Organization: PR Government

Tool Description / Use Cases: Government website with separate maps ranging from property tax data, tsunami, and census.

B. **Discussion, research findings and recommendations from task force**

Our research found that while there is an abundance of data, the presentation of the data is not actionable for deploying strategic or even coordinated energy solutions within communities, neighborhoods or targeting aid to the *most* vulnerable households/communities. Demographic and socio-economic data is available from the United States Census at various geographic scales including state, municipal, zip code tabulation area, census tract, and census block group levels.

Smaller geographic scales such as census blocks have high-quality data on only a few demographic data such as total population and total housing units, but do not have detailed socio-economic or demographic data on populations residing there. Conversely, aggregation of data on scales larger than blocks neither supports more localized decision-making nor provides actionable information necessary to energy agents of change. Access to more highly resolved (finer spatial scale) census data will enable needs analysis by broader audiences of external stakeholders and investors with the ability to leverage federal programs.

Understanding that overall need far exceeds available grant funds, we advocate for an empirically based and data-informed targeted approach to determine how these scarce funds for individual rooftop solar as well as community-based microgrids are selected. A key factor in the strategic alignment of these two solutions hinges on more granular data. For this reason, we encourage the DOE and National Renewable Energy Lab (NREL) partners to consider a standardized methodology in public-facing assessment tools to incorporate analysis of census-based data using a half-mile (or smaller) hex grid resolution. This methodology has a precedent in Puerto Rico in the Community Development Block Grant – Mitigation (CDBG-MIT) Risk Assessment developed by UFC's Dr. Christopher T. Emrich and Cimagaroon Howell for use by PRDOH.

Applying this hexagonal grid downscaling methodology to inform tools under development by NREL represents a simplified method to display complex geospatial information [1] in an approachable way that also allows for aggregation of energy grid infrastructure, critical facilities data, and any other data in a standardized way. Using regular spatial bins (hexagons) serves three (3) primary goals. First, it simplifies data sets and aids in visual communication of complex data. If done correctly, visual binning can enable readers to make reasonable count or density estimates that would otherwise be impossible because of the complexity of underlying data. Second, spatial binning shows a smooth surface of aggregated values across larger areas. Finally, a standardized regular gridded framework, such as the hexagonal grids used currently by Puerto Rico's CDBG-MIT programs, enables analysis and evaluation within and between datasets that would normally be difficult (or impossible) to visually, statistically, or spatially compare. For an example of this methodology in action, please see the Puerto Rico Hazards and Risks dashboard here on the PRDOH website: https://cdbg-dr.pr.gov/iframes/PRhazardandrisksIFRM

We also see an opportunity to ground-truth and even enhance standardized data sets with quantitative and qualitative factors gathered by community-based surveying, accomplished in partnership with organizations and leaders active in target communities. Utilizing NREL tools enhanced with spatial binning methodology as described, DOE in partnership with community based organizations, could target outreach and ground-truth survey efforts to gather and validate household energy needs for some of the most disadvantaged communities. We recommend the determination of these communities be based on an agreed-upon set of criteria and cross-agency coordination to consider the following:

- Narrow social burden criteria to delineate a priority or target population and geography to receive limited federal assistance. This delineation could also inform the public of outlier communities thereby facilitating the coordination of alternative solutions.
- Utilize Housing and Urban Development (HUD) adjusted income limits published for CDBG-DR and -MIT programs.[1]
- Update calculations of household energy burden based on the latest available American Community Survey (ACS) census data and estimations of household energy costs by region and/or community provided by LUMA (in coordination with the Puerto Rico Electric Power Authority (PREPA)).
- Create a clearinghouse database for federal grant-in-aid energy projects, especially at the household level.
- Create continuity in the mapping of environmental hazards by coordinating with AEG volunteers Dr. Chris Emrich and Cimagaroon Howell[2] who completed the CDBG-MIT Risk Assessment, on behalf of the PRDOH, for the entirety of Puerto Rico in 2021.

Furthermore, we recommend a pilot project to conduct this effort in target communities within the Cordillera Central to ground-truth socio-economic, demographic, and infrastructure data to ensure it accurately reflects the needs and characteristics of the community. Action steps to accomplish this in partnership with the DOE include the following:

- Define the scope. Identify the geographic area and population group for which to ground truth data. Determine in partnership with DOE the specific variables that should be verified.
- Develop a data collection plan. Determine the data collection methods to be used, such as surveys, focus groups, or interviews. Develop survey questions that will help to validate the data.
- Train volunteers. Recruit and train volunteers to collect the data. Ensure they understand the purpose of the project, the data collection methods, and the importance of accurate data.
- Conduct the survey. Collect data from the community using the methods developed. Be sure to collect data from a representative sample of the population and use methods that are culturally appropriate and respectful.
- Analyze the data. Use NREL statistical software to analyze the data and compare it to the existing. Identify any discrepancies between the two sets of data and remedy. ● Communicate the result. Share the results with the community and relevant stakeholders, such as local government officials, to advocate for changes that will improve the accuracy of future data and methodologies for assistance. Personally identifiable information (PII) must be protected in this process so as not to violate the Privacy Act of 1974 (Privacy Act), as amended, 5 U.S.C. § 552a.

[1] See annual and adjusted income limits for Puerto Rico on the HUD Exchange website located here: https://www.hudexchange.info/resource/5334/cdbg-income-limits/

[2] Dr. Chris Emrich and Cimagaroon Howell completed the CDBG-MIT Risk Assessment as subcontractors to the PRDOH Grant Manager HORNE, LLP.

- Advocate for change. Use the data to advocate for changes in energy solutions that will improve the impact of assistance. This can include advocating for more resources to be allocated to hard-to-count areas or for options in assistance.

A key element of this strategy hinges on the participation of entities that bring the following attributes to the process:

- Have established and trusted relationships with the community in which they are chosen to operate. This can be demonstrated through an organization and its leaders' history of living, working, and contributing to the communities in which they are operating.
- Connect in native language. While Puerto Rico is a bilingual society, its culture and human connection is founded on the Spanish language.
- Operate with cultural sensitivity. As with any place-based outreach effort, a lack of cultural awareness and sensitivity can isolate the very residents in which the organization wished to connect. For this reason, social hierarchies, family dynamics, community values, and place-based views must be respected.

C. Summary Recommendation:

In summary, we recommend that the DOE assign to the PR100 study the requirement to provide an end-result GIS resource for the public that promotes energy resilience information down to a hex grid level, empowering communities to engage in their energy future. The true value of this tool is in the powerful synthesis of socio-economic and demographic data (such as that mapped by the NREL) aggregated energy grid infrastructure data provided by LUMA.

When targeting communities, we acknowledge the need for two levels of operational information: that which adheres to Privacy Act and Homeland Security restrictions for public release, and that which is access-limited under data sharing agreements. We advocate for key members of this AEG volunteer task force to be considered as partners of DOE and NREL in this effort. Such a partnership creates a significant benefit in Puerto Rico by creating continuity of research sponsored by prior federal grants.

Furthermore, where practicable and beneficial, we advocate for community-based efforts to create a nuanced understanding of need in non-traditional or disadvantaged communities. Current processes require that socially burdened, technology or mobility challenged, working class residents are required to scour public information for announcements of assistance and

take time-sensitive action to gain their place in line for an application. Location, access, and property ownership issues can each present further complication. By taking a targeted, community-based approach in Cordillera Central we seek to identify and remove barriers to access on an attainable micro-scale.

In conclusion, we see these matters as important actions to address in the roll out of assistance programs across the archipelago. Improved public access to actionable information permits the conditions for energy solutions driven by external parties to relieve households from having to become sole actors in their own aid.

[1] Tableau. *Data Map Discovery: How to use spatial binning for complex point distribution maps*. Accessed at: https://www.tableau.com/about/blog/2017/11/data-map-discovery-78603

IV. Task Force Members

First Name	Last Name	Job Title	Company
Adiel	Morales Burgos	Head of Project Management	2G Energy North America
Anthony	Perez-Santiago	Product Development Engineer	DEPCOM Power Inc
Beth	Straight	Operations and Data Manager	Community Through Colors
Cimagaroon	Howell	Project Mangager	KU Associates
C.P.	Smith	Executive Director	Cooperativa Hidroeléctrica de la Montaña
H.G.	Chissell	Founder, CEO	Advanced Energy Group
Jason	Negron	Commercial Sales Representative	Batricity

Jemaris	Martes	Business Development, Utility-Scale Renewables	Glenn International
Joana	Abreu	Manager, Research	TRC Companies

Joaquin	Altenberg	CEO	Clean Energy Nexus PR
Loraima	Jaramillo	Program Manager	IREC
Luis	Monterrubio	Manager of Geospatial Programs	IEM
Magdalena	Fudalewicz	Senior Associate	Primera Group, Inc.
Maria	Barrera	Business Development	Fortress Power
Maribel	Hernandez	Board Member	Cooperativa Hidroeléctrica de la Montaña
Mark	Nakayama	Partner	11 Million Acres, LLC
Rafael	Roig	Senior Program Manager	Tetra Tech
Teresa	Morales Howell	Senior Policy Consultant, CDBG-DR and CDBG-MIT	HORNE LLP
Thomas	King	Founding Director	Fundación Borincana
Wanda	Rios	Directora Ejecutiva	Cooperativa de Energia La Margarita