Energy Assurance Plan
Government of Puerto Rico
June 30, 2020

SUBMITTED BY
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Energy Public Policy Program
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I. Executive Summary

The Governor of Puerto Rico has assigned the Puerto Rico Energy Policy Program from the Department Economic Development and Commerce (DEDC-EPP), to develop the Island’s Energy Assurance Plan (EAP) under Act 17-2019. The regulatory compliance involves policy mandates that define specific roles of the Energy Policy Program from the DEDC as the lead agency on energy response during an emergency. Based on Act 17 of 2019, the DEDC-EPP has the obligation to:

“Before each hurricane season, the Department of Economic Development and Commerce through the Energy Public Policy Program shall coordinate with the agencies and instrumentalities of the Government of Puerto Rico a revised Energy Assurance Plan providing for the establishment of a standardized Incident Command System (ICS) and Incident Management Team (IMT).” ACT 17-2019

Puerto Rico’s only EAP to date was developed in 2012 and submitted to the U. S. Department of Energy. This 2020 EAP represents the first response approach from an energy emergency perspective for the government of Puerto Rico, based on catastrophic experiences that created precedents for FEMA and new guidelines for the Emergency sector of the United States. The DEDC-EPP strongly believes in the importance of pursuing better energy assurance planning to help contribute to the resiliency of the energy sector, including the electricity grid, by focusing on the entire energy supply system, which includes refining, storage, distribution of fossil and renewable fuels, and incorporation of new smart grid technologies.

This Plan is a result of collaborative efforts between different public and private entities that provided support to existing emergency guidance. A Memorandum of Understanding (MOU) between Department of Economic Development and Commerce (DEDC) and Central Office for Recovery, Reconstruction and Resiliency (COR3) was developed to maintain holistic coordination with federal and government agencies. The Plan also recognizes current recovery efforts like the Joint Operational Catastrophic Incident Plan (JOCIP), developed by the Puerto Rico Emergency Management Bureau (PREMB). DEDC-EPP managed a collective process to assess what is needed to develop a holistic EAP, by maintaining standard levels of reliability and transparency. Within the Advocacy Group, DEDC-EPP engaged key stakeholders, including:

i. U. S. Department of Energy (DOE)
ii. Central Office for Recovery, Reconstruction and Resiliency (COR3)
iii. Puerto Rico Energy Power Authority (PREPA)
iv. National Association of State Energy Officials (NASEO)
v. University of Puerto Rico and Inter American University of Puerto Rico
FEMA- Threat and Hazard Identification and Risk Assessment

U. S. Department of Homeland Security (DHS)

PUMA ENERGY

The Working Group was part of the development and critical analysis of the EAP. Information and guidelines suggested for the planning, preparedness, response and recovery was discussed with all different parties at different stages. Nevertheless, the DEDC-EPP recognizes the limited time of 6 months, within earthquakes and COVID-19, as a limitation for a more comprehensive approach. The EAP will be updated considering current health crisis of COVID-19 and recent announcement of privatization for the transmission and distribution system. New roles and responsibilities that impact the existing Operational Emergency Plan from PREPA and PREMB’s Joint Operation Catastrophic Incident Plan will need to be updated as well.

Since the last EAP of 2012, Puerto Rico was hit by Hurricanes Irma and María, two of the strongest storms in recent decades. Hurricane María struck Puerto Rico as an upper level Category 4 storm with sustained winds of over 150 mph and rainfall exceeding 24 inches. María devastated the island, which was still in emergency response mode following Hurricane Irma. The situation led to a complete failure of Puerto Rico's electric power grid, transmission and distribution lines across the island, flooding substations, generation, and distribution facilities, resulting in the longest duration power outage in U.S. history.

The DEDC-EPP recognizes that the Puerto Rico EAP must reflect and address the unique lessons learned from recent hazards and threats that Puerto Rico has faced. Accordingly, the DEDC-EPP approached this effort with an interest in actively collaborating with local and state stakeholders in Puerto Rico, including the government-owned electric utility, wholesale fuel providers, consumer representatives, and other Island governmental agencies. This holistic approach includes shared responsibilities between the private sector, non-governmental organizations, and other government entities under the National Response Framework called Emergency Support Functions. The term “energy”, under ESF #12, includes producing, storing, refining, transporting, generating, transmitting, conserving, building, distributing, maintaining, and controlling energy systems and system components.

Regardless of the reason for the energy disruption, if the petroleum, electricity or natural gas sectors are impacted, there will be cascading impacts on other critical infrastructure, which heightens the need for decisive action from the state to address the shortage situation. A shortage exists whenever the Governor receives notification by the Department of Economic Development and Commerce of an increase in the demand for any petroleum product or there is a decrease in the available supply for the petroleum product. This situation may cause a
major adverse impact on the economy, public order, or the health, welfare, or safety of the people of Puerto Rico, and may not be responsibly managed within the distribution system. These interdependencies constitute a “system of systems” in which the failure of one or multiple infrastructure elements can cascade and affect the resilience of the entire system.

The EAP provides an extensive perspective of critical infrastructure sectors rather than workers. It also includes stakeholders who support crucial supply chains for critical infrastructure. The industries they support represent, but are not limited to, medical and healthcare, telecommunications, information technology systems, defense, food and agriculture, transportation and logistics, energy, water and wastewater, law enforcement, and public works.

State, local, tribal, and territorial governments are responsible for implementing and executing response activities, while the Federal Government is in a supporting role. The EAP establishes an energy disruption emergency response structure, while adhering to relevant public health guidance. The critical infrastructure owners and operators are expected to use
their own judgement on issues of the prioritization of business processes and workforce allocation to best ensure continuity of the essential goods and services they support.

All decisions should appropriately balance public safety, the health and safety of the workforce, and the continued delivery of essential critical infrastructure services and functions.

The U.S. Department of Homeland Security’s (DHS) Cybersecurity and Infrastructure Security Agency (CISA) provides roadmaps to secure essential critical infrastructure during any emergency. Consistent with these authorities, CISA has developed, in collaboration with other federal agencies, State and local governments, and the private sector, an “Essential Critical Infrastructure Workforce” advisory list. This list is being used to protect local communities, while ensuring continuity of functions critical to public health and safety, as well as economic and national security of Puerto Rico.

The island is required under Federal Homeland Security funding guidance to implement the National Incident Management System (NIMS). As the local government develop their critical infrastructure plans, each Governor has designated a State administrative agency to support the development of homeland security strategies, implement strategic goals and objectives, and administer Federal preparedness assistance. The National Association of State Energy Officials (NASEO), in collaboration with the National Association of Regulatory Utility Commissioners (NARUC), has produced Energy Assurance Guidelines that outline States’ overall role in energy assurance. This role includes operating within the Federal ESFs structure, organizing and building response mechanisms, coordinating with stakeholders, planning response strategies, profiling energy use and vulnerability, and identifying fuel related response measures. NARUC and NASEO continue to work with DOE to conduct multi-State and regional exercises and training sessions on energy emergency preparedness, response, and key Critical Infrastructure Protection (CIP) issues, as well as provide technical assistance to States to update their energy assurance plans.

Puerto Rico’s EAP is designed to enable effective coordination between the nongovernmental organizations, local, State and Federal Government before, during and after an emergency. This document contains the organizational structures that will carry out during the different phases of the emergency. FEMA will coordinate the Federal government’s response role during declared emergencies. Simultaneously, the Puerto Rico Emergency Management Bureau (PREMB) and DEDC-EPP, will coordinate with the non-governmental organizations, local governments, and State Agencies to prepare for, respond to and recover from an unforeseen occasion in Puerto Rico. During past emergencies, Puerto Rico experienced severe damage to the critical infrastructure of the island resulting in the total collapse of the power
grid and drinking water systems, as well as severe environmental damage affecting the capacity of governments and communities to achieve rapid recovery.

All levels of government share responsibility in identifying, mitigating, preparing for, responding to, and managing the recovery from energy incidents, emergencies, or disasters that affect Puerto Rico. However, it is impossible for the government alone to perform everything required to protect lives and property within the island. Residents and businesses also have the responsibility to prepare themselves to cope with energy disruptions and manage their affairs and property in ways that will aid the government in managing energy interruption. Energy Assurance Plan’s execution is essential to secure stakeholder buy-in and acceptance, to negotiate priorities and to ensure that proper expectations have been set regarding the work effort that lies ahead and the results to be produced.

The adoption of NIMS and other national doctrine provides a consistent approach to the effective management of energy disruptions resulting from natural or human caused incidents, emergencies, and disasters. This adoption allows the Government of Puerto Rico to conduct its response activities using a set of standardized organizational structures designed to improve interoperability among all levels of government, the private sector, and non-governmental organizations. The EAP for Puerto Rico, in accordance with the National Response Framework (NRF), is an integral part of the national effort to prevent and reduce vulnerability to terrorism, major disasters, and other emergencies. Also, serves to minimize damage and facilitate recovery from attacks, major disasters, and other emergencies that may affect energy supplies. The Plan is written to identify the roles and responsibilities, authorities, actions for State agencies, and stakeholder involvement for energy disruptions or emergencies that will affect the Puerto Rico Government for liquid fuels and natural gas.

This EAP relies on the concept that the energy assurance functions that many departments and agencies perform, must parallel their normal day-to-day functions. Because incidents, emergencies, and disasters can deplete personnel and equipment resources, agencies could suspend, for the duration of an energy disruption, some routine functions that do not contribute directly to resolving the energy disruption. They will redirect personnel, equipment, and supplies to accomplish tasks that would normally be required for those routine functions.

The diagrams demonstrate the step by step response actions, responsible stakeholders of ESF #12 that needs to support the diagram and suggested chain of command during an energy emergency. The synergy and communication between different stakeholders should represent a holistic approach.
INCIDENT ESF 12 STRUCTURE FIELD OPERATIONS

INCIDENT COMMANDER EXECUTIVE
Director
Yan Oquendo

Public Information Officer
(Energy Conservation Specialist)
Maura Ríos

Liaison Officer
(Director's Assistant)
Hernán Orama

Operations & Logistics
(State Energy Program Manager)
Carlos Tejera

Safety Officer
(Weatherization Assistance Program Manager)
Juan Lamboy

Finance
(CFO)
Rubén Rivera
Three different groups are being provided with responsibilities based on ESF #12 structure. Federal, State and private sector must work as one response tool for having positive results. The Federal Government through the corresponding agencies will provide the funds, resources, and assistance necessary to the State under federal laws and directives. After emergency is declared, the State Government will be responsible for issuing the request for an emergency or disaster declaration to the Federal Government. PREMB and DEDC-EPP under the direction of the State Coordinating Officer (SCO) and the Secretary of PR Department of Public Safety will activate the Joint Operational Catastrophic Incident Plan and coordinate the response and recovery efforts with the non-governmental organizations, local governments, and state agencies.
Each government’s top official will be responsible for carrying out the activities that are described in this plan and take the executive decisions necessary to fulfill the plan objectives under ESF #12.

The private sector will be represented by the Business Emergency Operations Center (BEOC). The BEOC will provide critical infrastructure data related to the energy sectors they represent to DEDC-EPP and will be responsible for activating their own Emergency Operations Plan (EOP). The BEOC represents the following industry sectors: Transportation, Water, Energy, Financial Services, Chemical, Critical Manufacturing, Health, Food, Information Technology, Agriculture and Commerce. The BEOC will have a liaison team at the State EOC that will maintain open communication channels between the state appointees and the private sector. All actions will be based on a holistic approach understanding the direct and indirect impact on different sectors.

The EAP is a living document that interacts with most of the plans that were developed after lessons learned from Hurricane María, recent earthquakes and current health crisis that is being address under COVID-19. The document will be revised, and training should be part of every year preparation before hurricane season starts. This Energy Assurance Plan 2020 represents the approach from the energy sector that addresses local public policy compliance for maintaining infrastructure resiliency of Puerto Rico.
II. Introduction

Puerto Rico’s Energy Public Policy Act 17-2019, page 103, Section 1.4 establishes the State disaster preparedness team and requires the DEDC to develop disaster preparedness plans. Such disaster preparedness plans are to address disaster prevention, response, and recovery, and collectively comprise the elements of the Government’s Energy Emergency Management Plan. The DEDC-EPP provides general strategic guidance and an organizational structure of Puerto Rico’s agencies during emergency response and short-term recovery operations. This Energy Emergency Plan serves as an annex to the PREMB’s Joint Operational Catastrophic Incident Plan of Puerto Rico and utilizes all the existing powers and authorities to develop and maintain a comprehensive emergency management program. Based on the responsibility for energy emergency planning and response for Puerto Rico, the “Department of Economic Development and Commerce through the Energy Public Policy Program shall coordinate with the agencies and instrumentalities.” DEDC now becomes the liaison of the energy sector during any emergency situation.

Act No. 76-2000 article 1 from page 3, "Law of Procedures for Situations or Emergency Events", authorizes the Governor to declare an energy or fuel supply emergency. Upon declaration by the Governor of an energy emergency threatening the health and welfare of the State’s citizens or economy. A state government cannot properly plan for and respond to an energy emergency unless it has a solid understanding of its energy markets, energy interdependencies, energy regulatory environment, and threat environment. This plan includes a thorough analysis of those key items. Additionally, the plan examines options that are available to the state to respond to and mitigate an energy shortage. Lastly, the plan discusses how emerging technologies and issues in renewable energy generation, the smart grid, and cybersecurity can impact the state’s energy reliability and security.

Puerto Rico’s energy sector, government structure, and threat environment are not static; therefore, the relevance of certain sections of this plan will change with time. It is the goal of the state to update this plan as needed and to ensure that Puerto Rico’s Emergency Support Function (ESF) #12 team remains engaged and educated on the topics contained in this plan. Due to the geographical location of Puerto Rico, after a catastrophic incident, the island could be isolated entirely due to the damage caused to ports and airports. This means that the additional federal aid could take weeks to arrive. Also, supplies and food for the population and roads and routes access could be severely impacted leaving many municipalities isolated. Health care services, both public and private sectors including childcare, centers for the elderly and patients with special needs would be impacted.
As mentioned before, the Energy Assurance Plan is a living document that coordinates with other federal, state and private plans to implement the best possible strategy during an emergency. The coordination of plans represents a holistic approach that will be updated based on lessons learned or new contingencies that were not addressed before.

The communication between all guidelines will respond to events that disrupt energy supply and assure a rapid return to normal conditions. This is a coordinated effort involving the private energy sector’s response, augmented by the local, state and federal government.
A. Nature of Energy Assurance Plan for Puerto Rico

Protecting and improving the resiliency of the Energy Sector in the face of both manmade and natural disasters is an ongoing effort that requires continued vigilance, contingency planning, and training. The EAP is intended to:

1. Define energy system parameters that need to be monitored during normal conditions and the type and magnitude of the variations in those parameters that could signal an impending emergency.
2. Assist government officials and stakeholders who are responsible for the health, welfare, and safety of the citizens of Puerto Rico with establishing priorities to mitigate the impact of an energy disruption on the island and its citizens, and respond to and rapidly recover from any energy shortage or energy emergency in Puerto Rico.
3. Establish a system to monitor and assure the adequacy and reliability of energy supplies.
4. Outline roles and responsibilities for responses to energy disruptions and energy emergencies.
5. Refer to the legal authorities, government, and industry contacts that will support response actions during an emergency.

The primary goal of which is to develop a strategic plan for the central government and its agencies to respond to a variety of energy emergencies such as blackouts, hurricanes, floods, fires, earthquakes, tsunami, or possible terrorist attacks and to integrate new energy portfolios (renewables, biofuels, etc.) and new applications, such as Smart Grid technology, into energy assurance and emergency preparedness plans.

Another purpose of this EAP is to provide the Incident Command Executive Board and energy consumers with a clear understanding of the state’s plans, processes, priorities, programs, personnel and timeframes to address the critical energy emergency issues. In addition to identifying the Island’s energy resources, infrastructure and the designated state agencies authorized to prepare for and address an acute energy emergency; this EAP identifies the critical public and private entities engaged in the energy industry at the international, regional, state and local levels of activity. Many of these public and private organizations are not only responsible for coordinating with the state in an energy emergency; they are directly responsible for the ongoing production, management, transmission and distribution of many of Puerto Rico’s energy products and services.
To accomplish this effort, the DEDC-EPP seeks to:

- Integrate emergency energy response activities of the major stakeholders in Puerto Rico.
- Assess existing energy supply systems and the energy resources among energy producers that serve the island (including identifying gaps that may exist among these resources).
- Identify critical infrastructure interdependencies and develop protection measures for critical energy infrastructure on the island.
- Incorporate response actions for new energy portfolios, including smart grid technologies that are being deployed in Puerto Rico.

It is intended that the EAP will be incorporated into the Joint Operational Catastrophic Incident Plan of Puerto Rico (JOCIP) and executed in coordination with Puerto Rico Emergency Management Bureau, which is the lead agency for coordinating activities, resources and efforts between states, federal, municipal and private sector at the time of an emergency or disaster, including energy disruptions.
B. Energy Security from an Emergency Management Perspective

The Energy Assurance Plan offers Puerto Rico many benefits that make this effort important. For example, by updating EAP, Puerto Rico’s central government will be able to address energy supply disruption risks and vulnerabilities in their plans to lessen the impacts that such incidents have on the economy and the health and safety of citizens. Better planning efforts will help contribute to the resiliency of the energy sector, including the electricity grid; by focusing on the entire energy supply system, which includes refining, storage, and distribution of fossil and renewable fuels. In addition, the DEDC-EPP as the central facilitator for energy emergency response planning, will be able to establish better channels of communication and coordination between the Puerto Rico Electric Power Authority (PREPA). Emergency responders, the central government and its supporting agencies, the press and media, and the public during energy emergencies. PREPA is the government-owned organization engaged in producing, transmitting and distributing electricity to its customers across Puerto Rico.

DEDC-EPP has taken an “All Hazards Approach” toward the creation of this EAP to ensure that Puerto Rico is well prepared to address the occurrence of both natural and man-made event that potentially can impact energy infrastructure assets in our territory, including:

- Hurricanes and Tropical Weather Systems
- Sabotage/Terrorism
- Tsunamis
- Flooding
- Earthquakes
- Wildfires
- Civil Disturbance
- Infrastructure Failures
- Other, Unidentified Natural Disasters

In order to maximize the impact of a revised Energy Assurance Plan on improving the Island’s energy resiliency in emergencies, Puerto Rico recognizes the centrality of sound data collection and management. This EAP is designed to continue its energy assurance training efforts through the work of designated energy assurance personnel, responsible for energy assurance planning and implementation, and in coordination with other Island agencies that have significant assurance training responsibilities. These exercises and training will also help guide future energy assurance planning because they will reflect the energy situation at the time of the exercises.
DEDC takes seriously its role as the central administrator for energy assurance planning in Puerto Rico. While this effort unquestionably relies on collaboration among the major stakeholders in Puerto Rico, it is also important to have one single entity that bears the responsibility for developing and overseeing the policies and procedures for emergency response under ESF #12. There are some action limitations that the EAP will address but have no jurisdiction on decision making. The Plan serves as an action guide to maintain safety measures but some of those actions are responsibility of other stakeholders.

### SEF #12 LIMITS OF RESPONSIBILITIES FROM DEDC-EPP

- **Establish Restoration Priorities for the Energy Industry**
  - SESF #12 can, however, work with industry and emergency management to identify critical infrastructure.

- **Acquire, manage, or operate emergency generators**
  - SESF #12 does, however, provide input on prioritizing facilities to receive generators based on the projected electricity restoration schedule.

- **Dictate to industry destinations of fuel shipments**
  - SESF #12 can, however, work with industry and emergency management to assist in expediting fuel delivery, and to resolve issues impacting delivery efforts.

Emergency Support Function 12 (Energy) is a grouped function along with others ESFs that provides assistance to the Department of Homeland Security (DHS) by assisting local, state, tribal, territorial, and Federal government entities, nongovernmental organizations (NGO), and the private sector by coordinating government capabilities, services, technical assistance, and engineering expertise during disasters and “catastrophic incidents” that require a coordinated Federal response. A “catastrophic incident” is defined as: “any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, or government functions.”

The Energy Security Plan under an Emergency perspective defines the operational functions, roles and responsibilities of Federal and State Agencies before, during and after an emergency event. This plan is designed to establish a synchronized operational structure between the Federal Government and the State Government to carry out activities of preparedness, response, recovery, and mitigation for incidents that have the potential or have caused serious
damage to the population and infrastructure of Puerto Rico. The EAP complements the JOCP and establishes an operational, logistical, and administrative procedures that will be carried out from the identification of a potential threat for the island until the recovery process after a disaster.

C. Significant Energy Emergencies in Puerto Rico

Lessons learned from recent emergencies obligated local emergency planners to prepare Puerto Rico for terrorist attacks, major disasters and other emergencies, it is impossible to maintain the highest level of preparedness for all possibilities at any given moment. Under limited resources, managing the risk posed by major events is imperative. In an atmosphere of changing and evolving threat, it is vital to build flexible capabilities that will enable the island to prevent, respond to and recover from a range of major events.

To address this challenge, the EAP provides a description of the most significant energy crisis to evaluate, compare and suggest possible solutions to mitigate future incidents. Various schemes have been used in the past EAP to analyze scenarios based on probability, number of casualties, extent of property damage, economic impact, and social disruption. Most of those events were not proportionally comparable to the scenarios in this Plan. All three different incidents are being recognized to test and develop a full range of response capabilities and resources, and to assist Federal, State, and local governments, as well as the private sector in preparedness.

i. Power Blackouts
Equipment breakdowns, lack of equipment maintenance or inadequate maintenance, and lack of staff experience caused by the high number of people who have retired contributed to the September 21 blackout that - in less than 27 seconds - left the country without light for at least 60 hours.

The College of Engineers and Surveyors of Puerto Rico (CIAPR) presented the results of the investigation into the general interruption of Puerto Rico’s electricity service, which occurred on September 21, 2016. The report ruled out sabotage and does not mention anything about lightning having caused the blackout. It was ruled out that the cause is that the plants were old. The event, which occurred in 2.6 seconds and culminated in the total interruption of the electrical system, began with a disturbance on line 51000, in the stretch between Aguirre and Aguas Buenas, that the oscillographs of Aguirre record as a breakdown from phase B to ground. However, this was not the cause for this general interruption.

The cause of the interruption was the effect of the combination of breakdowns and operational failures occurring on the four (4) different switches, combined with a limited rotating load reserve in the system during the time of occurrence. Each of these faults has an individual technical explanation, but none of them individually should be the cause of a general interruption.

The breakdown in the switch OCB 51030 was the basic cause of the outage. This had an internal mechanical fault at the pole of the bar #2 (north side), exploded the vessel of phase B, and caused a high intensity fire that affected the 230 kV switch yard almost entirely. The commission understood that the source of the fault was caused by contamination of insulating dielectric oil.

The extensive recovery time of the electricity is another fact that emerges from the report, since it exceeded what is reasonably acceptable. According to the CIAPR Ad Hoc Committee, the data evaluated are indicative that the boot units ("Black Start") require more attention and maintenance.

The total recovery of Puerto Rico’s electricity system exceeded 60 hours. This period to restore the island’s electrical system is considered excessive after such an event, where damage to system elements are known prior to the start of the reset. The area where the fault occurred was quickly inspected and, following the cleaning and insulation of the damaged devices, was available to be energized in 10 hours. This is considered a satisfactory result.

After the incident, local engineering entities concluded that Puerto Rico needs a well-defined energy public policy that covers all elements, including metrics of efficiency,
safety, performance and quality of service. Despite the long lines of thousands of Puerto Ricans in hotels and restaurants after the country was left in the dark for more than 40 hours, the final balance of the incident is not necessarily positive for Puerto Rico's tourism industry, let alone the economy in general.

Other related electricity interruption occurred during 2019. Officials reported that an interaction with a cat was the main cause for the first outage, which left thousands of people without power in the capital of San Juan. The second outage, was blamed on an iguana that contacted a 115,000-volt bar, leaving some 100,000 people without power. These cases reflected the vulnerability of local infrastructure after hurricane María.

ii. Hurricanes Irma and María

On Wednesday, September 20, 2017 at 6:15 am Hurricane María enters Puerto Rico through Yabucoa. According to the report of the National Oceanic and Atmospheric Administration (NOAA) María, Hurricane Category 4, had winds of 113 and sustained maximum winds of 155 miles per hour. Figure 6-1 shows the trajectory of the
hurricane. NOAA states in official communication that "As the center of the storm moved west-northwest on P.R. to the inland and northwest of P.R., hurricane-force winds spread throughout the mainland along with extremely heavy rains that produced catastrophic flooding and flash flooding, especially through the northern half of Puerto Rico" (NOAA, 2017).

During 2017, the Electric Power Authority was the most relevant player in the discussion of energy issues in the PR archipelago. According to renewable energy researchers such as Dr. Ramón Bueno of the Massachusetts Institute of Technology, the AEE was in 2017 the island's chief patron with more than 6,000 employees, even though a 30% decrease in recent years. In July, the public corporation filed for bankruptcy, with its share of public debt at $9 billion and another $2 billion in underfunded pension obligations. That and several other reasons increased the fragility of physical infrastructure. The Puerto Rico Energy Commission (CEPR) has documented that, at the time of the impact of Irma and María, the electricity system had become fragile because of its old age and maintenance, due to inadequate planning and management.⁷

The Energy Status Report for Puerto Rico 2017 shows that 80% of the transmission and distribution system collapsed after hurricanes. In the larger-capacity transmission lines between north and south, at least 10 high-voltage towers collapsed.⁸ The entire transmission loop of the east and much of the western were also devastated by the hurricane. However, the disaster related to Hurricanes Irma and María, also became dormant by the social interconnection of the Puerto Rican electricity system and its physical-technological characteristics, with the multiple dimensions of human well-being on the island.
Figure 6-2 shows the wind speed readings that could be obtained during Mary's passage. They indicate that Gurabo had a reading of 120 mph and Salinas of 118 mph.

It should be noted that most of the stations were affected and many of the data could not be obtained.

The passage of Hurricane María, two weeks after the passage of Hurricane Irma (Category 5), caused significant damage to the country's electricity grid, telecommunications, land, air and sea transportation, water supply and treatment, as well as other basic services such as doctors, safety and education. The cost of rehabilitating affected services is estimated to exceed $120 billion.9

Puerto Rico's energy system collapsed completely after Hurricane María. Reports issued by the Federal Department of Energy estimate that from September 20 to 29 there were no ESA customers with the electric power service.10

Reconstruction work on the electrical system was slow. The Acting Director of the AEE Justo González, reported that 100 days after the passage of Hurricane María only 55% of the subscribers had been reconnected to the system (El Vocero, 2017). Reports from the Federal Department of Energy (DOE) indicate that by the end of 2017, 85.10% of substations, 76% of transmission lines, 927 gas stations were operating and 69.8% of customers had electric service.11 The Build Back Better: Reimagining and Strengthening the Power Grid of Puerto Rico report included an appraisal of the state of the electrical system following Hurricanes Irma and María. It mentions that the transmission lines of
the P.R. center were severely damaged. The distribution system had significant damage, up to 75% of circuits needed repair, both the air and underground system were affected. Many substations were damaged, and several had critical (inoperable) damage or were inaccessible due to landslides or flooding.

Extensive damage of parking (switchgear), control systems and protection due to flooding were identified. In analyzing the system's operations, the task team mentions that Hurricane María caused extensive damage to transmission and distribution equipment, which compromised the EEA's ability to monitor, operate and control electrical operations across the island. Damage to generation facilities varies from minor to extreme. This report carried out assessments of damages by generation facilities, to know them in detail, please visit:


According to P.R. Indicators data, large-scale renewable generation was significantly reduced. During October, photovoltaic power did not inject power into the grid and in November and December they only contributed .3 mkWh and .2 mkWh, well below the average for the rest of the year of 18.73 mkWh. Wind power was left out of the energy mix until February 2018. The wind farm located in Naguabo suffered considerable damage and losses of almost 70% of the initial investment.

On the other hand, the passage of Hurricane María affected 70% of drinking water treatment and distribution systems. 220 out of 714 pump stations were reportedly left out of operation, 22 of the 51 sewage treatment plants were left out of operation.30 The agricultural sector was also affected by the hurricane, it was damaged by 80% of
Losses in the agricultural sector are estimated to exceed $2 billion.

iii. **Earthquake 2020**

A series of earthquakes left Puerto Rico in the dark on January 2020 as power outages swept nearly the entire island. About 80 percent of utility customers had power restored in 96 hours, yet authorities warned it could take weeks to stabilize the overall system.

A 6.4-magnitude earthquake rocked the U.S. territory on 7 January following days of seismic activity. Tremors and aftershocks leveled buildings, split streets, and severely damaged the island’s largest power plant, Costa Sur. The blackouts hit a system still reeling from 2017’s Hurricane María—which knocked out the entire grid and required $3.2 billion in repairs.

José Ortiz, CEO of the state-run Puerto Rico Electric Power Authority (PREPA), said the 820-megawatt Costa Sur facility suffered the brunt of the earthquake damage. The oil- and gas-burning power plant generates more than one-fourth of the island’s electricity, but this week it became a scene of cracked foundations, fallen equipment, ruptured turbines, and spilled water tanks. When Ortiz toured the plant on 8 January, a smaller earthquake shook the structure and forced utility workers outside.

The 6.4 earthquake cause power outages after tremors triggered automatic emergency response systems, which shut off power plants as a safety mechanism, Puerto Rico’s Gov. Wanda Vázquez Garcés told the press. But next day aftershock caused physical damage. PREPA engineers were able to restore power within hours to some parts of the island. Yet two-thirds of the utility’s 1.4 million customers remained without power for days.

When Hurricane María entered the island two years before the earthquake, it cut a diagonal path from southeast to northwest, knocked down key transmission lines that link supply to demand. The main problem was that there was not enough electricity to distribute. “What we need is to start generating power,” the PREPA chief said at a news conference.

Still, Puerto Rico’s grid remained unstable for several more weeks. Before the earthquakes, the utility was in the process of replacing a transformer in one unit of the Aguirre power plant in Salinas. That fix provided another 300 megawatts on early February 2020.
The Government of Puerto Rico asked the U.S. Federal Emergency Management Agency (FEMA) to supply a generator at Costa Sur to provide 500 megawatts of electricity. However, FEMA told CBS News that the emergency declaration that President Trump signed on 7 January doesn’t allow the agency to provide such generators.12

FEMA said it is “supporting and working closely with” officials in Puerto Rico to assess the earthquake damage in the most impacted municipalities: Guánica, Guayanilla, Ponce, and Yauco. “FEMA has prepositioned life-sustaining supplies, including meals and water throughout Puerto Rico to support the needs of the Commonwealth,” a spokesperson said by email.13

The New York Power Authority (NYPA) sent 10 technical experts to Puerto Rico to assist PREPA in emergency response efforts. The state-run utility deployed engineers and line workers to the island after Hurricane Maria and helped write the “Build Back Better” report, which outlined a $17.6 billion plan for strengthening Puerto Rico’s grid—including $32 million in repairs and storm hardening measures to the Costa Sur power plant. About 70 percent of the island’s power generation is in the south, while 70 percent of power demand is in the north.
D. Document Organizational Structure

The Energy Assurance Plan for Puerto Rico is concentrating on the most significant events that have been influential on local infrastructure emergency management. The description of the events, infrastructure vulnerabilities review and synergies between stakeholders are being addressed for understanding resiliency opportunities. The EAP provides a macro perspective about specific challenges that the Island must protect, respond and recover from future incidents that affects our energy, social and economic stability.
III. Energy Assurance Plan Objectives

A. Define and clarify stakeholders’ roles: public, private, academy

During an event, operational management will be important to the success of mitigation, response, and recovery. The Government agencies will establish a structure allowing for clear lines of communication and coordination under ESF-12. Different stakeholders’ roles must be managed shared to conduct a range of operations and services that are typically essential to continued critical infrastructure viability, including staffing operations centers, maintaining and repairing critical infrastructure, operating call centers, working construction, and performing operational functions, among others. Clear and definitive roles and responsibilities are the key to a successful response to a potential or real emergency. For most energy assurance functions, successful operations require a coordinated effort from several departments, agencies, and groups. Officials, departments, agencies and other personnel have also the responsibility for planning and coordinating specific functions that will facilitate a collaborative effort.

EAP Objectives: stakeholders’ roles: public, private, academy Diagram.
B. Transparency of information: data access and required infrastructure

Energy shortages deserves public explanations. Most small electric outages and natural gas line breaks are not usually reported in the media. Any event, however, can come to the media’s attention, depending on how many customers are affected and the time it takes to restore energy. A threatening event will concern the public, and people will turn to the media for answers. Reciprocatively, the media will begin its investigation with PREPA and state officials.

Energy sectors and the government have long wrestled with the challenge of providing accurate and graphic energy emergency information without causing panic. After Hurricane Maria, most of the island’s citizens are well-prepared and tolerant of temporary outages or shortages. The degree of tolerance is directly correlated with the access of timely information. Over the years, PREPA and the government have learned the value of being forthright with the public when discussing emergency situations. A lack of such information can sour public opinion and hinder cooperation. PREMB establishes a Joint Information Center (JIC) to ensure the consistency of the messages sent to the public. The JIC handles all media inquiries, coordinates requests for interviews, and issues press releases with the Office of the Governor.

See below for common questions asked by the media following a disaster. These questions will be addressed by a coordinated effort between different entities with DEDC-EPP as the point of contact for data networking.

1. How long will it be before the situation returns to normal?
   We are not sure when the situation will return to normal at this time; we will provide updates on a regular basis.

2. When did your response to this begin?
   The State Energy Office was activated on [Tuesday], we have staff deployed to the State Emergency Operations Center, as well as the Shortage Management Center.

3. What is the worst-case scenario?
   The fuel/energy shortage may continue for weeks or months.
   We will provide information as soon as we receive it.

4. What can people do to help?
   People can follow the guidance provided for conserving fuel.

5. When will we find out more?
   The next press conference will be at [Time] [Date].

6. How do you know the measures are working?
   We have procedures in place to monitor the effectiveness of these measures.
7. Who else is working with you to deal with the disaster?
   *We are working with county, state, and federal agencies.*

8. Will these measures be implemented statewide?
   *Yes, these measures will go into effect for all islands, please check your county emergency management website for more information.*

9. What are you doing to inform the public?
   *We are providing information on the county emergency management websites, the DEDC website, and through various social media sites.*

10. Why are these measures being implemented?
    *These measures are designed to increase the availability of necessary supplies for response agencies as well as the public.*

11. What does the public need to do if they see gas stations price gouging?
    *The public can send their reports of price gouging to the state’s Office of Consumer.*

With the EAP, energy emergency events will have a direct impact with the public adoption. It will be published on different websites as a collective government effort. The goal will be to provide weekly energy supply, demand, and price data by expanding fuels types, and level of detail during the emergency. As mentioned before, public access to an EAP was not available since 2012. Nevertheless, this public document will now be accessible under different websites.

- FEMA/COR3: https://recovery.pr/en
- DDEC: https://www.ddec.pr.gov/
- PREMB: http://manejodeemergencias.pr.gov/
C. Understand current Electricity profile by the State and identify vulnerabilities

The devastation of Hurricane María demonstrated how vulnerable the electric grid and critical infrastructure was in 2017. But when the next incident happened, hard-hit 6.4-magnitude earthquake, the island was once again plunged into darkness. “Puerto Rico is especially vulnerable: The beleaguered power authority, which filed for bankruptcy in July 2017, is $9 billion in debt, serving customers who can ill afford higher rates on an island that is also bankrupt and entering its 14th year of recession.”

Current generation, which is outdated, is inefficient and highly dependent on expensive fuels. Consequently, inefficient plants are equivalent to extra fuel that is needed to operate. The complicated poor infrastructure and the complication of transporting fuel through it also represents challenges. The location of generation plants, as most of the generation is in the south while most consumption in the north. For this reason, the electrical system relies heavily on the distribution and transmission system, which passes through the central mountain range that was severely damaged by the passage of Hurricane Maria. As a result, the plants in the south have not been able keep proper maintenance infrastructure.

Conducting wire carried by aging transmission towers must flow across forested mountain ranges to carry power to the densely populated San Juan area in the north. That leaves the
Energy Assurance Plan for Puerto Rico

June 2020

towers, and therefore the entire system, extremely vulnerable to future natural events and operational maintenance. Puerto Rico’s electric grid is extremely fragile and in need of repair. The natural disasters that have hit the island over the last two years have compounded these issues, highlighting the need for a modern, more resilient electric grid. Distributed energy systems, such as community-scale microgrids, have shown to be a promising solution to Puerto Rico’s electricity resilience and reliability.

D. Define response stages for an energy emergency

Emergency Operational Phases

The emergency operational phases under the JOCIP from PREMB, is being recognized as the foundation for the development of this EAP. The pre-incident (phase 1) involves the operational structure for catastrophic events, active staging areas and resources, situational awareness and public notification, and pre-incident evacuation and sheltering. The response stage (phase 2) that is, the immediate aftermath, assemble safety provisions for responders and public health services, damage assessment, environmental response, search and rescue operations, the restoration of critical infrastructure (such as electricity grids), mass care and shelter, medical shelters, and operational response. Lastly, the recovery stage (phase 3) encompasses the reestablishment of public services, infrastructure and economic recoveries, and federal recovery support.¹⁵

<table>
<thead>
<tr>
<th>Phase 1: Pre-Incident (Preparedness and Mitigation)</th>
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<tbody>
<tr>
<td>Operational Structure for Catastrophic Events</td>
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<tr>
<td>Activate Staging Areas and Resources</td>
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<tr>
<td>Situational Awareness and Public Notification</td>
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<tr>
<td>Pre-incident Evacuation and Sheltering</td>
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<tr>
<th>Phase 2: Response</th>
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<tbody>
<tr>
<td>Safety for Responders and Public Health Services</td>
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<tr>
<td>Damage Assessment</td>
</tr>
<tr>
<td>Environmental Response</td>
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<tr>
<td>Search and Rescue Operations</td>
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<tr>
<td>Restore Critical Infrastructure</td>
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<tr>
<td>Mass Care and Shelter</td>
</tr>
<tr>
<td>Medical Shelters</td>
</tr>
<tr>
<td>Operational Response</td>
</tr>
</tbody>
</table>
Phase 3: Recovery

| Public Services Reestablishment | Sub Phase 3 | 30 days + |
| Infrastructure Recovery         | Sub Phase 3 | 30 days + |
| Economic Recovery               | Sub Phase 3 | 30 days + |
| Federal Recovery Support        | Sub Phase 3 | 30 days + |
IV. Energy Scope Statement

A. Local Energy Supply Chain

i. Energy System Overview

Until 2020, Puerto Rico Electric Power Authority (PREPA) has been the public corporation responsible for the administration, operation, maintenance, and improvements of the electrical system. PREPA was created by Law 83 of May 1941, then known as the Authority of Water Resources. It represented the instrument of the Government to electrify the whole island. Until Act 57 of May 1979 changed its name because the most important resource in generation had ceased to be water (river source). Based on new resources necessity, the PREPA's mission also changed. Citing its documents, the most recent mission is, “to provide an electric power service in the most efficient, safe, economical, reliable, environmentally friendly way that responds to the needs of our customers, who are our highest priority”.16

Subsequent amendments have allowed, among other things, power co-generators to be connected to the PREPA system. That is the case of AES Corporation, generating with coal, and EcoEléctrica, which it generates with Natural Gas. Renewable industrial capacity plants such as Pattern, Gestamp and Windmar have also been integrated, among others, which generate with wind and solar resources.

The term “energy” encompasses producing, storing, refining, transporting, generating, transmitting, conserving, building, distributing, maintaining, and controlling energy systems and system components. Puerto Rico imports 100 percent of its petroleum, natural and propane gas, and coal other states and nations. The petroleum industry is for the most part in the hands of private industry with a few voluntary associations and industry consortiums. What is clear is that all primary fuels to produce energy are all imported except for indigenous renewable resources and from using energy more efficiency. More than nine-tenths of Puerto Rico’s petroleum imports are motor gasoline, distillate fuel oil, and residual fuel oil that serve the Government’s electric power and transportation sectors. For the fiscal year 2019, petroleum fueled 40% of the island’s total electricity generation, and natural gas 39%. Coal continued to fuel 18% of generation, while renewables supplied 2.3%.17

The general infrastructure of an electrical system, responsible for generating, transmitting, and distributing electricity to users, is presented in Figure 1-1. The system consists of generating power plants, generation transformers that increase voltage,
transmission lines, substations with voltage-decreasing transformers, distribution lines and distribution transformers that decrease voltage to levels that can be used by customers. In the modern system you can find generators in distribution circuits (GD), usually using renewable technologies such as photovoltaic and wind, among others.

The PREPA's critical infrastructure for the production, transmission and distribution of electricity is composed by conventional generation plants using fossil fuels and hydroelectric generation, which are currently in production. You can also observe the route of transmission lines at voltages of 115 thousand and 230 thousand Volts. In the figure you can see a great concentration of generation on the south coast of the island. It should also be noted that most of the consumption is concentrated in the north, specifically in the metropolitan area, San Juan, and its surrounding villages.
The power system includes ten fossil fuel and ten hydroelectric generation sites, owned and operated by PREPA, as well as privately owned generation facilities consisting of two cogeneration plants, two windfarms, and seven solar farms. The system also has 34 MW of currently operational hydroelectric generation capacity. Total generating capacity, both installed and available, is 4,877 and 4,324 MW respectively. The electric grid includes 2,585 miles of transmission lines, 31,485 miles of distribution lines across the service territory, and 334 substations. The power delivery and generation system include 559 power transformers and over 2,000 circuit breakers, of which over 700 are Oil Circuit Breakers (OCB’S) that need to be replaced due to condition and failure potential. PREPA generates approximately two-thirds of its electricity and purchases the remaining from third parties. A map of the existing installed generation capacity managed by PREPA is included in Figure 2-1.
Below is a description of Puerto Rico’s electrical system components. More detailed information can be found through Table 1-1, with e-addresses on the pages of the Puerto Rico Energy Bureau.

<table>
<thead>
<tr>
<th>Generation</th>
<th><a href="http://energia.pr.gov/datos/plantas/">http://energia.pr.gov/datos/plantas/</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission</td>
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</tr>
<tr>
<td>Distribution</td>
<td><a href="http://energia.pr.gov/datos/sistema-distribucion-de-la-aaee/">http://energia.pr.gov/datos/sistema-distribucion-de-la-aaee/</a></td>
</tr>
<tr>
<td>Transformer</td>
<td><a href="http://energia.pr.gov/datos/transformadores/">http://energia.pr.gov/datos/transformadores/</a></td>
</tr>
</tbody>
</table>

Table 1-1: Maps of Puerto Rico’s Electricity System in the Energy Bureau

Most of the data shown on this EAP is based on 2017 energy situational report of Puerto Rico. Since all the investment for the local infrastructure have been planned under a recovery perspective, the current situation is a result of temporary efforts to maintain operations until permanent work is developed. The EAP recognizes the 2017 infrastructure as the historic moment that summarizes the culmination of an operational expired infrastructure. It also represents the capture scenario of the Puerto Rico’s energy industry before hurricanes, earthquakes and ongoing COVID-19. From this year on, the infrastructure system has been in constant evolution under new planning, federal funding that will be incorporated to current temporary system recovery.
ii. **Generation**

Puerto Rico’s electrical system has an installed capacity of 6,0911MW. Capacity is distributed among AEE-owned plants by 80.3%, private plants with fossil fuels by 15.9% and renewables on an industrial scale with 3.8%, as shown in Figure 1-3 (PR Energy Bureau). Fossil generating capacity is 96.2% or 5,823 MW.\(^\text{18}\)
AEE generates electricity using fossil fuels and water. As for fossil fuels it mostly uses oil, in its derivatives #2 (Light Oil) and #6 (Bunker). It also uses natural gas (NG), specifically, at the South Coast plant in Guayanilla.

Figure 1-4 presents the comparative relationship between the technologies used by AEE for generation during 2017. As shown in Figure 1-4, the AEE has a capacity of 4770 MW, or 98% of its total, to generate fossil fuels and 2% of its capacity using hydroelectric plants. In the curve it can be noted that the proportion of capacity between the distillates #2 and #6 was very close, 39% and 43%, respectively. The capacity in NG was 17% of the total generating capacity.\[19\]

The thermoelectric plants of the AEE are located along the coast of the island, specifically in the municipality of San Juan, Guayanilla, Toa Baja (Palo Seco), Salinas, Arecibo and Mayagüez. It should be noted that the generating capacity in the south area is close to 63% of the entire capacity of the system, or about 3,791MW. See Figure 1-5. This installs 37%, or 2,262 MW of capacity in the northern area, mainly in San Juan Bay and the port of Arecibo. Figure 1-6 presents the geographical location of the largest thermoelectric plants in the Puerto Rico system. Table 1-2 presents the distribution of electricity generation by generation capacity, technology and location. Note that thermoelectric, combined cycles, diesel, gas turbines, represent about
4,776.1 MW, above 98% of AEE generation, taking into consideration the location of all these plants is indicated by arrows in Figure 1-6.

Figure 1-7 graphically summarizes the information presented in Table 1-2. This figure demonstrates the composition of thermoelectric plants and the combined cycles, which generate energy using fossil fuels.

Puerto Rico's private electricity sector has a generating capacity of 1,194 MW distributed between natural gas, coal and renewables (solar and wind). This generating capacity represents 19.7% of the total capacity of the electrical system. Current percentage is expected to increase significantly as approved renewable projects for power purchase agreement PPA at an industrial scale continue to penetrate.
The private companies to which AEE purchase energy are EcoEléctrica (GN), AES Puerto Rico (Coal) and those from renewable sources: AES Ilumina, Pattern Santa Isabel, Punta Lima Wind Farm, San Fermín Solar Farm, and WindMar Renewable Energy, San Fermín, Horizon, Oriana, Coto Laurel and Humacao Solar. These companies sell energy to the PREPA, as stipulated in a contract between the parties. Such agreements were signed to ensure that the sale price to the AEE is equal to or lower than the generation costs by that public corporation. The agreements were signed under the U.S. Public Utility Regulatory Policies Act (PURPA), which precisely required power companies to
buy electricity from independent producers. Figure 1-8 introduces the distribution of private generation by type of fuel used for private generators. Notice the domain of AES and EcoEléctrica that are generated with fossil fuels. Figure 1-8: Private generation 2017.

Information for the year 2020 on the cost per kWh delivered NEO – net energy output to the PREPA by private generators is presented in Figure 1-9. For renewables, many of the contracts include an annual climbing cost, which causes the cost of kWh purchased from these generators to increase every year. In addition, the prices presented include the cost of Renewable Energy Credit (RECs) which varies from 2¢ to 3¢ to kWh purchased, depending on the contract.20

![Table](https://example.com/table)

### Figure 4: Private Power Generation Costs (May 2020)

#### iii. Transmission

PREPA has about 2,478 miles of transmission lines, including 230 kv, 115 kv and subtransmission lines at 38 kv. There are 48 transmission centers for the interconnection of these lines, which are represented on the map by circles. Sub-transmission lines operate at voltage of 38 thousand Volts. This system runs mostly along the country's roads. In this way they reach the end user, where energy is consumed. In addition, there are over 33,000 miles of airlines and distribution underground, fluctuating in voltage levels between 4,160 and 13,200 Volts.21
Many of PREPA’s transmission lines damaged during the storms were constructed decades ago, located in difficult to access rights-of-way with many line sections spanning ridgelines and mountain tops. Lengthy spans are not uncommon, the geography of the island can make transmission line construction difficult. PREPA indicated that only 15% of its transmission lines were built to withstand a mid-Category 4 storm with the remaining 85% are built to lesser standards.

The 230 kV system comprises circuits with a total length of 375 miles of lines. These lines basically divide the island into two 230 kV loops, one to the west and one to the east, see solid line in Figure 1-10. Costa Sur Central and EcoEléctrica in Guayanilla connect to Mayagüez, Mayagüez connects with Cambalache in Arecibo and from there to Manatí, Manatí returns to the complex of Guayanilla, completing a loop. In the other direction Costa Sur Central and EcoEléctrica connect with Aguirre in Salinas and AES in Guayama, from there the lines continue towards Yabucoa, they return to Aguas Buenas. Manatí then connects with Aguas Buenas and thus end up connected to both ties.

The 115 kV system comprises 727 miles of circuits that surround and cross the interior of the island. The 115 kV lines are represented in the figure by dash lines. This system
completes and complements additional interconnections with lower capacity generating plants such as hydroelectric plants and gas turbines. The 115 kV lines and their substations provide service to all load centers.

During September 2017, the PREPA reported unprecedented damage to the electrical system that included 100% of customers without service due to Hurricane María. According to Ricardo Ramos, past Executive Director of the PREPA, 80% of the transmission and distribution system collapsed after the hurricanes passed. At least 10 high-voltage towers collapsed on the larger-capacity transmission lines between north and south. The entire transmission loop of the east and much of the western area were also devastated by the hurricane. These conditions in the electrical system represented the worst damage to the system, so as early as October 26, 2017 the lack of service was listed as the longest-serving blackout in the United States. Within 100 days of Hurricane María, the past Acting Director, Justo González, reported that approximately 55% of subscribers were connected to the system. (El Vocero).

Figure 2-1 shows the total decreasing number of AEE customers in from 2010 until 2017. The chronological data represents the average of clients per year.

The maximum demand is the peak power of electricity for a specific segment of time. Between 2011 and 2015, Puerto Rico has had the overall downward trend in peak demand, as shown in Figure 2-3. During 2016 it was seen in a slight decrease when
compared to 2015, this trend of reduction was again observed during 2017, in that year, the maximum demand was lower during all months compared to 2016. Figure 2-4 illustrates the monthly maximum demand for 2017. By September we see the decrease in peak demand for the month with 2,800 MW, lower than August (3,060 MW). This reduction probably reflects the passage of Hurricanes Irma and María during that month. Moreover, demand reflects a larger drop in October as hurricanes had left about 80% of the power system destroyed.

Several substations were critically damaged due to mudslides and inundation, with extensive damage to switchgear, protection, and control systems caused by flooding. This level of damage is often visible only by onsite inspection. Several substation control houses suffered water intrusion from stormwater or wind-driven rain. The field inspectors reported that many substations affected by flooding became inoperable due to the presence of contaminants and physical damage. Over the mid- and long-term, new and upgraded transmission lines are needed to reliably interconnect new or upgraded generation assets, which could include over 2,000 MW of solar generation and internal combustion units at eight or more regional locations, as outlined in the IRP.
iv. **Electricity**

Puerto Rico’s electricity is supplied by the Puerto Rico Electric Power Authority (PREPA), a government agency that owns the electricity transmission and distribution systems for the main island, Vieques, and Culebra, as well as 80% of the electricity generating capacity. Founded in the 1920s as a water resource agency, PREPA’s responsibilities grew over the years to encompass island electrification. In recent years, it has served more customers than any other public electric utility in the United States. Until 2012, Puerto Rico obtained two-thirds of its electricity from petroleum, generated mainly at six PREPA power stations. The other one-third of PREPA’s power supply was almost evenly divided between natural gas and coal-fired generation, provided by two independent power producers, plus a small amount of power supplied from hydroelectric generators.\(^{22}\)
For the fiscal year 2019, petroleum fueled 40% of the island's total electricity generation, and natural gas 39%. Coal continued to fuel 18% of generation, while renewables supplied 2.3%. In September 2017, Hurricanes Irma and María made landfall two weeks apart and destroyed much of Puerto Rico's electricity transmission and distribution infrastructure.

In general, generating facilities were not as badly damaged as the electric grid. Still, PREPA's largest generating plants are in the south, while the largest population concentrations are in the north, making the system dependent on its 2,400 miles of transmission and 30,000 miles of distribution lines. The hurricanes caused near total loss of power on the island. Eight months later, 93% of power had been restored by PREPA, with the help of the Federal Emergency Management Agency and U.S. Army
Corps of Engineers. To make Puerto Rico’s electricity grid more resilient to future storms, PREPA is considering establishing mini- and micro-grids, adding more renewable power generation, and increasing battery storage capacity. These targets are included in PREPA's Integrated Resource Plan.

The commercial sector consumes nearly half of the island's electricity, and the residential sector consumes just above one-third. The industrial sector, including agriculture, accounts for slightly more than one-eighth of power consumption, with the balance consumed for public uses like street lighting. Per capita, Puerto Rico's electricity consumption is typically less than half of the average in the 50 states. PREPA's heavy reliance on petroleum means that Puerto Rican power prices fluctuate along with international petroleum prices and vary monthly with fuel and purchased power costs. Average rates across all sectors in Puerto Rico are higher than rates in 48 of the 50 states. Only Hawaii and Alaska have higher average rates.²³

PREPA had to not only re-build its electricity infrastructure after the hurricanes, but also restructure its business after operating in bankruptcy protection since 2017. As part of the restructuring plan, the Puerto Rico legislature approved privatizing parts of PREPA in 2018. Under the plan, the utility is expected to sell off some of its generation assets and plans to have its transmission and distribution system operated by a private company.
v. Petroleum

As of 2020, Puerto Rico has no crude oil production. However, refining facilities in the Island have not been operating since 2008 and instead 100% refined fuel products are therefore imported from abroad according to the Gasoline Wholesaler Association of PR. GWA Answers to EAP questionnaire submitted by Sol, Total and Chevron. Other wholesalers were contacted but did not provide a response to the EAP questionnaire for last EAP. Currently, fuel supply for power generation in Puerto Rico is provided through a combination of natural gas, coal, and petroleum products (fuel oil and diesel).

The top oil-based fuel importers/suppliers for the Island are Shell Trading, Total Petroleum, Puma Energy, Best Oil and Peerless Petroleum. Caribbean Petroleum (CAPECO) suffered a major explosion in October 2009 substantially affecting their operations and their long-term outlook is uncertain. CAPECO filed for bankruptcy proceedings in Delaware August 10, 2010 and is embarked in a liquidation of assets as part of those proceedings.\textsuperscript{24} CAPECO's major assets include a deep-water dock in San Juan harbor, a "tank farm" containing 48 multipurpose tanks and 28 tanks that hold liquid petroleum gas. In addition to the tanks and dock, Caribbean Petroleum owns six pipelines that connect the dock to the tank farm. The company's dock is the only one in San Juan harbor capable of servicing vessels up to 850 feet in length.\textsuperscript{25} On December 23, 2010, Puma Energy International announced that it was the successful bidder in the Bankruptcy Court of Delaware for substantially all of the assets of Caribbean Petroleum Company (CAPECO). PUMA Energy acquired CAPECO's entire retail network, which consists of 157 locations, gasoline, diesel and other fuel storage facilities as well as undeveloped land and a private deep-water jetty. After implementing an environmental remediation, Puma plans to work at the storage facility and continues upgrading retail sites, the retail network now operates under the Puma Energy banner.
Due to the distributed nature of responsibilities for the importation of fuels for energy production and transportation, and the fact that most, if not all, of the fuels are imported by private industry.

Oil based fuel imports are received by ship through several terminals distributed along the north, south, east, and west coasts of the Island. San Juan (Puerto Nuevo), Cataño, Yabucoa, Guayama, Salinas, Ponce Peñuelas, Guayanilla y Mayagüez as shown in Figure 4.
The oil-based fuel products supply chain from the importing terminal to the energy producing facilities consist of pipelines and trucking depending on the fuel type and ownership. The eight main terminals and harbors used for the importation for energy producing fuels are shown in Figures 2 to 9. The transportation for most of the fuel are controlled by 3 different companies. American Petroleum, Cabo Rojo Gas and Bitas Fuel Corp, all 3 of them had the responsibilities of providing fuel during recent emergencies. A suggestion from those fuel entities was to maintain clear access to fuel terminals during a disaster. The EAP will now coordinate to have debris cleaned up as an immediate response action to secure distribution.
Figure 2: Puerto Nuevo Terminal, San Juan

Figure 3: Yabucoa (Shell) Terminal, Yabucoa

Figure 4: Las Mareas (Guayama) Terminal, Guayama

Figure 5: Salinas (Aguirre) Terminal, Salinas
Figure 6: Ponce Terminal, Ponce

Figure 7: Peñuelas Terminal, Peñuelas

Figure 8: Guayanilla (CORCO) Terminal, Guayanilla

Figure 9: Mayagüez Terminal, Mayagüez
After arriving at each marine terminal, transportation of the fuel to power grid connected power production facilities and aviation terminals is mostly by secondary pipeline systems. Fuels distribution for ground transportation, emergency diesel generators and other end uses occur mostly via trucking from the terminals to intermediate storage facilities and retail distributors. The Island does not have any commercial rail infrastructure for this purpose. The US Coast Guard has the mission to provide security and control access from the sea, while the PR Ports Authority, the Puerto Rico Public Service Commission and terminal owners share the responsibility from the landside. Fuel pipelines from importing terminals to distributing facilities are generally under the oversight of the US Coast Guard. Trucking and other secondary distribution pipeline and retail storage systems, particularly for LPG (propane) are regulated by the Puerto Rico Public Service Commission (PR PSC). As of 2020, Puerto Rico, unlike many other states, does not require the use of motor gasoline blended with ethanol.

**vi. Natural Gas**

Puerto Rico is not a natural gas producer and imports all its natural gas needs. Natural gas importers and users are primarily electric power producers. Most natural gas is imported in liquefied form (LNG). Natural gas is used at the privately owned EcoEléctrica cogeneration facility and at the Costa Sur steam plant, which are both located at Guayanilla Bay. Natural gas is imported as LNG into the Peñuelas terminal and regasification facility on the southwestern coast. The EcoEléctrica plant is adjacent to the regasification facility and the Costa Sur plant receives gas via a short pipeline. The LNG terminal has one 160,000 m³ storage tank and space to add a second of the same size. All of Puerto Rico’s LNG imports are used for electricity generation. From 2013 through 2016, Puerto Rico received an average of two LNG cargos per month, with each cargo providing about 2.5 Bcf of natural gas, or 159 million cubic feet per day (MMcf/d).\(^{26}\) The normal maritime route for LNG shipments uses commercial routes on international waters in the Caribbean Sea from Port Spain in Trinidad-Tobago to the EcoEléctrica terminal.
LNG imports are received by ship through the port of Peñuelas to the EcoEléctrica LNG terminal and transported via pipelines to the adjacent EcoEléctrica power generation facilities. EcoEléctrica operates and manages the LNG terminal facilities in Peñuelas. The port itself is managed by the Autoridad de Puertos and US Coast Guard. Per the agreement between EcoEléctrica and the local utility, a 15-day reserve of fuel is required for contingency operations. In addition to LNG, the EcoEléctrica facility can also operate on Liquid Propane Gas (LPG) and diesel (#2 oil) as back up fuels.

Puerto Rico is looking to further expand its natural gas consumption to displace fuel oil for electricity generation. Since September 2016, Puerto Rico has imported 100 percent of its LNG from Trinidad through long-term contracts. PREPA has long planned to add more natural gas-fired generating capability. However, building a pipeline (Via Verde Project) to transport natural gas from the regasification plant on the southern coast to the north coast met public opposition and was dropped in 2012.

Currently, Crowley is a major shipper of liquid natural gas between Jacksonville, Florida, and Puerto Rico and a contender for supplying PREPA’s proposed gas-powered microgrids with LNG. Meanwhile, PREPA contracted New Fortress Energy to supply LNG for a San Juan power plant that is undergoing a conversion from oil to gas. On February 2020, Fortress Energy began running its natural gas delivery operation in Units 5 & 6 in the San Juan Bay.
New Fortress’ chief development officer, said “there’s a tremendous growth opportunity that’s highly complementary to PR’s strategic plan to modernize its power infrastructure. Units 5 and 6 have averaged over 620,000 gallons per day, and we’ve seen as high as 800,000 gallons per day as we continue to ramp up,” McElmurray said.27

vii. Coal

Puerto Rico is not a coal producer and imports all its coal needs. As of 2010, there is a single large-scale user of coal as primary fuel: AES PR Inc. AES PR is an independent electric power producer with a long-term power producing agreement with the local utility. The privately-owned AES facility burns Colombian bituminous coal. The coal is delivered to Puerto Rico at the Las Mareas Port, just south of the plant site, and is transported to the plant via covered conveyors. The AES-PR coal-fired power plant is expected to be retired by 2027 when the current PPOA expires.

Puerto Rico has no coal resources and produces no coal. The Government as one coal fired electricity generating plant, at Guayama, which began operations in 2002. Typically, about 1.6 million tons of coal are imported annually from Colombia to supply the 454-megawatt plant.87,88 In 2017, Hurricane María damaged the generating plant and transmission grid, but the plant resumed generating electricity in February 2018.89 Ash from coal combustion is recycled on site into a partially solidified aggregate that is used in asphalt and concrete for road construction and other applications. Nevertheless, as of January 2020, amendment to Law 40 of 2017, signed by Governor Wanda Vázquez Garced became into effect. The mandate establishes a clear and precise ban on the deposit and disposal of coal ashes or coal combustion residues, which includes the prohibition of the use of non-encapsulated coal combustion residues. Senate Bill 1221 was signed to amend the “Law to Prohibit the Deposit and Disposal of Coal Ashes or Coal Combustion Residues in Puerto Rico”. Which prohibits the deposit and disposal of coal ashes or coal combustion residues in all roads, land, landfills and bodies of water within Puerto Rico.28

The island’s per capita coal consumption is typically about one fifth of per capita coal consumption in the 50 states. At the same time, the Puerto Rico Energy Policy Act 17-2019 mandates the phasing out of coal-fired electricity generation by 2028.

Puerto Rico Energy Policy Act from April 11th, 2019, states the need to comply with a Renewable Energy Portfolio in order to reach a minimum of 40% renewable energy by or before 2025; 60% by or before 2040; and 100% by or before 2050. The island's renewable resources mostly include wind, hydropower, and solar energy. During fiscal year 2019, only 2.3% of PREPA's electricity came from renewable energy, wind and solar represented about two-fifths of total renewable generation. The remainder came from hydroelectric and landfill gas facilities. Puerto Rico is home to both, the largest solar photovoltaic facility and the largest wind farm in the Caribbean.²⁹

Solar power has been Puerto Rico's fastest growing renewable electricity generation, increasing from 0.3% of total generation in fiscal year 2015 to 1.1% in fiscal year 2019. The largest solar farm, the Oriana facility at Isabela, has 45 megawatts of capacity and came online in late 2016, almost doubling PREPA's solar generating capacity. By the end of 2018, PREPA had signed 58 power purchase and operating agreements (PPOAs) with renewable generation, of which 8 were in commercial operation, with a total capacity of 201 megawatts: 97 megawatts from solar, 101 megawatts from wind, and 2.4 megawatts from landfill gas.
Local utility is negotiating with developers about 14 additional solar energy projects. PREPA also plans to add up to 1,800 megawatts of solar power and 920 megawatts of battery storage between 2019 and 2025. Puerto Rico has two utility-scale wind farms that became operational in 2012: the 101.2-megawatt Santa Isabel facility on the southern coast and the 23.4-megawatt Punta Lima facility at Naguabo. Hurricane María caused significant damage to the Punta Lima wind farm, but the Santa Isabel wind farm was undamaged. Other wind projects have been proposed, but Puerto Rico's onshore wind resource is limited.

Puerto Rico’s 21 hydroelectric generating units, some of which are more than 100 years old, are sited on reservoirs that often supply drinking and irrigation water as well as electricity. Output varies significantly, affected by rainfall and competing water uses.30

In the past, Puerto Rico has encouraged development of municipal solid waste, landfill gas, and other waste-to-energy facilities, but proposed facilities have faced local opposition and been cancelled. Two landfill gas facilities, located at Fajardo and Toa Baja, have a combined capacity of 6 megawatts and began generating electricity in 2016.

During the month of May of 2020, Hon. Governor Wanda Vázquez announced that PREPA renegotiated 23 renewable energy contracts with private companies to obtain more favorable costs and advance the goal—imposed by law—of achieving 100 percent generation with alternative sources by 2050. Seven of those 23 contracts are for solar
and wind energy projects already operating, while the remaining 16 date back eight years and had not been executed due to economic reasons. Now, the expectation is that these 16 projects - all solar - will be on track before 2023. The most beneficial aspect of the projected scenario is the positive environmental impact. Nevertheless, the cost per kilowatt-hour for generating energy in Puerto Rico with PREPA was 14.28 cents per kilowatt-hour and these projects were negotiated at 10 cents or less. Under Act 17-2019 mandate, there will be more renewable projects that support local resiliency and economy. These projects are being addressed in the Integrated Resources Plan, which should be very close to reaching the approval by the Puerto Rico Energy Bureau on 2020.

B. Articulate types of energy critical infrastructure in terms of their responsibilities

Interdependencies among infrastructure systems with electric power can cause indirect failures across various essential services. These dynamics have not been as fully understood in Puerto Rico, and infrastructure planning does not yet effectively incorporate interdependency considerations. At the same time, it is also difficult to monetize the benefits associated with an avoided disruption due to interdependency.

A perfect example was experienced during Hurricane María, the loss of cellular and data services in Puerto Rico was sometimes a direct result of the power issues, not necessarily damage to the communications infrastructure. In order to make efficient investments that mitigate risk effectively and increase the resilience of Puerto Rico, capital planning decisions must address interdependencies between the electric power system and other critical infrastructure that provide much essential services, such as hospitals, water, waste water, waste, telecommunications, cybersecurity and transportation.

The energy sector’s critical infrastructure employees need to be protected based on different responsibilities that are interconnected. Essential assistance provided from professionals that are trained to monitor, operate, engineer and maintain the energy system represents an extension of critical infrastructure that needs to be available to respond efficiently. It will ensure the reliability, safety, environmental health, and physical and cyber security of Puerto Rico during an emergency. CISA defines essential critical infrastructure workforce as follow:
• Energy/commodity trading/scheduling/marketing functions, who can't perform their duties remotely.
• IT and OT technology for essential energy sector operations including support workers, customer service operations; energy management systems, control systems, and Supervisory Control and Data Acquisition SCADA systems, and energy sector entity data centers; cybersecurity engineers; and cybersecurity risk management.
• Workers supporting the energy sector through renewable energy infrastructure (including, but not limited to wind, solar, biomass, hydrogen, ocean, geothermal, and/or hydroelectric), including those supporting construction, manufacturing, transportation, permitting, operation/maintenance, monitoring, and logistics.
• Workers and security staff involved in nuclear re-fueling operations.
• Providing services related to energy sector fuels (including, but not limited, petroleum (crude oil), natural gas, propane, natural gas liquids, other liquid fuels, nuclear, and coal), supporting the mining, processing, manufacturing, construction, logistics, transportation, permitting, operation/maintenance, security, waste disposal and storage, and monitoring of support for resources.
• Environmental remediation/monitoring limited to immediate critical needs technicians.
• Manufacturing and distribution of equipment, supplies, and parts necessary to maintain production, maintenance, restoration, and service at energy sector facilities (across all energy sector segments).32

i. **Operational response from a catastrophic scenario**

**Puerto Rico’s Natural Hazard Scenarios**

1. Storms and Hurricanes - Puerto Rico is in the hurricanes and storm’s path, which are developed in the Atlantic, crossing the Caribbean and many ends up affecting US mainland. The season begins on June 1st and ends on November 30th annually. This is the natural phenomenon that historically has caused the most damage and loss of life on our island.
2. Earthquakes - Puerto Rico is surrounded by tectonic faults, some of them located in the interior and southern region of the island.
3. Severe flooding - Puerto Rico generally has a tropical climate which offers a season of rains and droughts, although sometimes irregular. Because of its geographical nature, the rains cause runoff which in a short time can cause unexpected flooding of rivers, creeks, or strong tidal waves when severe weather approaches.

4. Tsunami – Puerto Rico’s trench is the deepest part of the Atlantic Ocean; it represents significant seismic and tsunami hazards around the island.

ii. Technological and Man-made Hazards Situations

1. Electrical System Failure - A power failure is the interruption or loss of electric service caused by an interruption in the generation or transmission caused by an accident, sabotage, natural risks, failure in equipment maintenance or reduction of fuel.

2. Hazardous Materials - Companies often use materials considered to be hazardous to carry out their operations. These materials are transported through our State and main roads. In the event of an accident, sabotage or act of terrorism, life, property and the environment of our municipality could be seriously impacted.

3. Terrorism - In recent years, terrorism has become globalized and has been directed toward innocent victims in places that never were expected. Puerto Rico is a territory of the United States of America. Due to its geographic location and political status, Puerto Rico can be used as a bridge to carry personnel, weapons, drugs, or weapons of mass destruction, to or from the United States. This risk cannot be ignored, and for this reason, we must be prepared.

4. Large Scale fires - The risk of fires in urban, rural and forest are present in many municipalities of the island.

5. Dam Failures- a dam rupture without notice could represent a catastrophic event that could cause thousands of deaths in a very short time which might occur due to flooding downstream without notice.
During a catastrophic scenario the response mission is to save lives, meet basic human needs and protect local environment immediately after an incident. Based on the 2019 National Preparedness Report from the Department of Homeland Security, most of the challenges that are needed to prevent, protect, mitigate, respond, recover from a catastrophic scenario represents the greatest risk to the Nation.

After identifying logistical and supply chain issues that arose during 2017 hurricane response operations in Puerto Rico, FEMA coordinated with the American Logistics Aid Network (ALAN) to improve supply chain redundancies and to engage with industry partners to solve complex logistics challenges. ALAN is an industry-wide organization that provides supply chain assistance to disaster relief organizations. By improving supply chain redundancies, both FEMA and ALAN are better equipped to make sure that meals, water, and other lifesaving resources are delivered to the response workforce of Puerto Rico. As a result, different capabilities are necessary to maintain community resiliency and socioeconomic health. All 15 Response Core Capabilities are being adopted under an energy perspective to review possible gaps that the EAP might take into consideration for improving response efficiency:

- Planning
- Public Information and Warning
- Operational Coordination
- Infrastructure Systems
- Critical Transportation
- Environmental Response/Health and Safety
- Fatality Management Services
- Fire Management and Suppression
- Logistics and Supply Chain Management
- Mass Care Services
- Mass Search and Rescue Operations
- On-Scene Security, Protection, and Law Enforcement
- Operational Communications
- Public Health, Healthcare, and Emergency Medical Services
- Situational Assessment

During a crisis, the EAP will be deployed across all levels of government, nongovernmental organizations, and the private sector must rapidly determine the scope, complexity, and interdependent impacts of a disaster. The core capabilities will help to improve coordination between decision-makers by providing a unified framework for prioritizing, sequencing, and focusing response efforts. Simultaneously, the Emergency Support Function ESF-12 defines Federal interagency support in
response to an incident and the core capabilities that drive response actions. This roadmap provides tools for anticipating, resourcing, and managing immediate threats to life and property, and setting the conditions for delivery of assistance and long-term recovery.
V. Conceptual Guides and Strategies

A. Roles, Responsibilities, Plans and Strategies


Among DEDC’s responsibilities:

• DEDC is the Governor’s advisor on all matters related to energy, including emergencies.

• DEDC must advise the Governor, all agencies, public instrumentalities, institutions and the general public in energy related technological aspects, socioeconomics, legal advice regarding generation, distribution and transmission and energy efficiency in Puerto Rico.

• Must draft and develop, before Hurricane Season, Puerto Rico’s Energy Assurance Plan.

• Related to energy efficiency, is the entity in charge of auditing the Energy Savings Plan of all governmental entities.

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<tr>
<th>State Energy Program</th>
<th>Weatherization Assistance Program</th>
<th>Green Energy Fund</th>
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<tr>
<td>• Energy efficiency, conservation and consumption reduction for governmental and municipal installations</td>
<td>• Provides assistance to low income based families into achieving energy efficiency in their homes</td>
<td>• Act 83-2010</td>
</tr>
<tr>
<td>• Provides energy audits, energy efficiency projects</td>
<td>• Helps reduce environmental impact through energy efficiency</td>
<td>• This fund was created as an instrument to promote, for both residential and commercial needs, the alternative of solar energy systems</td>
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The Puerto Rico Weatherization Assistance Program (WAP), enables families to reduce their energy consumption by making their homes more energy efficient. Retrofitting strategy for Puerto Rico was included for the first time in the WAP program in 2009.
Conservation strategies are also addressed by the State Energy Program (SEP) under DEDC-EPP. Governmental buildings are also being retrofitted as part of minimizing demand from the grid to generate energy. The consumption reduction support local resiliency and provides viability in producing renewable energy with less upfront costs to the homeowner for a lower energy assurance risk.

 ii.  

**Puerto Rico Electric Power Authority: Integrated Resource Plan (IRP)**

The Puerto Rico Electric Power Authority (PREPA) filed its IRP in June 2019. The document, which will ultimately provide a 20-year roadmap for managing the tropical island’s electricity resources, has been under review ever since. As required by the 2014 Transformation Act and the Energy Policy Act, PREPA has prepared and is currently refining an IRP that will identify resources, both conventional and renewable, as well as energy efficiency and conservation measures, for satisfying demand for electric energy in Puerto Rico.

The IRP scenarios include the Energy System Modernization Plan (ESM), and the Preferred Resource Plan, which aim to direct further investment in and development of Puerto Rico’s electric utility system.
The plan needs to consider forecasted electricity demand and analyze the viability of various power sources to ensure electricity is reliably distributed across the island. The integrated resource plan (IRP) is an opportunity for Puerto Rico to incorporate modern and sustainable electricity infrastructure, including microgrids that can reduce the island’s dependency on fossil fuels, and efficiently manage its energy resources over the long term.

The Puerto Rico Electric Power Authority (PREPA) contains an updated Operational Emergency Plan for 2019. This Plan covers responsibilities of the utility with PREMB on different emergency phases. These roles for energy security responsibilities were shared to the DEDC when Act 17-2019 defined new roles of maintaining the Energy Assurance Plan for Puerto Rico. For this EAP to be efficient on different levels, it must be adapted by PREPA and PREMB. Both plans will need to be updated by new shared responsibilities and procedures that this document proposes.
iii. FEMA/COR3: Stafford Disaster Relief and Emergency Assistance Act (Stafford Act)

The Stafford Act, as amended, outlines the federal government’s role during disaster response and recovery when the President declares a major disaster. The President can declare a major disaster after a governor of an affected state or chief executive of an affected Indian tribal government finds that effective response is beyond the capabilities of the state, tribal, or local governments. If the President declares a major disaster, the declaration can trigger a variety of federal assistance programs through which the federal government provides disaster assistance to state, tribal, territorial, and local governments as well as certain nonprofit organizations and individuals. Since PREPA is owned by the Commonwealth, it is eligible to apply to receive assistance for infrastructure repairs or replacement through these federal programs.

FEMA is the primary federal agency responsible for mitigating, responding to and overseeing recovery from disasters. FEMA is also responsible for coordinating the assistance provided under the provisions of the Stafford Act. The Disaster Relief Fund funds Stafford Act disaster relief and recovery programs, including FEMA’s Public Assistance Program and Hazard Mitigation Grant Program. The Disaster Relief Fund is the primary source of federal disaster assistance for state and local governments when a disaster is declared. Disaster Relief Fund appropriations historically have been provided for general disaster relief rather than dedicated to specific presidentially declared disasters or emergencies. Relative to the mainland U.S., Puerto Rico’s infrastructure outcomes rank near the bottom in quality and operating performance. Poor infrastructure has contributed to congestion and thus impacted the ease of doing business on the Island. The capital investments enabled by post-Maria federal recovery funding offer a unique opportunity to make transformational investments that support economic development. Under several natural disaster recovery efforts that are being addressed simultaneously in Puerto Rico, FEMA has expanded overall flexibility and willingness to support more transformational investments under Section 428 (under Title IV of the Stafford Act).

The Government created the Central Office for Recovery, Reconstruction and Resiliency (COR3), as a Division of the P3 Authority to lead the coordination, development, and execution of long-term recovery and reconstruction efforts. As part of a reconstruction process, it is imperative to build a central capability with the skills and mandate to design an overall recovery strategy and oversee efficient project delivery. FEMA collaboration with local agencies under Stafford Act is provides a roadmap for future level of service required to mitigate current vulnerabilities. The COR3 is aggressively resiliency activities with federal funding, to ensure that Puerto Rico’s critical assets are sufficiently protected from future hazards.
The Grid Modernization Plan for Puerto Rico from COR3 provides the vision, transformation approach, and cost estimate input for the permanent reconstruction of the Puerto Rico energy system. A key intent of the document is to present the proposed programs and investment plan to transform the current power system to a more reliable, resilient, and decentralized electric power system. The document also provides guidance to the Federal Emergency Management Agency (FEMA) for the evaluation of program funding support. Different meetings with COR3 took place for developing this EAP. All shared information between both agencies are part of the result of this emergency approach.

iv. Operational Guides

a. **PREMB: Joint Operational Catastrophic Incident Plan for Puerto Rico 2018**

The JOCIP is a response model protocol under the Emergency Support Functions that were implemented in Puerto Rico. It represents the foundation of the EAP playbook. It was developed in coordination of federal, state, local and private sector committees. The planning team for this emergency plan was comprised by the Puerto Rico Department of Public Safety Emergency Management Bureau (PREMB), US Department of Homeland Security Federal Emergency Management Agency (FEMA), Puerto Rico state primary agencies, local governments, and critical infrastructure private sector representatives. The catastrophic scenario provided lessons learned and best practices from State Agencies; input from Federal Agencies such as FEMA, US Department of Defense (DOD), US Coast Guard (USCG), US Department of Health and Human Services (HHS), collection of empirical data, development of quantitative statistics, surveys, and risk analysis evaluations; over 200 interviews with representatives of the public and private sectors; and the identification of possible limitations and contingencies. Puerto Rico have been responding to different emergencies during the process of developing this EAP. After this document is finalized, the new updated version for next year will be developed with their approval and possible changes that JOCIP will have to integrate as part of new roles and responsibilities by the EAP.


The study reviews the federal response to the 2017 hurricanes. The report describes the role of federal agencies in supporting electricity grid recovery
efforts in Puerto Rico and examines the status of federal support for grid recovery in Puerto Rico and challenges affecting progress on grid recovery efforts. It reviewed relevant laws, regulations, and federal policies for disaster recovery; and agency documents. Results from analysis suggests new recommendations. For example, FEMA should provide clear written information in the form of policy, guidance, or regulations that clarifies how it will implement new authorities and steps to enhance coordination among local and federal entities.

c. **Department of Energy (DOE): Energy Resilience Solutions for the Puerto Rico Grid 2018**

The DOE report contains recommendations for the Government of Puerto Rico to consider for incorporation into its recovery plans. It presents alternatives to improve resiliency of the energy system based on investment future recovery investments. The document suggests decisions that will improve the ability of the system to withstand likely stresses, ameliorate disruptions when they inevitably occur, recover quickly, and incorporate lessons learned into post-event planning and operations.

“The Puerto Rican State Office of Energy Policy or its successor should immediately draft an updated Energy Assurance Plan, annual review of the EAP, and all associated components, including mutual assistance agreements, and technical and logistical procedures for Incident Management Teams. To the extent feasible in order to enhance operational efficiencies and interoperability, regulatory agencies should consider and adopt relevant NERC reliability standards to be implemented by the Commonwealth” (page 57).

The Report suggests that the DEDC-EPP, in coordination with other appropriate Government agencies and instrumentalities, should immediately commence drafting of an updated Energy Assurance Plan. This plan should provide for, among others, the use of the Incident Command System including the immediate establishment of a standing Incident Management Team.

The Office of Cybersecurity, Energy Security, and Emergency Response (CESER) addresses the emerging threats of tomorrow while protecting the reliable flow of energy to Americans today by improving energy infrastructure security and supporting the Department of Energy’s (DOE) national security mission.
CESER’s focus is preparedness and response to natural and man-made threats, including tactically and strategically addressing the increased frequency and sophistication of cyber threats exercises.


NASEO provides roadmap for developing assurance planning as a dynamic process. The planning framework outlines and details information for assessing, updating, and revising all current state and territory energy emergency plans. These guidelines tie concerns for the protection of critical infrastructure and concepts of energy assurance with the traditional energy emergency response planning undertaken by state energy offices, energy restoration responsibilities supported by public utility commissions, and state and local emergency plans developed by emergency and homeland security agencies.


NASEO guidelines have been addressed by different meetings along the process of developing this EAP. The document was revised and recognized by the Association; they will continue to be part of the updating process for next year dissemination exercise.

e. **FEMA/DHS: National Preparedness Goal (32 Core Capacities)**

The National Preparedness Goal defines an whole community preparedness approach to be for all types of disasters and emergencies. The planning effort based on capabilities required by local communities provides resilient nation approach that prevent, protects, mitigate, respond, and recover from an incident and hazards that pose the greatest risk. These risks include events such as natural disasters, disease pandemics, chemical spills and other manmade hazards, terrorist attacks and possible cyber-attacks. Different meetings with U.S. DHS took place for developing this EAP. All shared information between both agencies are part of the result of this emergency approach.
f. *American Public Power Association: Cyber Incident Response Playbook 2019*

As the electricity system grows in intelligence, the impact of malicious and unintentional cyber threats has become an increasingly important issue for the electric sector of Puerto Rico. Electric utilities face cyber threats to both the business and operational components of their outfits. The increased automation of the electric grid has allowed grid operators to more efficiently and reliably operate their networks. However, these same digital technologies have simultaneously increased dependence on telecommunications networks and provided new avenues for cyber adversaries to potentially gain control of operational components that might disrupt electricity service.
VI. METHODOLOGY

A. Threat and Hazard Identification and Risk Assessment (THIRA): Integration of energy in the National Preparedness Goal (32 core capabilities “Infrastructure System”).

The Federal Emergency Management Agency (FEMA) presents information from numerous sources to develop the National Preparedness Report. The analysis of data on risks and capabilities is collected from states, territories, select urban areas and communities through the Threat and Hazard Identification and Risk Assessment (THIRA) and Stakeholder Preparedness Review (SPR).

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<td><strong>PREVENTION</strong></td>
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<td>Economic Recovery</td>
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<td>Housing</td>
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FEMA uses the THIRA/SPR to work with communities and understand their progress and gaps in preparedness. The “Cross-Cutting Core Capabilities” summarizes the main mission areas in three aspects that are common denominator for all capabilities. Those three elements are Planning, Public Information and Warning and Operational Coordination. Through the THIRA, communities assess their risks and set targets for the capabilities needed to address...
vulnerabilities. Through the SPR, communities evaluate how close they are to meeting their targets, identify their gaps, and develop approaches for closing those gaps. In 2017, FEMA worked with Puerto Rican communities to revise the THIRA/SPR methodology. Under this revised methodology, communities performed the following activities:

- Assessed their capability levels for the core capabilities in the Response and Recovery mission areas.
- Identified the level of capability they plan to achieve over time and assessed how close they currently are to meeting those targets.
- Rated their confidence in the accuracy of their capability assessments.

As a result, from the evaluation, the Puerto Rican Government and the FEMA team concluded that the territory’s building codes should be updated to the most recent edition of the International Code series. Additionally, they suggested requirements for the proper staffing and training of code enforcement officials, and the development of standards, guidance, and trainings that reflect island specific construction practices. Reference: These efforts are documented in a comprehensive Mitigation Assessment Team Report published in 2018 and available at: https://www.fema.gov/media-library/assets/documents/173789.

In November 2018, Puerto Rico adopted the 2018 Puerto Rico Building Code (PRBC), an updated set of building codes based on the 2018 International Codes series, the most up-to-date building code series available. The new code adoption will increase community resilience to future disasters by increasing requirements for protection measures against threats such as wind or corrosion. However, some significant challenges remain on the energy sector for improving communities island wide resilience. This methodology will improve decision-making on training investments to help local communities close key preparedness gaps with the collaboration of Federal and State Government.

B. Stakeholders preparedness review

The Stakeholder Preparedness Review (SPR) is a self-assessment of a jurisdiction’s current capability levels against the targets identified in the Threat and Hazard Identification and Risk Assessment (THIRA). Reform Act of 2006 requires an annual report from any state or territory receiving federal preparedness assistance administered by the Department of Homeland Security. The SPR supports the National Preparedness System by helping jurisdictions identify preparedness capability gaps and sustainment requirements. States, localities, tribes, territories, Urban Area Security Initiative partners, and the federal government use this information to help make programmatic decisions to build and sustain capabilities, plan to deliver capabilities, and validate capabilities. The outputs of this process inform a variety of
emergency management efforts, including emergency operations planning, mutual aid agreements, hazard mitigation planning, grant investment strategies, and training and exercise efforts.

Due to the unique circumstances surrounding grid recovery in Puerto Rico, including extensive and unprecedented damage, FEMA is implementing a resource constrained, government-owned utility aiming to hire a private operator; and a new utility regulator in the process of building capacity. Federal efforts are needed to enhance coordination and ensure federal agencies can help local entities maximize opportunities to protect energy access to the island during any emergency situation.

C. Identify and Update Critical Infrastructure

Functioning critical infrastructure is imperative during the response to any emergency for both public health and safety as well as community well-being. Certain critical infrastructure industries have a special responsibility in these times to continue operations. There are 16 critical infrastructure sectors whose assets, systems, and networks, whether physical or virtual, are considered vital to the United States and Puerto Rico. The operational incapacitation would have a debilitating effect on security, economic security, public health or safety, or any combination thereof.
The workforce for maintaining the infrastructure for all 16 essential sectors will also need special attention for an effective response. The EAP suggests waivers and special permits implementation for maintaining essential services active on all emergency phases. Based on CISA, the personnel that should maintain active based on essential services for protecting local infrastructure are:

- Workers supporting the energy sector, regardless of the energy source (including but not limited to nuclear, fossil, hydroelectric, or renewable), segment of the system, or infrastructure the worker is involved in, or who are needed to monitor, operate, engineer, and maintain the reliability, safety, environmental health, and physical and cyber security of the energy system.
- Essential energy sector operations including support workers, customer service operations; energy management systems, control systems, and Supervisory Control and Data Acquisition SCADA systems, and energy sector entity data centers; cybersecurity engineers; and cybersecurity risk management.
- Workers supporting the energy sector through renewable energy infrastructure (including, but not limited to wind, solar, biomass, hydrogen, ocean, geothermal, and/or hydroelectric), including those supporting construction, manufacturing, transportation, permitting, operation/maintenance, monitoring, and logistics.
- Providing services related to energy sector fuels (including, but not limited, petroleum (crude oil), natural gas, propane, natural gas liquids, other liquid fuels, nuclear, and coal), supporting the mining, processing, manufacturing, construction, logistics, transportation, permitting, operation/maintenance, security, waste disposal and storage, and monitoring of support for resources.
- Manufacturing and distribution of equipment, supplies, and parts necessary to maintain production, maintenance, restoration, and service at energy sector facilities
- Workers who maintain, ensure, or restore, or are involved in the development, transportation, fuel procurement, expansion, or operation of the generation, transmission, and distribution of electric power, including call centers, utility workers, engineers, retail electricity, constraint maintenance, and fleet maintenance technicians who cannot perform their duties remotely.
- Workers who produce, process, ship and handle coal used for power generation and manufacturing.
- Workers at generation, transmission, and electric black start facilities.
- Workers at Reliability Coordinator, Balancing Authorities, and primary and backup Control Centers, including but not limited to independent system operators, regional transmission organizations, and local distribution control centers.
- Mutual assistance personnel which may include workers from outside of the state or local jurisdiction.
• Vegetation management and traffic control for supporting those crews.
• Essential support personnel for electricity operations.
• Generator set support workers such as diesel engineers used in power generation including those providing fuel.
• Workers for crude oil, petroleum and petroleum product storage and transportation, including pipeline, marine transport, terminals, rail transport, storage facilities and racks and road transport for use as end-use fuels such as gasoline, diesel fuel, jet fuel, and heating fuels or feedstocks for chemical manufacturing.
• Petroleum and petroleum product operations control rooms/centers and refinery facilities.
• Retail fuel centers such as gas stations and truck stops, and the distribution systems that support them.
• Natural gas, propane, natural gas liquids, and other liquid fuel processing plants, including construction, maintenance, and support operations.
• Natural gas processing plants workers, and those that deal with natural gas liquids.
• Propane gas service maintenance and restoration, including call centers.

According to PREPA’s 2018 financial plan, it has lost approximately 30 percent of its workforce since 2012 and is faced with a significant shortage in skilled workers, particularly in Generation, T&D, Customer Service and IT. The 2018 financial plan also notes that approximately 10% of PREPA’s current workforce has submitted paperwork to retire. These staffing challenges have been amplified after Hurricanes Irma and María. To maintain a vital and capable workforce into the future at PREPA, the Working Group recommends reaching out to local educational institutes to attract talent and forming research partnerships to stay engaged with the newest innovations in the energy industry. This will require a paradigm shift in PREPA’s outlook as a modern and dynamic organization.36

Presidential Policy Directive 21 identifies the Energy Sector as uniquely critical because it provides an “enabling function” across all critical infrastructure sectors. The energy infrastructure is divided into three interrelated segments: electricity, oil, and natural gas. The reliance on electric power and fuels suggests that all sectors have some dependence on the energy infrastructure. The Puerto Rico’s energy sector is aware of its vulnerabilities, the effort of leading and maintaining communication thought this EAP, will increase its planning and preparedness for upcoming emergencies. The EAP enables collaboration through industry groups and stakeholders for data gathering and substantial information sharing practices.
D. Consultation from advocacy group

DEDC-EPP managed a collaborative process (referred to as the advocacy group activities) to assess what is needed to develop a holistic EAP by maintain standard levels of reliability and transparency. Within the Advocacy Group, DEDC-EPP engaged key stakeholders, including:


ii. PREPA: Arturo Deliz / Director Federal Program

iii. NASEO: Campbell Delahoyde & Jeff Pillon / Program Managers


v. FEMA/COR3: Ing. Roberto Ramos / Sara Aponte / Infrastructure Department

vi. CISA/US DHS: Julio R. González / Protective Security Advisor


viii. PUMA ENERGY: Mario Sierra / Luis Sáez / General Manager

ix. PRIDCO: Víctor Merced / Director Manufacture Business Development

The Working Group was part of the development and critical analysis of the EAP. The information and guidelines suggested for the planning, preparedness, response and recovery was discussed with all different parties. Nevertheless, the DEDC-EPP recognizes the limited time of 6 months with earthquakes and COVID-19 as a limitation for a more comprehensive approach. More detailed planning needs to take place in order to respond with specific guidelines for sharing information and complementing efforts from different stakeholders on a holistic approach that avoids redundancy when deploying the Plan. The consultation advocacy group will maintain the compromise of participating in the yearly update process to consider topics that could not be addressed due to the emergency context in Puerto Rico. The EAP will be updated with COVID-19 new roles and responsibilities that will impact the existing Operational Emergency Plan from PREPA and PREMB’s Joint Operation Catastrophic Incident Plan.
VIII. Energy Supply Diagnostics

A. Mitigating Future Electricity Risks

Based on different articles that addressed Puerto Rico’s recovering atmospheric efforts, the EAP mentions some of the most significant opportunities that influences this EAP. Some of the main improvement are: (1) improve distribution poles, recommend concrete poles as they appear to be more resistant, (2) substation monitoring and remote control, this would facilitate shutting down in a flood situation and reducing damage due to flooding equipment, (3) anti-flood measures, would involve moving facilities to higher points or protecting them from flooding, (4) safe fuel supply, (5) underground transmission infrastructure, although it is recognized that this recommendation can be costly given installation and maintenance, is ideal for improving resilience. Taking the cost into consideration, it is recommended only for areas where it would be most viable. (6) ability to finance, since most recommendations require funding, (7) use of renewable energy, specifically recommend solar energy in order to diversify the energy mix and reduce dependence on fossil fuels ultimately mention and (8) modernize the grid. to improve the flexibility of the power system Greater adoption of distributed resources is also recommended such as combining heat and energy, storage, micro-grids and electric vehicles.

Rocky Mountain Institute presented opportunities that Puerto Rico's electricity sector have during the process of recovering the onslaught of Hurricanes Irma and María. They are: (1) coordinating the dissemination of new technologies with the efforts of rebuilding the electricity grid, the authors suggest locating new projects close to reconnection needs, as well as providing long-term value, and ensuring that such projects are built with the right equipment, (2) combining solutions to finance the implementation of new technologies that complement the efforts, this recommendation refers to prioritizing the deployment of projects based on the value they offer in the short and medium term to Puerto Rico, (3) investing in an equitable system for all customers through distributed energy sources and considering the long-term cost and value of investments to avoid an increase in customer rates.37

For its part, the Federal Department of Energy (DOE) states that "each decision should aim to improve the system's ability to withstand likely stresses, improve disruptions when they inevitably occur, recover quickly, and incorporate lessons learned into post-event planning and operations."10 The report mentions four targets (1) a reliable electricity supply, (2) at predictable and manageable cost, (3) consistent energy quality and (4) maximizing local resources.
The DOE mentions among short-term actions:

1. ESA and Governor should prepare mutual aid agreements and incident control system to support during the next event.
2. The Energy Bureau and Telecommunications Board should coordinate a joint study to determine and enforce the safe loading requirements of distribution poles bearing both electrical and telecommunications infrastructure.
3. Consider installing transmission towers for temporary emergency recovery.
4. The Energy Commission in coordination with the ESA must implement micro-network regulations, such regulations will allow customers to design their systems in a way that supports the reliability and resilience of the electricity grid. (PREB and PREPA)

B. SWOT Analysis: Strength, Weaknesses, Opportunities and Threads

i. Energy Assurance Planning

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination of new solutions to fund the implementation of new planning that complement network rebuilding efforts and emergency response.</td>
<td>Poor legislation and regulations that can improve infrastructure reliability and resilience. PREPA, PREB and other agencies should include staff training plans as part of infrastructure expenditures.</td>
<td>Capacity training and development, system planning, and data collection should be supported as part of all infrastructure expenses, including in the Integrated Resource Plan, Energy Assurance Plan, and accounting service cost.</td>
<td>Invest in an equitable system for all customers through distributed energy sources and considering the long-term cost and value of investments to avoid an increase in customer rates.</td>
</tr>
</tbody>
</table>

ii. Electricity

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investments for network improvement are being based on detailed modeling and planning efforts.</td>
<td>Infrastructure interdependencies scenario demonstrates poor reciprocal relationships within the energy sector (e.g., electricity-petroleum, electricity-NG), as well as cross-sector infrastructure like telecommunications and/or water [used to investigate supply disruption impacts and identify mitigation approaches].</td>
<td>Modernize the thermal generation portfolio to reduce fuel costs and improve operational flexibility.</td>
<td>Unreliable electricity supply</td>
</tr>
<tr>
<td>Dominant Political Influences Over Infrastructure Decisions under unstable finance scenario.</td>
<td>Reinforce substations through a defense-in-depth approach to withstand winds, floods, and mudslides; implement microgrids and use under grounding for critical infrastructure.</td>
<td></td>
<td>Substations located in flood-prone locations needs to be relocated or elevated.</td>
</tr>
<tr>
<td>Need of small, flexible generation plants can integrate near load centers into a smarter system could reduce the number of critical failure points.</td>
<td>Upgrade system voltages where necessary to address capacity and performance issues, and improve system flexibility and resilience.</td>
<td>Small size conductors that are not fully insulated are located in areas of massive trees.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The extreme vulnerability of the communications and electrical grid infrastructure.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### iii. Petroleum

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing contingency plan for providing fuel across the island have been evaluated.</td>
<td>Petroleum products includes underground pipelines with compressor stations, or barges, which are vulnerable to multiple types of hazards.</td>
<td>Supply flexibility can be developed for dealers to assess the status of the capability to meet demand and identify any supply problems that may be apparent.</td>
<td>Petroleum energy supplies depend on the energy infrastructure, volume of throughput, system capacity, and interstate routing, which can be subjected to associated hazards.</td>
</tr>
</tbody>
</table>

### iv. Natural Gas

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas is typically stored underground and under pressure as an efficient way to balance variations between supply input and market demand.</td>
<td>The supply system for natural gas includes underground pipelines with compressor stations, or barges, which are vulnerable to multiple types of hazards.</td>
<td>Upgrade current generation stations to use liquefied natural gas (LNG) and expand import and storage capacity to improve availability and deliverability of LNG, a more diverse and lower cost fuel source.</td>
<td>Natural gas supplies depend on the energy infrastructure, volume of throughput, system capacity, and interstate routing, which can be subjected to associated hazards.</td>
</tr>
</tbody>
</table>

### v. Coal

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Act 17-2019 mandates the elimination of coal by January 1, 2038.</td>
<td>Transporting coal requires an extensive transportation system that is likely to pass through local mountains, valleys, etc.</td>
<td>Combining solar energy with coal-fired power generation as a transitional switch towards 100% renewable dependence.</td>
<td>Current inexpensive energy source.</td>
</tr>
</tbody>
</table>

### vi. Renewable Energy

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable energy portfolio standards of Act17-2019(20%) by 2050</td>
<td>Lack of continuity of operations in public and the private sector.</td>
<td>Decentralize generation and move to cleaner, more sustainable energy sources in support of Puerto Rico’s renewable energy resilience</td>
<td>Local resources are not maximized.</td>
</tr>
<tr>
<td>Economic accessibility for investment from residential, commercial and industrial sector.</td>
<td>Limited infrastructure to deploy an aggressive renewable generation by net-metering.</td>
<td>Use proven emerging technologies such as energy storage, microgrids, and energy efficiency to provide greater system flexibility and resiliency throughout the island.</td>
<td>Limited resources for local generation with renewables.</td>
</tr>
</tbody>
</table>
VIII. Proposed Strategies to Respond and Mitigate Energy Disruption

A. Energy Assurance Planning and Mutual Aid

As demonstrated by post-Hurricane restoration efforts in Puerto Rico, a lack of replacement parts and back-up equipment can delay restoration efforts. Energy assurance plans ensure that local officials, in collaboration with industry, consider the development of an inventory and identify the proper placement of essential components and back-up equipment to operate the energy system. Given Puerto Rico's geography and the delays associated with shipping resources to the island, accessibility for response tools are being addressed.

Current energy infrastructure and delivery systems are increasingly vulnerable to severe weather, system, and infrastructure failures, and deliberate physical or cyber-attacks. Planning for energy sector disruptions is essential to safeguarding energy system reliability and resilience. This EAP will help to achieve a robust, secure and reliable energy infrastructure that is also able to restore services rapidly in the event of any disaster or disruption.

Spikes in energy demand during peak energy use, unanticipated power plant or refinery outages, transmission congestion, or natural disasters can cause disruptions that extend over a broad area or last more than several hours. These energy emergencies often require intervention by the DEDC-EPP and a more collaborative public-private response to ensure public health and safety. DEDC-EPP will coordinate across governments agencies and with PREPA and other energy providers, businesses, and the public to reduce consequences and provide for rapid recovery. DEDC-EPP will be in ongoing contact with industry, always seeking ways to reduce risk and vulnerabilities to critical energy infrastructure to reduce the effects of future disruptions.

This document address energy supply risks and vulnerabilities and suggest opportunities for a quick recovery and restoration. Combined with training and exercises for personnel and stakeholders, the EAP enhance response and recovery efforts and support resiliency investments.

DOE provided support for the island to develop and refine energy assurance plan, build in-house expertise on infrastructure interdependencies and vulnerabilities, and integrate renewable energy portfolios and new applications such as cyber and smart grid technologies.

Under the direction of the DOE’s Office of Electricity (OE), the National Association of State Energy Officials (NASEO) and the National Association of Regulatory Utility Commissioners
(NARUC) created guidelines used by local government to update existing EAP. It provides guidelines that integrate lessons learned from all 3 energy emergencies.

National Emergency Management Association (NEMA) also offers a helpful and related resource on current state and promising practices for energy assurance planning. Puerto Rico is a member of the Emergency Management Assistance Compact (EMAC), a national interstate mutual aid agreement that enables states to share resources during times of disaster. The thirteen articles of the Compact set the foundation for sharing resources from state to state. *(Energy Resilience Solutions for the Puerto Rico Grid DOE P38).*

In the response to Hurricane María, the six-week delay in requesting mutual aid assistance hampered recovery efforts and raised questions as to Puerto Rico authorities’ overall management of the recovery effort. While no regulatory changes are needed, a complete review of the procedures for invoking a call for mutual aid assistance should be undertaken to ensure future situations are handled effectively. To prepare for the future calling for mutual aid assistance, the utility, along with appropriate government agencies, should undertake a review of their emergency response management procedures and develop an updated Incident Command System (ICS). In general, ICSs are part of the National Incident Management System (NIMS) under federal Department of Homeland Security authority. An ICS establishes a command hierarchy to coordinate emergency response and identifies the Incident Management Team (IMT) and procedures for communications, organization and pre-positioning of emergency equipment, and command operations. PREPA and appropriate Puerto Rico authorities will expedite their ICS update by working with the Southern States Energy Board and with utility organizations, such as the American Public Power Association (APPA). Beyond developing the Plan and an organization structure, it is important that local authorities conduct periodic training exercises based on their ICS.

**B. Fundamental Elements on emergency response organization**

The Incident Command System (ICS) provides a commonly accepted management structure that results in better decisions and more effective use of available resources. Both government and private organizations are moving toward this management system with common terminology and a standard module structure. Puerto Rico has adopted guidelines based on the National Incident Management System (NIMS), which can be adapted to its environment, or as necessary, when coordinating with external agencies. The fundamental
principles of emergency management are based on four phases – mitigation, preparedness, response and recovery. By communicating effectively all the efforts that are being deploy in the most efficient manner, a better collective respond will minimize damages. Maintaining a transparent and clear communication of current status and next steps to maintain a safe environment under an emergency is crucial.

The response from ESF #12 stakeholders represent guidance for emergency management. The synergy between public and decision makers needs to be clear to gain confidence and communicate protection roadmap. Some of the most common questions asked by the media following a disaster needs to be addressed before organizing any public communication.

**Figure 11 Emergency Support Functions**

<table>
<thead>
<tr>
<th>Response Phase</th>
<th>Recovery Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESF 1: Transportation</td>
<td>SRF 1: Community Planning and Capacity Building</td>
</tr>
<tr>
<td>ESF 2: Communications</td>
<td>(SRF 6, 7, 13, 14, 16)</td>
</tr>
<tr>
<td>ESF 3: Public Works</td>
<td>SRF 2: Economic Recovery</td>
</tr>
<tr>
<td>ESF 4: Firefighting</td>
<td>(ESF 16)</td>
</tr>
<tr>
<td>ESF 5: Information and Planning</td>
<td>SRF 3: Health Services</td>
</tr>
<tr>
<td>ESF 6: Mass Care</td>
<td>(ESF 9, 17)</td>
</tr>
<tr>
<td>ESF 7: Resource Support</td>
<td>SRF 4: Social Services</td>
</tr>
<tr>
<td>ESF 8: Health and Medical</td>
<td>(ESF 6, 11, 15)</td>
</tr>
<tr>
<td>ESF 9: Search and Rescue</td>
<td>SRF 5: Disaster Housing</td>
</tr>
<tr>
<td>ESF 10: Hazardous Materials</td>
<td>(ESF 9, 15)</td>
</tr>
<tr>
<td>ESF 11: Food and Water</td>
<td>SRF 6: Infrastructure Systems</td>
</tr>
<tr>
<td>ESF 12: Energy</td>
<td>(ESF 1, 2, 3, 12)</td>
</tr>
<tr>
<td>ESF 13: Military Support</td>
<td>SRF 7: Natural and Cultural Resources</td>
</tr>
<tr>
<td>ESF 14: Public Information</td>
<td>(ESF 10, 17)</td>
</tr>
<tr>
<td>ESF 15: Volunteers and Donations</td>
<td></td>
</tr>
<tr>
<td>ESF 16: Law Enforcement</td>
<td></td>
</tr>
<tr>
<td>ESF 17: Agriculture and Animal Protection</td>
<td></td>
</tr>
<tr>
<td>ESF 18: Business and Industry</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 11 Emergency Support Functions**
## Phase 1 - Pre-Incident

<table>
<thead>
<tr>
<th>Objective I – Operational Structure for Catastrophic Events</th>
<th>Phase 1 A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIME H +/-1</strong></td>
<td><strong>FUNCTION</strong></td>
</tr>
</tbody>
</table>
| 0-130H Incident Action Plans                               | Identify critical facilities that relies on pumps houses for Island Control. | -SRNA  
-PRASA  
-PRPR | JCEP didn’t included ESF-12 holistic roles stated by EAP | Vulnerable community relocation based on possible flood scenarios. |
| -96H Resource Mgmt. Order resources and assisting the private sector | ERG to LERK to Petroleum Industry Stakeholders. | -ERG  
-LELG  
-JREnergy  
-JP Gas & Petroleum  
-LELG | ISRR / Time DE Maintenance | Fuel, Private Production, Transportation. |
| -96H Resource Mgmt. Order resources and assisting the private sector | Maintaining lists of local businesses that have capabilities to respond to emergencies with basic services or products. | PREMB  
AGU  
CGU  
BECC | Small Businesses are not registered as government suppliers. | AGU will provide guidance on the emergency procurement process and will arrange a waiver of 30 days to complete the processes. |
| -96H Incident Action Plans                                 | Presentation of punch-list items of missions for each phase under Basket Structure. | All ESFs | Consult with PREMB in the Preparation Section, ask for a template and offer a Just-In-Time Training (JIT). |
| -96H Incident Action Plans                                 | Review recovery actions and develop strategies for restoring ongoing local and National Energy response. | All ESFs | Help to the maximum extent practicable on voluntary, rather than mandatory strategies. |
| -96H ESDFS Functionality                                  | Encourage responders and coordinators to prepare for the emergency. | All ESFs | There are no official lists of responders. |
| -96H ESDFS Functionality                                  | Appropriate materials such as maps, facts sheets, and fuel supply information. | All ESFs  
ART  
CTNN | The computer system network is poor. | Request Emergency services (JIT) |
| -72H Incident Action Plans                                 | Test communications systems and computer of the EDC. | All ESFs  
BECC  
ART  
CTNN | The computer system network is poor. | Request Emergency services (JIT) |
| -72H Incident Action Plans                                 | Cooperate with local utilities about management of local dams and their safety. | PRESA  
PREPL  
PRAT  
MNA | JCEP didn’t included ESF-12 holistic roles stated by EAP | Draft pre-agreed Resources Request forms (RRF) |
| -72H Incident Action Plans                                 | Maintain contact with the federal ESF counterparts. | All ESFs  
PRAT | Lack of knowledge of how to make an API. | Consult with PREMB in the Preparation Section, ask for a template and offer a Just-In-Time Training (JIT). |
| -48H Incident Action Plans                                 | Discussion of operational plans, review of resources, identify priorities and available resources. | All ESFs | No Buyers. |
| -48H Incident Action Plans                                 | Update of resources, pre-positioning of resources, emergency procurement, establish contact with the private sector and then to send an inventory of essential resources | BECC  
PREMB | Request waiver for an alternate method of procurement or request to AGU. |
| -24H ESDFS Functionality Full                             | Full activation of agencies EDC. | DEC-ECP  
BECC  
ART  
CTNN | Agencies are not prepared in their EDC | Request contact information from local suppliers and companies via the mass media. |
| -24H Resource Mgmt. Order resources and assisting the private sector | Request the coordinators of the private companies a list of businesses that have capabilities for the distribution of fuel, water and medicine to be hired if necessary, by the state or EDCMA. | All ESFs  
BECC  
ART  
CTNN | No buyers. | Request contact information from local suppliers and companies via the mass media. |

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Energy Assurance Plan for Puerto Rico

June 2020
## Objective II – Activate Staging Areas Resources

### Phase 1A

<table>
<thead>
<tr>
<th>TIME * H +/-</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESP 12 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:12H</td>
<td>Logistics</td>
<td>Validate MOUs with truckers and transport companies.</td>
<td>Petroleum transport MOU will be revised to ensure the fastest and most efficient movement of fuel to possible affected region. Define a single point of contact for the trucking industry, and other agencies to assist in the removal of barriers to the quick delivery of fuel.</td>
<td>ASG, CSP, PREMB, DPH, OGP, GAA</td>
<td>The agreements have not been finalized.</td>
<td>Establish contacts and reach interim agreements.</td>
</tr>
<tr>
<td>2:12H</td>
<td>Logistics</td>
<td>Validate that the docks can receive cargo around the island (Cabo, Ponce, Mayaguez; among others) as alternate loading access points.</td>
<td>Validate with the U.S. DOT's Federal Motor Carrier Safety Administration (FMCSA) about rules that require the thorough inspection of cargo to ensure lighting and cargo standards are met and inspection repair and maintenance requirements. Coordinate the effort to get as many loads into the disaster area as possible in a short amount of time.</td>
<td>APPR, USCG</td>
<td>Ports Authority has not carried out the feasibility study. ЮрОЦП didn't included ESP-12 holistic roles stated by EAR.</td>
<td>USCG should evaluate with Ports Authority to identify the viability of the docks by type of vessel, capacity and debarkation method.</td>
</tr>
<tr>
<td>3:12H</td>
<td>Logistics</td>
<td>Validate contracts with fuel distributors.</td>
<td>Under the contract, it is imperative that distributors have the flexibility to get any available fuel into the affected area in any way possible. Validate logistics to ensure response.</td>
<td>ASG, CSP, PREMB, GCR, OGP</td>
<td>Expired Contracts. Contract with single supplier. ЮрОЦП didn't included ESP-12 holistic roles stated by EAR.</td>
<td>Authorize emergency contract. Request emergency contract with all suppliers of fuel.</td>
</tr>
<tr>
<td>3:12H</td>
<td>Supply Chain</td>
<td>Establish an MOU with suppliers and carriers (independent truckers, unions, and companies)</td>
<td>Confirm a Distributor’s License to transport motor fuel within the government and compliance with general standards and requirements that apply to vehicle labeling, record keeping, etc.</td>
<td>ASG, CSP, PREMB, OCO, PREPA, DDEC-EPP</td>
<td>There are only agreements with a single supplier</td>
<td>Request quotations from alternate suppliers to make free selection contracts in case of emergencies.</td>
</tr>
</tbody>
</table>

### Phase 1B

<table>
<thead>
<tr>
<th>TIME * H +/-</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESP 12 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>-72H</td>
<td>Logistics</td>
<td>Confirm the EOC’s power, water, and food capabilities.</td>
<td>Maintain communication with PREPA and PRASA about operation resiliency during an emergency.</td>
<td>Utilities do not work, or there is a shortage.</td>
<td>Coordinate with PREPA, PRASA</td>
<td></td>
</tr>
<tr>
<td>-72H</td>
<td>Logistics</td>
<td>Confirm the capabilities of food and water for responders and Coordinators of state agencies</td>
<td>Review checklist of responders and essential necessities for 10 days.</td>
<td>All ESFs</td>
<td>There is no food or water for responders in case of the occurrence of the emergency.</td>
<td>Make emergency purchase orders to supply the agency’s EOC with enough food and water for at least ten days.</td>
</tr>
<tr>
<td>-24H</td>
<td>Logistics</td>
<td>Mobilize fuel carriers to supply government’s critical infrastructure</td>
<td>Identify most critical infrastructure of emergency operation and confirm that fuel and all contingencies have been addressed to ensure continuous operation.</td>
<td>CSP, PREMB</td>
<td>There is no contract with certain carriers.</td>
<td>Make emergency contracts with ASG.</td>
</tr>
<tr>
<td>TIME</td>
<td>FUNCTION</td>
<td>TASKS</td>
<td>ESF 12 ACTION</td>
<td>SUPPORT UNITS</td>
<td>LIMITATION</td>
<td>CONTINGENCY</td>
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</tr>
<tr>
<td>≤12H</td>
<td>Critical Infrastructure</td>
<td>Evaluate the type of operations and products that private critical infrastructures produce to determine their criticality.</td>
<td>Obtain accurate and timely information and is used to calm markets, helping to avoid panic behavior by consumers or businesses. Collecting this information is critical to ensuring that the supply and distribution system responds effectively to an emergency. Mitigating a deteriorating energy emergency situation depends on objective analysis of appropriate energy prices, supply, and demand data.</td>
<td>PROCO PREMB Sectors</td>
<td>Companies do not want to share information</td>
<td>Use the contact from the BEOC and DHS Protective Security Advisor</td>
</tr>
<tr>
<td>≤12H</td>
<td>Critical Infrastructure</td>
<td>Evaluate the economic impact of the critical private infrastructure.</td>
<td>Enhance resiliency of services while minimizing economic disruption by analyzing private sensitive information that will impact the economic development with manufacture stakeholders across the island.</td>
<td>PROCO PREMB BEOC Sectors Leaders</td>
<td>Companies do not want to share information</td>
<td>Use the contact from the BEOC and DHS Protective Security Advisor</td>
</tr>
<tr>
<td>&gt;12H</td>
<td>Risk Communication</td>
<td>Revision of existing public information and pre-scripted messages. Overseas monitoring of both broadcast and print media news reports about energy assurance. Corrections would be made at press briefings, through press releases, or by direct contact with the station or publication.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;96H</td>
<td>Critical Infrastructure</td>
<td>Establish communication with critical infrastructures.</td>
<td>Assist in monitoring and expediting distribution of energy resources. Perform critical roadway maintenance. Coordinate with federal agencies for any necessary transportation system waivers.</td>
<td>DTOP PREMB EDCC-EPP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;96H</td>
<td>Risk Communication</td>
<td>Test information technology systems. Identification of, and procedures for, maintaining communications with customers that provide critical telecommunications, transportation and fuel distribution services.</td>
<td>ALL ESFs</td>
<td>Systems do not work</td>
<td>Activate emergency services or redundancy systems.</td>
<td></td>
</tr>
<tr>
<td>&gt;96H</td>
<td>Risk Communication</td>
<td>Perform telecommunication systems tests. Identify communication staff and practice different exercises of the process to share information.</td>
<td>ALL ESFs</td>
<td>Systems do not work</td>
<td>Activate emergency services or redundancy systems.</td>
<td></td>
</tr>
</tbody>
</table>
# PHASE 2 – RESPONSE

## Objective V – Provide Safety for Responders and Public Health Services

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESP 12 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24H</td>
<td>Responders and Coordinators Safety</td>
<td>Check communications systems for responder’s communication</td>
<td>Plans and resources are allocated to maintain leveled response across multiple operational shifts. Confirm status with PREPA’s representative located at COE about mobilization of personnel to addressed emergency.</td>
<td>ALL ESFs, FEMA, PRNG</td>
<td>Damages to communications systems</td>
<td>Use alternate communications systems, including KP-4 and PRNG HF system.</td>
</tr>
<tr>
<td>+24H</td>
<td>Responders and Coordinators Safety</td>
<td>Ensure the availability and use of personal protective equipment during the operations</td>
<td>Identify equipment and personnel needs and support capabilities.</td>
<td>ALL ESFs, OSHA, PROSHA, Dept. of Labor</td>
<td>There is no personal protective equipment in the agency</td>
<td>Perform emergency purchase orders</td>
</tr>
<tr>
<td>+24H</td>
<td>Public Safety</td>
<td>Impose curfew from 6pm to 6am to civilians not related to the emergency. Emergency Essential Personnel defined as Public Healthcare Personnel, Private and Public Safety, Press personnel, truck drivers, transportation services personnel, law enforcement agencies, security officers, fire fighters, paramedics, SAR personnel, chaplains, volunteers under mission assignments, communication technicians, contractors, food and medicine supply chain workers, Military, Critical Infrastructure employees, Emergency Coordinators, Media personnel and Veterinarians</td>
<td>Provide clear communication of supplier’s access to critical infrastructure damages.</td>
<td>ALL ESFs, PRNG, DHFR, DINA SECURITY, DSS, DOI, DHS, PM’s, Courts, DDEC-EPP</td>
<td>Doubts arise about the term Emergency Essential Personnel</td>
<td>Clarify with the media which is considered an Emergency Essential Personnel: Public Health, Private and Public Security, Transportation, Communications, Food and Drug Supply Chain, Military, Emergency Coordinators, Employees of School/kitchens, Press and Veterinarians</td>
</tr>
<tr>
<td>+24H</td>
<td>Public Safety</td>
<td>Provide security in the fuel distribution centers “Fuel Racks”</td>
<td>Determine fuel availability and backup capabilities at system level.</td>
<td>ALL ESFs, PRNG, DHFR, DINA SECURITY, DSS, DOI, DHS, PM’s, Courts, DDEC-EPP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+72H</td>
<td>Responders and Coordinators Safety</td>
<td>Coordinate fuel supply and transportation for Emergency Essential Personnel</td>
<td>Coordinate actions to meet energy requirements, conduct analysis and implement measures, and support activation and mission assignment requirements.</td>
<td>ALL ESFs, AG, DDEC-EPP</td>
<td>Emergency Essential Personnel do not have fuel to get to their work areas or their homes</td>
<td>ASG issues an emergency contract with all major brands of fuel sold in PR. ASG sends a message to all staff who are classified as Emergency Essential Personnel EEPs will have priority to buy fuel.</td>
</tr>
<tr>
<td>+72H</td>
<td>Responders and Coordinators Safety</td>
<td>Coordinate commodities, food, and water to the emergency responders and employees affected by the emergency.</td>
<td>Identify needs, resource shortfalls and develop contingency plans.</td>
<td>ALL ESFs</td>
<td>The agency does not have inventory to help their employees</td>
<td>Coordinate with other agencies to provide humanitarian aid for the employees affected by the emergency as a high priority.</td>
</tr>
</tbody>
</table>

### Phase 2 C

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>SUPPORT ENTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Days</td>
<td>Responders and Coordinators Safety</td>
<td>Coordinate alternate human resources to ensure continuity of the response</td>
<td>ALL ESFs</td>
</tr>
</tbody>
</table>
## Objective VI – Damage Assessment

### Phase 2 - Beginning of Incident

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESF 12 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24H</td>
<td>Develop damage assessments by Branches</td>
<td>Assess damage of regional offices infrastructure</td>
<td>Meeting with Energy Task Force to prioritize generator installations for facilities that need emergency power.</td>
<td>ALL ESFs</td>
<td>Lack of Personal</td>
<td>Utilize volunteers, staff, coordinate collaboration with the College of Engineers of PR.</td>
</tr>
<tr>
<td>+24H</td>
<td>Develop damage assessments by Branches</td>
<td>Preliminary assessment of damage to basic utilities</td>
<td>Collect and provide information on % of state population with and without electric and gas services.</td>
<td>PREASA, PREPA, MINFRA, PREMB</td>
<td>Extensive damage</td>
<td>Provide alternate services if possible</td>
</tr>
<tr>
<td>+24H</td>
<td>Develop damage assessments by Branches</td>
<td>Damage assessment to the Dams of PRASA, PREPA and DRNA</td>
<td>Track power outages and restoration activities and report information to ESF.</td>
<td>PREMB, PREPA, PRASA, DRNA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+48H</td>
<td>Develop damage assessments by Branches</td>
<td>Assess the damage to the electrical grid</td>
<td>Provide analysis of the extent and duration of energy suppliers’ outages and prioritize essential service needs.</td>
<td>PREPA, PREMB, DDIC-FPP</td>
<td>Lack of personnel and equipment, obstruction of access</td>
<td>Coordinate with the USACE and private contractors, DTOP, municipalities for removal.</td>
</tr>
</tbody>
</table>

### Phase 2 C

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESF 12 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Days</td>
<td>Develop damage assessments by Branches</td>
<td>Keep up-to-date damage reports and sort by impact and criticality</td>
<td>Work with electric and natural gas utilities to provide ongoing updates on estimated population impacted.</td>
<td>ALL</td>
<td>Lack of trained personnel.</td>
<td>Coordinate JTT with state agencies and municipalities staff</td>
</tr>
<tr>
<td>30 Days</td>
<td>Coordination with EOC</td>
<td>Supervise the requested resources.</td>
<td>Coordinate with all ESFs to assess backup power generation, fuel needs and capabilities.</td>
<td>PREMB, FEVVA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Objective IX - Restore Critical Infrastructure

#### Phase 2: Beginning of Incident

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESP 3 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINUITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;24h</td>
<td>Communications</td>
<td>Recommend the use of satellite phones in all agencies.</td>
<td></td>
<td></td>
<td></td>
<td>Do not know how to use the satellite phone.</td>
</tr>
<tr>
<td>&lt;24h</td>
<td>Energy</td>
<td>Damage assessment to the power generation and distribution system</td>
<td>Support mass care operations' power generation status and needs.</td>
<td>PREPA, PREM, BESC, EEOC, EDOI</td>
<td>PREP-MB helicopters are not in service.</td>
<td>Contact private commercial helicopter services.</td>
</tr>
<tr>
<td>&lt;24h</td>
<td>Energy</td>
<td>Perform reconnaissance flights as soon as weather allows.</td>
<td></td>
<td></td>
<td></td>
<td>PREPA, PREM, helicopters are not in service.</td>
</tr>
<tr>
<td>&lt;24h</td>
<td>Government Services</td>
<td>Identify a supervisory staff to form teams to carry out an assessment of the damage caused by the incident and make a list of necessary resources to reestablish services as soon as possible.</td>
<td>Determine fuel availability and backup capabilities at system levels.</td>
<td>ALL ESFs</td>
<td>Government staff do not report to work.</td>
<td>Use top management staff, use volunteer groups, offer ex-EEP and use them to do the work.</td>
</tr>
<tr>
<td>&lt;24h</td>
<td>Government Services</td>
<td>Start damage assessment to government facilities</td>
<td>Work with US DOI to identify cascading impacts of regional damages that might affect local government response.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;24h</td>
<td>Shelters</td>
<td>Coordinate with electricity generators and water utilities for schools.</td>
<td>Coordinate the allocation of fuel to support mass care operation.</td>
<td>PREPA, ASP, DM, EEOC, EDOI, PM, PREM, DCOE-EP</td>
<td>There are no resources.</td>
<td>Request assistance from FEMA.</td>
</tr>
<tr>
<td>72h</td>
<td>Public Works</td>
<td>Road clearing of the fuel distribution nets across the island</td>
<td>Support debris removal activities for initial fueling operations. This includes electric utility operations supporting addressing downed lines, and fueling support emergency response.</td>
<td>DTOP, PREPA, Municipio, DCOE-EP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72h</td>
<td>Energy</td>
<td>Carry out reconnaissance flights as soon as time permits</td>
<td>Prioritize systems and infrastructure and identify requirements for repair and restoration.</td>
<td>PREPA, GOV, PREM, DCOE-EP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72h</td>
<td>Energy</td>
<td>Check inventories and request parts for network repairs</td>
<td>Coordinate with energy suppliers to distribute information updates.</td>
<td>PREPA, USACE, DOH, DCS, FEMA, DCOE-EP, PREPA</td>
<td>There are no parts in inventory.</td>
<td>Perform emergency purchase orders.</td>
</tr>
<tr>
<td>72h</td>
<td>Critical Infrastructure</td>
<td>Coordinate private critical infrastructure (CIC)</td>
<td>Track and analyze power and fuel issues and determine priority solutions. Engage in energy infrastructure and system restoration.</td>
<td>PREPA, DCOE-EP, DOH, FAMA, DCS, PREP-MB, APM-PI, RRCC, DCS, EEOC, Energy, Infrastructure Sector, PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72h</td>
<td>Government Services</td>
<td>Start evaluation of damages to structures and government facilities</td>
<td>Coordinate and assess impact to energy infrastructure and supplies, estimating repair timelines, population impacted.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72h</td>
<td>Government Services</td>
<td>Activate the communication process with the employees of the agency to know their condition after the emergency and identify their basic needs.</td>
<td>Activate with energy suppliers and resources outside the impacted areas to support both tactical and permanent repairs.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72h</td>
<td>Government Services</td>
<td>Activate essential nonemergency personnel to report to their work centers to assist in the cleaning and restoration of public services of the agencies</td>
<td>Support debris removal activities to support fueling operation.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Phase 2B

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESP 3 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINUITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Days</td>
<td>Communications</td>
<td>Establish a plan to energize the facilities with repairers and antennas used by federal state and local agencies.</td>
<td>Report outcomes from federal damage assessments and the effect on regional and national energy systems.</td>
<td>AEMEO, DCS, DTOP, Municipalities, ARRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Days</td>
<td>Energy</td>
<td>Power restoration prioritization process</td>
<td>Coordinate the assessment, repair and mobilization of energy systems needed to support critical infrastructure and essential services.</td>
<td>FEMA, USACE, PREPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Days</td>
<td>Government Services</td>
<td>Relate essential functions of the agencies as necessary</td>
<td>Implement and manage statewide fuel allocation program, establish fuel points of distribution and initiate fuel delivery.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Days</td>
<td>Government Services</td>
<td>Coordination with the suppliers of services and products to deliver equipment to support critical infrastructure and essential services to recover for the recovery of the agency</td>
<td>Coordinate the identification and mobilization of heavy equipment and personnel needed for energy operations.</td>
<td>PREPA, PREM, DCS, EEOC, EDOI, PREPA, EEOC, EDOI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Days</td>
<td>Government Services</td>
<td>Coordination with the suppliers of services and products to deliver equipment and essential materials to respond and for the recovery of the agency</td>
<td>Coordinate the identification and mobilization of heavy equipment and personnel needed for energy operations.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 Days</td>
<td>Business</td>
<td></td>
<td>Work with electric and natural gas utilities to determine ability for immediate service restoration.</td>
<td>ALL ESFs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Objective XII – Operational Response

### Phase 2 A - Beginning of Incident

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESF 12 ACTION</th>
<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24H</td>
<td>Supply Chain</td>
<td>Carry out an immediate Operational Capabilities Assessment of the main Food and Fuel Distributors of the island</td>
<td>Determine initial island fuel availability for pre-designated priority fuel users.</td>
<td>BEDEC Health Sector MIDA PREMB</td>
<td>Lack of communication</td>
<td>Use the Private Sector representative and Runners.</td>
</tr>
<tr>
<td>+24H</td>
<td>Supply Chain</td>
<td>Provide immediate support to main food, private critical infrastructures, and fuel distributors to restore their supply chain capabilities as soon as possible. Provide fuel distribution companies list, open access roads to the fuel distribution nodes, coordinate truck drivers with CSP, and any other basic support.</td>
<td>Coordinate transportation and distribution of propane and Liquified Natural Gas (LNG).</td>
<td>PREMB BEDEC Health Sector MIDA PRNG PHPO DTOP CSP FEVA DHS-PSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+24H</td>
<td>Maps</td>
<td>Use coordinates on maps of addresses of essential employees and responders.</td>
<td>Identify power generation status/needs of mass care operations.</td>
<td>ALL ESFs</td>
<td>Essential employees did not report to work</td>
<td>Locate employees that did not report to work. Use the coordinates send staff to check the situation with these employees.</td>
</tr>
<tr>
<td>+24H</td>
<td>Emergency Resources Identification</td>
<td>Activate pre-positioned resources.</td>
<td>Coordinate the allocation of fuel to support mass care operations.</td>
<td>ALL ESFs</td>
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<td></td>
</tr>
</tbody>
</table>

### +72H Incident Management Plans

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
<th>ESF 12 ACTION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>+72H</td>
<td>Incident Management Plans</td>
<td>Coordinate and synchronize the incident management plans with the functions of state and federal agencies.</td>
<td>Track power outages and restoration activities and report info to ESF 3.</td>
<td>ALL ESFs</td>
<td></td>
<td>Establish a review process among the agencies to cross-check plans. Require agencies to work as a team.</td>
</tr>
<tr>
<td>+72H</td>
<td>Supply Chain</td>
<td>Provide fuel access priorities to truck drivers that are responding to the emergency and are considered Emergency Essential Personal</td>
<td>Establish new temporary sites for fuel distribution to support emergency repairs to critical infrastructure.</td>
<td>PREMB DDEC-EPP</td>
<td>ASG fuel stations are overburdened</td>
<td>ASG issue new temporary contracts with all fuel distributors of the island.</td>
</tr>
<tr>
<td>+72H</td>
<td>Supply Chain</td>
<td>Supply fuel resources to all emergency vehicles</td>
<td>Analyze the extent and duration of possible fuel shortage and prioritized needs.</td>
<td>PREMB DDEC-EPP</td>
<td>ASG fuel stations are overburdened</td>
<td>ASG issue new temporary contracts with all fuel distributors of the island.</td>
</tr>
<tr>
<td>+72H</td>
<td>Information Sharing and Risk Communications</td>
<td>Inform the public about flooded areas, fires in progress, blocked roads, collapsed bridges, electric power infrastructure on the ground, etc.</td>
<td>Monitor and continue to assess energy supplies and infrastructures.</td>
<td>GOV DDEC-EPP</td>
<td>PREMB</td>
<td></td>
</tr>
</tbody>
</table>
PHASE 3 – RECOVERY

### Objective XIV – Infrastructure Recovery

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
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<th>SUPPORT ENTITIES</th>
<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 days +</td>
<td>Mitigation Activities: Restoration of utilities</td>
<td>Review and/or prepare mitigation plans for the utilities and Government infrastructure</td>
<td>Monitor and coordinate power, natural gas, and fuel restoration for recovery efforts.</td>
<td>PREMB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Objective XV – Economic Recovery

<table>
<thead>
<tr>
<th>TIME</th>
<th>FUNCTION</th>
<th>TASKS</th>
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<th>LIMITATION</th>
<th>CONTINGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 days +</td>
<td>Economic Restoration and Business Continuity</td>
<td>Set as a priority the power and water services restoration to shopping malls and commercial areas</td>
<td>Work with energy suppliers to determine their ability to implement priorities for repairs and restoration as established by Governor.</td>
<td>PREPA PREMB IRECC</td>
<td>Lack of inventory</td>
<td>Use USA Contractors</td>
</tr>
<tr>
<td>30 days +</td>
<td>Economic Restoration and Business Continuity</td>
<td>Request fuel distributors’ list from the private sector</td>
<td>Maintain communication with FEMA and COMSAT about damages assessments for Critical Infrastructure.</td>
<td>AGG PREMB IRECC Fuel Sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 days +</td>
<td>Business Recovery</td>
<td>Power Generators assistance, if needed</td>
<td>DDEC will be maintaining communication with Private sector and business development for SBA or incentives opportunities.</td>
<td>IRECC NMEAD FEMVA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ii. Energy Task Force Responsibilities

Either PREMB or DEDC-EPP can activate the local Energy Task Force (ETF) which is comprised of the following agencies. Its role is to facilitate the safe and rapid restoration of the commercial energy grid, identifies priorities and provides temporary emergency power for critical facilities, and ensures the adequacy and availability of fuel supplies, storage, and distribution. As a comprehensive coordinating group, the ETF provides constructive strategy and solutions to resolve both mid-term and prolonged energy shortages. The ETF may establish a temporary power strike team, a fuel distribution strike team, and a power restoration strike team, all of which require support from DEDC-EPP staff in their ESF #12 role. The group will be activated as part of phase I preparedness stage. Sensitive information from different stakeholders will be provided to the DEDC-EPP director as the main point of contact. The DEDC-EPP will be responsible of sharing the pertinent information to different ESFs or any other stakeholder that relies on the gathered information for efficient response. The contact listed for operational responsibilities will be distributed to PREMB. PREMB and DEDC-EPP will be able to have control of providing contacts, the list will also be available at ESFs table located at the EOC.
<table>
<thead>
<tr>
<th>AGENCY</th>
<th>RESPONSIBILITY</th>
</tr>
</thead>
</table>
• Monitor the overall fuel price, supply, and demand situation. Discuss potential corrective actions with major energy suppliers.  
• Issue emergency orders and directives as necessary and appropriate.  
• Operate a public relations center and maintain liaison with the media and local governments.  
• Administer Low-Income Home Energy Assistance Program and emergency fuel programs to assist qualified residents with cooling costs. (WFP-Program)  
• Administer Energy Assurance Plan by updating necessary documentation and implementation measures under State Energy Program (SEP) support. |
| P.R. Department of Economic Development and Commerce / Office of Permits Management (OGPM) | • Permits and Waivers for continuous operation. |
| P.R. Department of Economic Development and Commerce / Planning Board | • Principal administrator of the Hazard Mitigation Federal Plan.  
• Manages federal funding proposals for preserving natural resources and infrastructure resilience. |
| P.R. Emergency Management Bureau | • Provide coordination of State response.  
• Manages or co-manages major staging areas during emergencies that could require onsite fueling depots.  
• Runs the Center Operation Aid; Manages Branches and support Taskforces under the JOCP Comprehensive Emergency Management Plan. |
| P.R. Department of Agriculture | • Maintain liaison with farm and agriculture-related associations.  
• Obtain status of fuel requirements for seasonal agricultural production. |
| P.R. Department of State | • Maintain information on status of industry and commercial closings due to energy shortages.  
• Provide information on energy supply circumstances affecting specific industries.  
• Maintain liaison with regional tourism centers, business/trade groups, and utility companies. |
| P.R. Department of Education | • Maintain liaison with all school districts.  
• Coordinate with school administrators to identify needed energy supplies. |
| P.R. Department of Transportation and Public Works | • Assist in preparations to expedite energy resource deliveries, if necessary.  
• Coordinate with federal agencies for any necessary waivers (i.e., weight restrictions, driver’s hours of operation, geographical area limitations) to expedite distribution of fuel. (NASSO Petroleum Shortage Guidelines)  
• Conduct maintenance operations such as, landing, traffic signals, etc.  
• Coordinate with the Port Authority and the U.S. Coast Guard for operations on the fuel deliveries.  
• Maintain liaison with appropriate federal agencies, such as U.S. Department of Transportation and local transit authorities. |
| P.R. General Service Administration | • Maintain liaison with all institutions supplied under State fuel contracts.  
• Provide general equipment support, including telecommunications facilities, computer equipment and other office systems. |
| P.R. DPS Police Bureau | • Assists in emergency energy resource deliveries to critical or sensitive locations through such activities as vehicle escorts and traffic control and enforces other emergency response measures as required by statute. |
| P.R. Department of Natural Resources | • Issuance of environmental restrictions (e.g., sulfur in fuel content standards).  
• Maintain liaison with the U.S. Environmental Protection Agency. |
| Central Office for Recovery, Reconstruction and Resilience (CORN) | • Identifying, procuring and administering all Federal, State and/or private resources available to governmental entities to invest in the island’s recovery.  
• Coordinating all the efforts and activities of the governmental entities related to recovery.  
• Financing, executing or effecting infrastructure works and projects related to recovery.  
• Advising the Governor of Puerto Rico and providing aid and technical advice to other governmental entities in all matters related to recovery. |
| P.R. Energy Bureau (PRIE) | • Integrated Resource Plan (IRP) for Puerto Rico compliance.  
• Regulates local energy utility plans. |
| P.R. Department of Treasury | • Administrative economic assistance provider (incentives, grants, waivers, relief). |
| P.R. Office of Management and Budget (OGP) | • Provides support in managing the budget under emergency.  
• Measures effectiveness of governor’s emergency policies. |
| P.R. Telecommunications Regulatory Board | • Ensures communication by satellite phones if necessary.  
• Maintain communication infrastructure under the most efficient frequency options available. |
| P.R. Ports Authority | • Coordinate with maritime company leaders for supplies logistics. (CTCE and CROWN).  
• Port-wide security incidents point of contact.  
• Participates from coordinated fuel importation logistics. |
| P.R. Water and Sewer Services Authority (PRASA) | • Protects and maintains operation for potable water systems and addressing wastewater infrastructure issues. |
| F.R. Electric Power Authority (PREPA) | • Main workforce for response and recovery efforts.  
• Utility service for the Island (Generation, Transmission and Distribution). |
| Financial Oversight and Management Board (FOMB) | • Responsible for certifying Puerto Rico’s financial plan.  
• Approving and monitoring budgets and budgetary activities.  
• Advising Puerto Rico on financial management and certifying restructuring and approving actions related to debt issuance.  
• Certifies Puerto Rico’s economic and disaster recovery plan. |
| Department of Homeland Security (DHS) | • Develops national strategies for assessing and reporting first responders’ capabilities.  
• Standardizes training and exercise programs.  
• Support All-Hazards Policy initiatives and management capabilities. |
| Department of Energy (DOE) | • Provides technical assistance to local and federal entities to support grid recovery efforts.  
• Coordination with FEMA for recovery funding planning and implementation.  
• Define roles between interagency agreements. |
| Federal Emergency Management Agency (FEMA) | • Grid recovery policy guidance.  
•Lead for federal support recovery.  
• Public Assistance Program for island recovery. |
| Department of Housing and Urban Development (HUD) | • Guidance for Community Development Block Grant Disaster Recovery (CDGB-DR) funding.  
• Provides federal funding to enhance or improve electric grid. |
| PUMA Energy Caribe | • Representative and main point of contact for fuel logistics and service stations. |
| F.R. Business Emergency Operations Center | • Point of Contact of diverse private sector representatives. |
| CROWLEY | • Supply chain services between Puerto Rico and USA.  
• Fuel supply transportation.  
• LNG logistics provider and storage. |
iii. **Private Sector Roles**

The government agencies are responsible for the protection of the lives and properties; however, they cannot work alone. In various phases of an energy incident they will have to work with the private sector to manage the emergency. Therefore, in planning for energy emergencies, DEDC-EPP has to consider the measures for a prompt recovery of energy sources such as facilities, systems and structures of production, importation, distribution and retail, (public and private) to normal operation in the least invasive manner as possible to minimize changes in market.

The Puerto Rico Business Emergency Operation Center (PR-BEOC) created by the Federal Emergency Management Agency (FEMA) after Hurricane María struck in 2017 was developed to maintain clear and constant communication between the private and public sector. The private sector, represented by the non-profit PR-BEOC, was officially announced June 6, 2018, by then-Secretary of State. In a press release at the time, the State Department indicated that officials decided that after the historic hurricane, “it was important that the private sector and the Government were aligned in the recovery efforts.”

PR-BEOC represents the sectors of agriculture, chemical, commerce, critical manufacturing, energy, financial services, food, health, information, technology, transportation, and water. Private sector partners represent the most valuable source of information for data related to their own sector operations. For example, during a fuel shortage, the state consults with jobbers and petroleum pipeline companies to determine when the fuel supply would be replenished for the island. Private sector energy asset owners and operators are primarily responsible for the stabilization of infrastructure-related services after an incident occurs. Under Stafford Act events, ESF #12, through consultation with DOE Headquarters, becomes the Federal point of contact with the energy industry for information sharing and requests for assistance from private- and public sector energy owners and operators.

Internally, DEDC-EPP must coordinate with the private sector to obtain equipment and service to support operations during any of the three phases of an energy emergency. As a result, mutual agreements or contracts with other agencies municipalities, enterprises or private sector entities are required. Currently, DEDC has a memorandum of understanding (MOU) with PR-BEOC. As part of the affirmative steps of the government and private companies to improve response and protection in emergencies, the secretary of the Department of Economic Development and
Commerce (DEDC), Manuel A. Laboy Rivera, and the president of the Board of Directors for the Business Emergency Operations Center (BEOC), Wendy Perry, signed a collaboration agreement where they agree to share information from the local manufacture sector during an emergency.

For example, the biopharmaceutical, medical device, agro-industrial and other chemical manufacturing industries contribute significantly to the economic development of Puerto Rico. The chemical industry in Puerto Rico represents 29.9% of all the Gross Domestic Product (GDP) in the country. The value of economic production amounts to $30,216.7 million, from an economy of $101,130.9 million. The value of its exports amounts to $46,351.3, which represent 76.5% of all the value exported.\(^{39}\)

The DEDC-EPP recognizes the value of the Life Sciences Industry in Puerto Rico, since they produce medicines, treatments and medical devices essential for the health of millions of citizens of Puerto Rico, the United States and other countries. Through the direct collaboration agreements with the private sector, Puerto Rico will establish an effective exchange of information, as well as identify vulnerabilities in critical infrastructure, in order to address them. The Non-Governmental Organizations (NGOs) are legal entities created by citizens, which can play an important role before,
during and after an energy incident. They are independent and have specific interests, which can support the government efforts at all levels – planning and response operation. They can provide training and manage voluntary resources, but do not have representation or participation in the government. One of the groups that can facilitate expertise during an energy emergency is the Puerto Rico College of Engineers and Surveyors (CIAPR for its Spanish abbreviation), which can for instance provide technical expertise. In any case the participation of an NGO will be coordinated through the ESF#12.

C. ESF respond coordination at a multiorganizational and multisectoral level

The incident command structure established in the JOCIP is the Incident Command System (ICS), a command and control incident management system used for all types of hazards, coordinated events or emergencies. The ICS is a flexible and scalable structure, it can be used for all types of incidents with different scope and complexity. The ICS is the standard at the state and federal level for incident management. The ICS establishes common terminology that allows multiple response organizations to work together through various functions and scenarios.
The State and its Agencies shall establish their incident command structure by federal regulations of the ICS and the National Incident Management System (NIMS). The Federal Government will establish a unified command system in coordination with the State government through the GAR and SCO. The government of Puerto Rico will activate the Emergency Support Functions (ESF) necessary for the incident management in all its phases.40

D. Dissemination of Information

It is intended that this EAP will be a living document, where comments can be incorporated every year as part of the hurricane season preparedness. The DEDC-EPP will be accessible in gathering all recommendations or requests that might take place during proposed dissemination exercises. The input should be directed to the designated and current Puerto Rico Energy Assurance Coordinator at DEDC-EPP, which is the state agency directly responsible for the development and maintenance of the Puerto Rico Energy Assurance and Emergency Management Plan. Any comment or question will be carefully considered in the preparation of future amendments. The approval of possible changes suggested by any stakeholder will be announced when the updating yearly process is completed. DEDC-EPP works in close
collaboration with the Puerto Rico Emergency and Management Bureau PREMA to accomplish necessary actions needed to integrate the private and public sector roles.

Private sector partners serve as the most valuable source of information for data related to their own operations. For example, in case of a widespread power outage, CROWLEY, AES, and PRBEO representatives should be the primary source of information regarding the geographic coverage of the outage, its anticipated duration, and resources available to restore power. Similarly, during a fuel shortage, the state consults with PUMA Energy Caribe LLC and petroleum pipeline companies to determine when the fuel supply would be replenished for the state. PREPA and other electric providers will play a limited role in ESF #12 during disasters. Other providers whose operations are not often affected on a wide scale, such as natural gas utilities, are already included in ESF #12 discussions if their systems or operations are impacted.

During a potential, impending, or actual energy disruption, it is critical to remain in contact with authorities and energy industry representatives who can provide timely, accurate information regarding energy supply and delivery. Throughout the development of the Governmentwide Energy Assurance Plan, DEDC-EPP and PREMB will engage these partners in the planning process and build good working relationships with the energy industry. These contacts, listed in Table 3, will be updated periodically as needed.
Contacts

Federal All-Hazard Contacts

Federal Emergency Management Agency (FEMA) National Response Coordination Center
- ESF 4 – OFED: (202) 472-1000
- National Health Center: FEMA-OFED@fema.gov

FishKast
- 844-236-8600
- E-mail: info@fishkast.com

Federal Motor Carrier Safety Administration (FMCSA) – U.S. Department of Transportation (DOT)
- FMCSA Regulations Hotline: 1-877-888-7720
- DOT Crisis Management Center: 202-366-1083
- Alex Kines, FMCSA Emergency Coordinator/Safety Advisor: alex.kines@fhwa.dot.gov (202) 366-3737

U.S. Department of Energy (DOE)
- General Counsel: EnergyResponseCoordinator@dot.gov
- 24/7 Emergency Operations Center: EnergyResponseCoordinator@dot.gov (202) 564-5830

Department of Homeland Security (DHS)
- Natural Operations Center: 202-260-8000
- ISO Leader: ISO.DHS@DHS.gov

Environmental Protection Agency (EPA)
- Emergency Operations Center: eoc.epa.gov
- 202-564-6700

U.S. Coast Guard (USCG)
- Port Sedna San Juan: 787-723-6800
- Seventh District: 202-267-4723
- 787-723-6770
- National Command Center: 202-267-2300

Cyber/Physical Security Contacts

Federal Bureau of Investigation (FBI)
- FBI San Juan Field Office: (787) 714-6300
- CyWatch – National Cyber Investigative Joint Task Force (NCJTF): CyWatch@fbi.gov (613) 292-3077

DHS
- National Cybersecurity and Communications Integration Center: NC3I@dhs.gov
- Cybersecurity and Infrastructure Integration Center: IC3@nist.gov

Puerto Rico Government Contacts

Governor’s Office
- Andrew M. Belkin, Chief of Staff: andrew.belkin@chef.gobierno.pr

Energy Policy Program
- Michael L. Levine, Director; Secretary of Energy Policy Program, Executive Director: michael.levine@chef.gobierno.pr

Office of the Governor
- Governor’s Office: chefe@chef.gobierno.pr

Office of the Adjutant General
- Adjutant General’s Office: ofg@chef.gobierno.pr

Resident Commissioner’s Office
- Dennis M. Rosell, Resident Commissioner: dennis.rosell@chef.gobierno.pr

Electrical Power Authority
- Ernesto A. Quiñones, President: ernesto.quinones@nea.gobierno.pr (787) 729-8700 ext. 2216

Industry Contacts

American Public Power Association
- Mike Phillips, Senior Vice President: mPhillips@apppa.org

AES
- David Szot, Manager: david.szot@aesaes.com

Substation Electric
- Carlos Reyes, Chief Engineer & General Manager – Operations: carlos.reyes@substationelectric.com

Widmire
- Victor González, President: widmirepower.com

Juncos Electric Operations Manager

Palmas Energy
- Carlos Romero, Facility Manager – Acting Director: carlos.romero@palmasenergy.com
- Single Lines, Regional Manager: saul.rodriguez@palmasenergy.com

Harco / Ortegana Energy
- Carlos Ramirez, Manager: carlos.ramirez@harcoenergy.com

National Association of State Energy Officials (NASEO)
- Jeff Reiss, NASEO Vice President: jreiss@naseo.org

Ponce Energy (Parque Solar)
- Rubiano Martir, CEO: cmartir@poncesolar.com

Puerto Rico Power Line
- Rene Martorell, Manager: renemartorell@puertoricoenergy.com

Puerto Rico Energy Companies
- Brent Thomas, SVP Manager: bthomas@puertoricoenergy.com
- Carlos Roles, Operational Manager: crroles@puertoricoenergy.com

Total Ponce
- Domingo Vélez, SVP Manager: dvelez@puertoricoenergy.com

Sul-Puerto Rico Limited (Sul Puerto Rico)
- Yaima Primera, Energy and Safety Manager:

American Petroleum
- Nelson Silva, President: nsilva@appec.com

Fire Marshal
- Nick Marquez, Operations Manager: nick.marquez@palmasenergy.com

Pedroso Oil Company, Inc.
- Luis Negron, General Manager: luis.negron@pedrosooil.com

Best Powerline (BPL Distribuidor)
- Oscar Márquez, General Manager: omarquez@bestpowerline.com

Empire Gas
- Josué S. Núñez, Operations Manager: jnunez@empiregas.com

Trujillo S.A. Ponce
- Luis Gallardo, Operations Manager: lgallardo@trujillosaponce.com

Creating
- Carolina Conrado, Manager: carolina@creating.org

The U.S. Department of Energy Office of Electricity Delivery and Energy Reliability (OE) maintains a password-protected Energy Emergency Assurance Coordinators (EEAC) website. This system allows authorized state energy emergency coordinators to access valuable energy security information, including daily news summaries, emergency reports, lessons learned from other states, links to outage and curtailment information, and contact information for colleagues in other jurisdictions. The EEAC is a cooperative effort among the National Association of State Energy Officials (NASEO), National Association of Regulatory Utility Commissioners (NARUC), National Conference of State Legislatures (NCSL), Governors Association - Center for Best Practices, Public Technology Institute, and OE’s Infrastructure Security and Energy Restoration (ISER) Division. It establishes a secure cooperative communications environment for state and local government personnel with access to information on energy supply, demand, pricing, and infrastructure. EEACs are most often representatives from state energy offices, public utility organizations, state legislators, emergency management agencies, homeland security offices, local governments, and governors’ offices.

Under Act 17-2019, representatives from DEDC-EPP should be designated as energy emergency assurance coordinators. In the event of an energy supply disruption or emergency, the OE relies upon the EEAC contacts to provide an up-to-date assessment of energy markets in the affected states and territories. During these emergency situations, as well as other non-emergency situations in which the list may be used, the EEAC serves as the link between the

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state, industry, and OE. Currently, Puerto Rico is not being represented with updated data, this EAP will fill that gap of valuable information.

In an energy emergency, OE may need to disclose sensitive and privileged information. In these situations, DEDC-EPP should follow the state’s protocol for disclosure of information. In non-emergency or less sensitive emergency or disruption situations, communications can be sent directly to the OE via email, and an EEAC can use the listservs to send information to different regions. In addition, coordinators may utilize the bulletin board to share information and best practices across the states.41
### DEDC-EPP ESF #12 After Action Report-Submission Form

| **Date:** Enter the date the form is completed |
| **Incident Title:** provide a title that briefly describes the incident. |
| **Event Type:** (i.e., Hurricane, Flood, etc.) |
| **Name/Phone:** Enter your first and last name followed by your business phone number |
| **Office/Role:** (i.e., operations, logistics, finance, etc.) |
| **Capability Element the Observation/Recommendation applies to:** (check one) |
| □ Plan |
| □ Organize |
| □ Equipment |
| □ Train |
| □ Exercise |
| **Observation:** Provide a brief synopsis of your observation. |
| **Discussion:** Fully describe the issues related to the observation to include impacts on the response. |
| **Recommendation:** Provide a recommendation to address the observation and alleviate the concerns in the discussion. |
IX. EAP – Program Evaluation and Improvement

A. Updating the Plan

The updating process of Puerto Rico’s energy emergency plans need to be scaled to the level of available resources. In some instances, the necessary resources may not be available to perform a more thorough update. Based on Act 17-2019 mandate, DEDC-EPP needs to be able of assuming the responsibility of updating the EAP on a yearly manner. The EAP will have an immediate updating process to include current health pandemic COVID-19 and define procedures with roles and responsibilities from the Energy Task Force. The update requirements that the DEDC is responsible for, consist on:

1. DEDC-EPP will assign a review team to overlook existing plan and determine if there are any program or policy updates/changes which affect the plan.
2. DEDC-EPP will ensure relevant agencies (and individuals) are still correct. If not, perform a search and make replacements within the document as needed.
3. Update laws or policies that may have changed which affect the plan.
4. Review points of contacts to remove individuals who have either been reassigned, retired, or have resigned and add new individuals as needed.
5. Review the state’s energy emergency assurance coordinators contacts list within the DOE to remove individuals who have either been reassigned, retired, or have resigned and add new individuals as needed.
6. Identify planning elements which should be revised, added, or expanded as priorities for future updates to the plan.
7. Form a team to specifically identify significant gaps in the plan which should be addressed and/or existing planning elements which should be refined and expanded.
8. Address significant gaps in a limited number of high priority areas.
9. Provide further contingency planning details (e.g., draft executive orders, samples of previous issued orders, and implementation steps).
10. Engage energy sector stakeholders in review of the draft plan.
### SMART Guidelines for Corrective Actions

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Specific</strong></td>
<td>Corrective actions should address the five W’s – who, what, when, where, and why. The action should be tied back to an object that was evaluated.</td>
</tr>
<tr>
<td><strong>Measurable</strong></td>
<td>Corrective actions should include numeric or descriptive measures that define quantity, quality, cost, etc. The focus should be on the outcomes of the corrective action.</td>
</tr>
<tr>
<td><strong>Achievable</strong></td>
<td>Corrective actions should be within the control, influence, and resources of the responsible owner/assignee.</td>
</tr>
<tr>
<td><strong>Relevant</strong></td>
<td>Corrective action should be instrumental to the mission of the organization and linked to its goals or strategic intent. Validations of the corrective action ensures that it meets the goals and intent.</td>
</tr>
<tr>
<td><strong>Time-bound</strong></td>
<td>Corrective actions should have a specified and reasonable timeframe to be completed.</td>
</tr>
</tbody>
</table>

*Figure 8 represents best practices and corrective actions that will provide new possibilities for maintaining the EAP updated.*

### B. Short-term and Long-term EAP Outcomes

Short and Long-term outcomes are going to be crucial for maintaining a viable energy plan for protecting Puerto Rico’s economic, social and environmental resiliency. Short-term outcome should be executed during next Hurricane season. It will be deployed under a roadmap for energy response suggested by the National Association of State Energy Officials’ State Energy Assurance Guidelines is as follows:

**Phase 1: Overview and alerting** - Normal energy supply, demand, and price is ongoing until the time a monitored parameter reaches a level indicating that action is required. The primary sources for this data will be the U.S. DOE and EIA for petroleum incidents, municipal energy stakeholders, and the PREB regarding the electric and natural gas utility it regulates.

**Phase 2: Assessment to Action** - This assessment is divided into actions taken within the Energy Supply Structure and actions requiring government and citizen response.

- Compare acquired baseline data to additional data available, and obtained at the outset of a shortage, or related problem.
- Contact relevant energy sector stakeholders in order to acquire updated information as needed.
- DEDC-EPP will identify data and update frequency required during action and follow-up phases:
  - Recognize that follow-up feedback could indicate a variety of outcomes such as:
- Action should continue.
- The situation has cleared.
- The situation has worsened requiring different actions.

**Phase 3: After-Action Assessment** - An action is taken during Phase 2, the data is monitored to reveal trends in light of the anticipated impact of a shortage. Results are monitored and, depending on the situation, the need for additional data acquisition is determined.

**Phase 4: Review Lessons Learned** - In a post-event review, the value of data acquired before, during and after the event are evaluated together with lessons-learned from actions that were or not have been taken. Recommendations for improvement to the Energy Assurance Plan are developed.

- Prepare a timeline including key data monitored, alerts issued, and actions taken from 24 hours prior (or as near as practical) to the alert through return to normal conditions. Specific information should be documented for the duration, response, restoration and recovery times for energy supply disruption events.
- Potential information to ask/consider:
  - Was the assessment accurate in defining the extent of the problem?
  - Did the data and monitoring frequency provide adequate warning in all phases?
  - Were the actions effective in alleviating/resolving the problem?
  - Was there timely response to the alerts by the proper organizations (state, supply chain, media, public)?
  - Were the assessment and action steps executed at the appropriate time?
  - Could a faster assessment and action or different action have yielded better results?
  - Did the historical data and thresholds for phase changes indicate a proper response?
  - What changes to the Energy Assurance Plan should be made to achieve a better result?

By obtaining information suggested, Puerto Rico will enhance the ability to understand the nature of an impending and actual energy shortage. However, this data has one more critical purpose, it provides a basis for mitigating future emergency measures. Using the data obtained above before and during an emergency will enable responders to examine the efficacy of the Puerto Rico’s Energy Assurance Plan.

A calendar will be developed every January and shared with all stakeholders to demonstrate short-term implementation meetings and training that will help on following up with short-term outcomes. Some of mentioned events will be in coordination with State officials and collaborative national events. Sharing information from other state’s experiences will help
understand local scenario by comparing Caribbean and tropical conditions that are unique for the emergency scenario for the island of Puerto Rico.

**C. Plan Evaluation Mechanism**

The Puerto Rico’s Energy Assurance Plan is not completed until a dissemination deployment takes place under this document. Before and during an energy event, it is the responsibility of the Energy Public Policy Program to stay involved in activities to monitor, report, and assess energy supply issues affecting the government. Monitoring activities require coordinating and maintaining relationships with all surrounding industry contacts, to be adequately informed about all energy-related issues. In maintaining those relationships with industry contacts, planning activities will take place to better understand the essential resources to the island. Such planning activities include the development of this Plan and the testing and training of its use by all coordinating Puerto Rico’s energy industry groups.

Additionally, information regularly collected through coordination and planning activities is analyzed to evaluate any potential impacts to energy local supply. The DEDC-PPE will regularly review Puerto Rico’s energy profile and assess vulnerabilities and potential impact to its supply. These same evaluation and assessment processes, which are implemented by the DEDC-EPP on a regular, day to-day basis to evaluate best practices of how current energy supply, will be utilized and carried out as an emergency verification assessment during an event or impending event. Current information will be used to develop recommendations to the Governor either to continue current programs or to begin new emergency programs. Emergency programs may include mandatory implementation of previous voluntary measures and other measures such as Emergency Fuel Allocation Program or Economic Assistance.

General Instructions for yearly emergency:
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
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<tbody>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Week of January</td>
<td>DEDC-EPP’s administrator will sent a reminder memorandum to PREPA’s agencies Directors for them to update their Emergency Plan on different areas.</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Week of March</td>
<td>DEDC-EPP’s administrator will verify all updated emergency procedures sent by Directors. He will need to meet with them for planning a work and training program to every personnel.</td>
</tr>
</tbody>
</table>
| April and May        | PREPA’s Directors, administrative supervisors and managers will implement preventive measures and training for coordinating:  
   a) Supplies  
   b) Transportation (Ground and Aerial)  
   c) Communications  
   d) Personnel Roles  
   e) Accountabilities and Finances  
   A report for a, b and c needs to be provided to DEDC-EPP.                                                                                           |
<p>| 1&lt;sup&gt;st&lt;/sup&gt; Week of May | Regional administrators and division supervisors will determine personnel assignments based on their necessity and responsibilities.                                                                                  |
| 4&lt;sup&gt;th&lt;/sup&gt; Week of December | DEDC-EPP’s administrator will evaluate emergency response plans from directors. A review report will be provided to the PREPA’s Executive Director about activities and recommendations.                              |</p>
<table>
<thead>
<tr>
<th>WAREHOUSE</th>
<th>FACILITY</th>
<th>PHONE/CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A81</td>
<td>Arecibo Regional Warehouse</td>
<td>(787) 621-6385</td>
</tr>
<tr>
<td>A71</td>
<td>Quebradillas District Warehouse</td>
<td>(787) 521-1489</td>
</tr>
<tr>
<td>A82</td>
<td>Utuado District Warehouse</td>
<td>(787) 521-0357</td>
</tr>
<tr>
<td>A83</td>
<td>Manati District Warehouse</td>
<td>(787) 521-0386</td>
</tr>
<tr>
<td>A14</td>
<td>Bayamón Regional Warehouse</td>
<td>(787) 521-0700</td>
</tr>
<tr>
<td>A91</td>
<td>Vega Baja District Warehouse</td>
<td>(787) 521-0047</td>
</tr>
<tr>
<td>A13 &amp; A16</td>
<td>Monacillos District and Generation Warehouse</td>
<td>(787) 721-5492</td>
</tr>
<tr>
<td>A31</td>
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<td>(787) 521-8979</td>
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<td>A22</td>
<td>Humacao District Warehouse</td>
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<td>Barranquitas District Warehouse</td>
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X. CONCLUSION

The Island’s energy markets, regulatory policies, and threat environment are unique from any other state in the country. This plan represents Puerto Rico’s most thorough effort to date to prepare for a significant energy emergency. The energy assurance plan thoroughly discusses Puerto Rico’s energy statistics, policies, interdependencies, island geographical context, threat environment, mitigation and available response tools. The plan should be considered the best single source of information for government officials during any energy emergency. Thanks to the all-hazards planning approach, the Energy Assurance Plan is organized to support efforts during any type of energy emergency, whether natural or man-made.

Thanks to funding provided by the State Energy Program (SEP), Puerto Rico now has an initial Energy Assurance Plan and a more engaged and knowledgeable ESF 12 approach. Therefore, it is important to note that certain aspects of this plan may always not be applicable. It is the intent of DEDC-EPP to update this plan periodically as needed and to keep stakeholders aware of any changes. Thus, this plan should be considered a living document. The next step for updating current document is being addressed by incorporating COVID-19 effects, new privatization of transmission and distribution system with LUMA Energy and any other aspect that will be needed to respond effectively.

Please direct any future comments or concerns to the Energy Policy Program of DEDC. The Energy Policy Program can be reached at (787) 765-2900 or eap@ddec.pr.gov.
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39 Department of Economic Development and Commerce of Puerto Rico
40 See ESF Appendix A (JOCIP)
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## Definitions and Acronyms

A comprehensive glossary of energy terms and definitions and a wealth of energy information is available at the Department of Energy, Energy Information Administration’s website [http://www.eia.doe.gov](http://www.eia.doe.gov) Definitions of many of the terms and acronyms used in the Puerto Rico Energy Assurance Plan are presented below.

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<td><strong>Agency</strong></td>
<td>State department, local government, agency, board, public benefit corporation, public authority, or commission.</td>
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<td><strong>Allocation</strong></td>
<td>Apportionment of fuel based on purchases and consumption amounts for stated periods.</td>
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<td><strong>API American Petroleum Institute</strong></td>
<td>A trade association of the petroleum industry.</td>
</tr>
<tr>
<td><strong>Aviation Fuels</strong></td>
<td>Petroleum-based fuels designed for use in aircraft, fuels designed to operate aircraft combustion engines, and refined-petroleum turbine engines.</td>
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<tr>
<td><strong>Bbl Barrel</strong></td>
<td>42 gallons; a unit of measurement.</td>
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<tr>
<td><strong>Bulk Plant</strong></td>
<td>One or more storage tanks owned or leased by wholesale distributors or prime suppliers storing product for redistribution of product to end-users.</td>
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<tr>
<td><strong>Coal</strong></td>
<td>A solid fuel including bituminous (soft), anthracite (hard), metallurgical, and lignite types.</td>
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<td><strong>Customer of Record</strong></td>
<td>A purchaser who has entered into an oral or written contract with a supplier at least 15 days prior to the Governor’s declaration of emergency establishing a product volume requirement, method of delivery, and payment and credit terms.</td>
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<tr>
<td><strong>Dealer</strong></td>
<td>A person who resells product through retail sales outlets under consignment, lease, commission and proprietorship terms.</td>
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<tr>
<td><strong>Diesel Oil</strong></td>
<td>A petroleum fraction used as a fuel in internal combustion engines.</td>
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<tr>
<td><strong>DOE</strong></td>
<td>U.S. Department of Energy.</td>
</tr>
<tr>
<td>Term</td>
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<td>Distributor</td>
<td>one who purchases the major portion of their requirements from a major oil company and is authorized to use its trademark (branded) or and independent business who buys product from one or more suppliers and uses its own trademark (unbranded).</td>
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<tr>
<td>End User</td>
<td>consumers of allocated products, including wholesale purchasers and consumers.</td>
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<tr>
<td>Energy Emergency</td>
<td>an imbalance between fuel supply and demand sufficient to result in a general threat to the health and welfare of the State’s citizens.</td>
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<tr>
<td>Energy Source</td>
<td>substances, such as petroleum, natural gas, and coal that supply heat and power; also, electricity and renewable forms of energy.</td>
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<tr>
<td>Essential Services</td>
<td>means judicial proceedings, law enforcement, fire protection, emergency medical service, snow and ice removal, telecommunications, sanitation and water services and other necessary public services.</td>
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<tr>
<td>Fuel Oil</td>
<td>petroleum distillate product burned for the generation of heat and the generation of power.</td>
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<td>Hardship/Emergency</td>
<td>an unforeseen combination of circumstances or the resulting state that calls for prompt action in order to ameliorate or eliminate something that causes or entails suffering or privation.</td>
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<td>LNG</td>
<td>liquefied natural gas; gas that has been cooled to approximately minus 160 degrees centigrade for storage or shipment as a liquid under high pressure in cryogenic containers.</td>
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<td>LPG</td>
<td>liquefied petroleum gas; a substance that is gaseous under normal atmospheric conditions and can be liquefied under moderate pressure at normal temperatures. Propane and butane are the principal examples; commonly known as bottled gas, tank gas, and LPG.</td>
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<td>Middle Distillates</td>
<td>refined products in the middle of the distillation range of crude oil including kerosene, home heating oil, range oil, stove oil, and diesel fuel.</td>
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<td>Motor Fuels</td>
<td>fossil fuels including gasoline, diesel fuel, and propane used to drive internal combustion engines.</td>
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<td>Term</td>
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<td>Motor Gasoline</td>
<td>a refined petroleum product which, by its composition, is suitable for use as a fuel in internal combustion engines.</td>
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<td>Octane Rating</td>
<td>a rating of gasoline in terms of antiknock qualities as determined by dividing by two the sum of the research octane number plus the motor octane number. The higher the number the greater the antiknock qualities of the gasoline.</td>
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<td>Peak Shaving</td>
<td>the use of supplemental supplies of gas (e.g., LNG, propane-air mixtures) for distribution by gas utilities to supplement the normal supply of pipeline gas during periods of extremely high demand of relatively short duration.</td>
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<td>Petroleum Products</td>
<td>refined or re-refined petroleum product from synthetic or crude oil or oil extracted from other sources.</td>
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<td>Pipeline</td>
<td>a pipeline that performs the trunk function and carries petroleum products, including interstate, intrastate, and intracompany pipelines.</td>
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<td>Pipeline Terminal</td>
<td>the entity (be it gas processing plant, refiner, importer, mining company or any reseller) that makes the first sale of any product that is subject to state set-aside or allocation control into the state distribution system for end-use in the State.</td>
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<td>Priority Consumer</td>
<td>any end-user who is ranked for allocation purposes according to essential service performed, importance of consumption requirements or by gradation of alternate fuel capability.</td>
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<td>Propane</td>
<td>a hydrocarbon fuel that is gaseous at ordinary atmospheric temperatures and is readily converted to a liquid state; commonly known as &quot;bottled gas.&quot;</td>
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<td>Residual Fuel Oil</td>
<td>heavier, high-viscosity fuel oil, which usually needs to be heated before it can be pumped and handled conveniently (Nos. 4, 5, and 6 fuel oil; Bunker C). Primarily used in industry, large commercial buildings, and electric generation.</td>
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<td>Retail Sales Outlet</td>
<td>a site on which a supplier maintains an ongoing business of selling any allocated product to end-users or wholesale purchaser-consumer.</td>
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State Set-Aside  the amount of allocated product which is made available from the total supply of a prime supplier for utilization by the State to resolve emergencies and/or hardships due to fuel shortages during a declared energy emergency.

EOC  Emergency Operations Center.

Surplus  an allocated product with no restrictions on its purchase.

Tanker Terminal  a facility for receiving and loading ocean-going tankers and barges.

Unbranded  used to describe the product sold by an independent marketer.

Wholesale Purchaser-Consumer  any person who is an ultimate consumer, who as part of normal business practices, purchases or obtains an allocated product from a supplier and receives delivery of that product into a storage structure substantially under the control of that person at a fixed location. References made to "direct purchaser" or "end-user" are the same as wholesale purchaser-consumer.

Wholesale Purchaser-Reseller  any person who purchases, receives through transfer, or otherwise obtains (as by consignment) an allocated product and resells or otherwise transfers that product to other purchasers without substantially changing its form or content.

Emergency Agencies

- 9-1-1 Bureau of 9-1-1 Emergency System
- ACC Cooperatives and Truck Drivers’ Association
- ACT Highways and Transportation Authority
- AFC Community Pharmacies Association
- AIPR Puerto Rico Manufacturers Association
- AMA Metropolitan Bus Authority
- AMSSCA Administration of Mental Health and Anti-Addiction Services
- APPR Puerto Rico Ports Authority
- ASG General Services Administration
- ATM Maritime Transport Authority
- ATPR Puerto Rico Land Authority
- BDE Economic Development Bank
- BEOC Business Emergency Operations Center
- CAP The Capitol
- CDC Center for Disease Control
- CERT Community Emergency Response Team
- CERFP CBRNE Enhanced Response Force Package
- CESCO Driver's Service Centers
- CFDA Catalog of Federal Domestic Assistance Number
- CIAPP College of Engineers and Surveyors of Puerto Rico
- CIKR Critical Infrastructure and Key Resource
- COMM Communications
- American Red Cross
- CSP Public Service Commission
- CT Tourism Company
- DAPR Puerto Rico Department of Agriculture
- DCR Department of Corrections and Rehabilitation
- DEDC Department of Economic Development and Commerce
- DE Department of State
- DEPR The Puerto Rico Department of Education
- DFPR Department of the Family of Puerto Rico
- Joint Operational Catastrophic Incident Plan of Puerto Rico
- DHHS Department of Health and Human Services
- DHPR Department of the Treasury of Puerto Rico
- DHS Department of Homeland Security
- DJPR Department of Justice of Puerto Rico
- DMORT Disaster Mortuary Operational Response Team
- DoD U.S. Department of Defense
- DOJ Department of Justice
- DOT Department of Transportation
- DRC Disaster Recovery Center
- DRD Department of Sports and Recreation of Puerto Rico
- DNA Department of Natural and Environmental Resources of Puerto Rico
- DSAT Disaster Survivor Assistance Team
- DSP Department of Public Security of Puerto Rico
- DSPR The Puerto Rico Department of Health
- DTOP Department of Transportation and Public Works of Puerto Rico
- DVPR Department of Housing of Puerto Rico
- ECST Emergency Coordinators Support Team (BEOC)
- ECTAD Emergency Coordinators Team Active in Disaster (BEOC)
- EHP Environmental and Historic Preservation
- EMAC Emergency Management Assistant Compact
- EOC Emergency Operations Center
- EPA Environmental Protection Agency
- EPP Energy Policy Program (DEDCC)
- ESF Emergency Support Function
- FCO Federal Coordinating Officer
- FDA Food and Drug Administration
- FEMA Federal Emergency Management Agency
• FIRM Flood Insurance Rate Map
• FMS Federal Medical Stations
• FNSS Functional Needs Support Services
• FSRT Fatality Search and Recovery Team
• Joint Operational Catastrophic Incident Plan of Puerto Rico
• GAR Government Authorized Representative
• GIS Geographic Information Systems
• GOV Puerto Rico Governor’s Office
• GSA U.S. General Services Administration
• HSEEP Homeland Security Exercise and Evaluation Program
• ICS Incident Command System
• IHP Individuals and Households Program
• IMAT Incident Management Assistance Team
• IMT Incident Management Team
• IOF Interagency Initial Operating Facility
• ISB Incident Staging Database
• IVU Sales and Use Tax
• JCA The Environmental Quality Board
• JFO Joint Field Office
• JIC Joint Information Center
• JITT Just in Time Training (Training at the time)
• JOCIP Joint Operational Catastrophic Incident Plan of Puerto Rico
• JP Planning Board
• JRT The Puerto Rico Telecommunications Regulatory Board
• KP4 FRAPR.org Amateur Radio Federation of Puerto Rico
• LEP Relations Limited English Proficiency
• MERS Mobile Emergency Response System
• MIDA Chamber of Marketing, Industry, and Distribution of Food
• NCBPR/PRFD Firefighters Corps Bureau (Negociado del Cuerpo de Bomberos de Puerto Rico)
• NCFPR Bureau of Forensic Sciences
• NDMS Homeland Disaster Medical System
• NCEMPR Medical Emergency Corps Bureau (Negociado de Emergencias Médicas de Puerto Rico)
• NFHL The Homeland Flood Hazard Layer
• NFIP National Flood Insurance Program
• NGO’s Non-governmental organizations
• NIMS National Incident Management System
• NMAS National Mutual Aid System
• PRPD Puerto Rico Police Department
• NPSC National Processing Service Centers
• NRF National Response Framework
• NVRT National Veterinary Response Team
• NWS National Weather Service
• OGP Office of Management and Budget
• OMME Municipal Office of Emergency Management
• ONA Other Needs Assistance
• OVAD/VOAD Voluntary Organizations Active in Disaster
• PAC Teams Public Assistance Coordinators
• PAI Action plans for incidents
• PDA Preliminary Damage Assessment
• PREMB Emergency Management and Disaster Administration Bureau
• PIO Public Information Office
• PM Municipal Police
• PRASA Puerto Rico Aqueducts and Sewers Authority
• PREPA Puerto Rico Electric Power Authority
• PRIDCO Puerto Rico Industrial Development Company
• PRNG Puerto Rico National Guard
• PSA Protective Security Advisor
• RAD Risk Analysis Division
• RRCC Regional Response Coordination Center
• RRCS Regional Response Coordination Staff
• RSOI Reception, Staging, Onboarding, and Integration Operations
• RSS Receive, Stage and Store
• SAR Search and Rescue
• SNJ Strategic National Stockpile
• SURI
• Unified System of Internal Revenue
• US&R Urban Search and Rescue
• USACE United States Army Corps of Engineers
• USCG United States Coast Guard
• USDA United States Department of Agriculture
• USTD
• The United States Treasury Department
• VA Veterans Affairs
• VOAD Voluntary Organizations Active in Disaster
• WebEOC Web-based Emergency Operation Center
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