

# VIRGIN ISLANDS WATER AND POWER AUTHORITY STRATEGIC TRANSFORMATION PLAN

Reliable, clean, and affordable energy for the U.S.V.I

June 2020





# WAPA's Strategic Transformation

A satellite map of the U.S. Virgin Islands is the background. A dashed orange line labeled 'IRMA' in orange text curves across the top right. A dashed light blue line labeled 'MARIA' in light blue text curves across the bottom left. The islands are shown in green and brown, surrounded by deep blue water.

The U.S. Virgin Islands has responded well to two major hurricanes that struck the Territory in September 2017.

Hurricanes **Irma** and **Maria** arrived over a two-week period and devastated the islands' infrastructure including large portions of the electrical grid. The ensuing restoration and rebuilding effort took many months. Many of our loved ones, friends, and neighbors were forced to live without electric power for unacceptable periods.

After the massive grid restoration effort was finished, WAPA embarked on a comprehensive effort to reshape its system in the Territory.

**Within five years, significant progress will be made.**

Substantial Federal government funds are available to make our electrical grid far more resilient to major hurricanes. WAPA has plans to strengthen its transmission and distribution system through extensive undergrounding of facilities. Where this isn't feasible, **we intend to install over 8,400 composite poles** that are able to better withstand major hurricanes and last much longer. **When this work is complete, WAPA's customers will enjoy a state-of-the-art grid** that is able to bear the brunt of a major storm and be restored quickly. Everyday service reliability will also be much greater.





## Vision Statement

The Virgin Islands Water & Power Authority uniquely provides reliable, affordable and diversified utility services to our community and surrounding areas through knowledgeable and committed personnel and environmentally friendly technologies

**We have already installed 21 megawatts of new generation. When complete, WAPA will have about 90 megawatts of highly efficient capacity.**

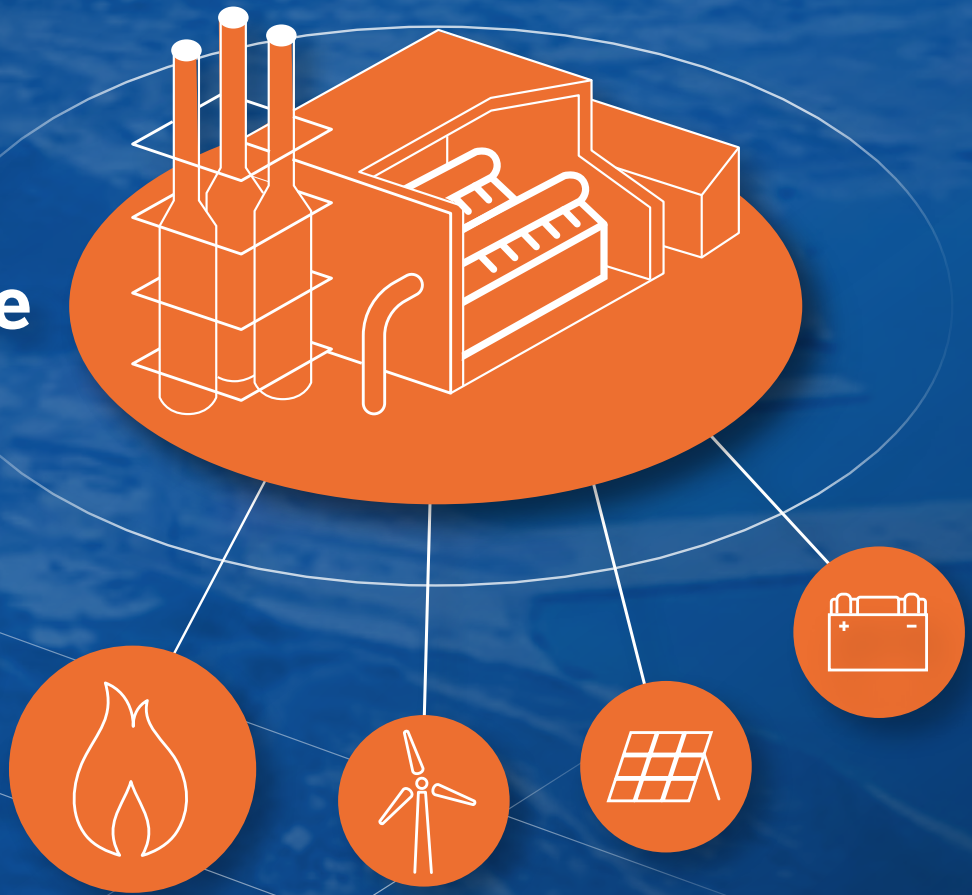
Our electric generating resources are in the midst of a historic transition from extreme dependency on costly fuel oil and a low contribution from renewable resources to a modernized fleet of generating resources. Our new generating units will be dual fuel, but will run almost exclusively on cleaner and less costly propane. This transition will greatly reduce our emission of carbon dioxide and other harmful pollutants.

**Current**





**Future**



Even more significant, we will gradually integrate **over 50 megawatts of solar photovoltaic and wind capacity, coupled with modern battery energy storage systems (BESS)**. This capacity will further reduce emissions and further reduce our overall fuel costs.

**Eventually, the Territory will obtain over 50 percent of its electric energy from renewable resources.**



## Mission Statement

WAPA's mission is to become the leading utility service provider in the Caribbean by placing our customers first, engaging and educating our employees and protecting our pristine environment. We will utilize technology and implement infrastructure improvements to safely and reliably provide an **affordable, diversified mix of energy resources and high quality water**.

## Introduction

With the help of Federal funding, **we believe that WAPA's future has never been brighter.** Within a decade, our grid will be far more resilient and reliable and we will be well on our way to a much more sustainable generation sector.

We are completely focused on executing this transformation for the Territory and our customers. This document presents the highlights of our strategic transformation plan.

WAPA's challenges reflect 3 core target themes. Key initiatives have been developed to address each theme.

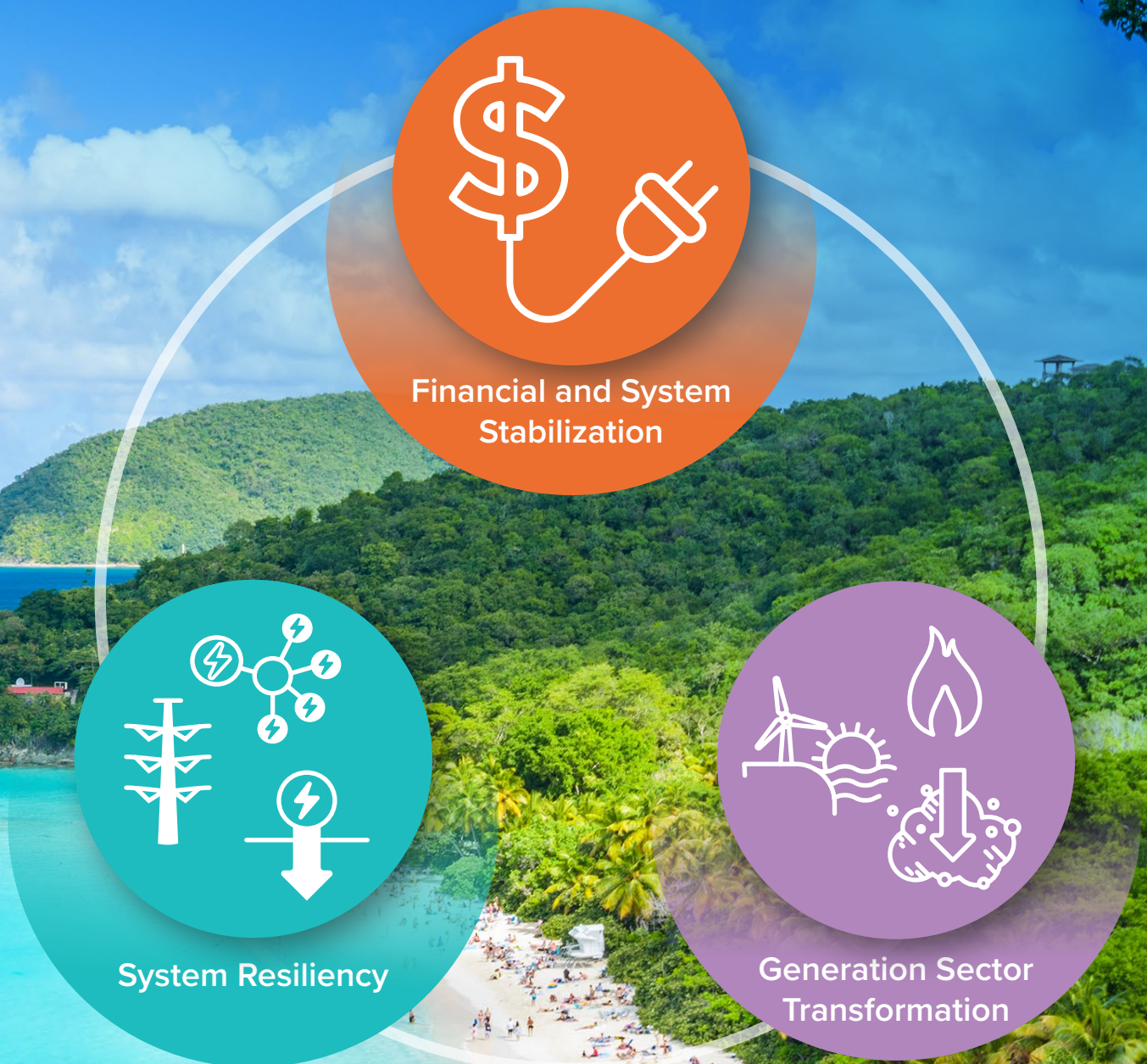
**WAPA will be tireless in achieving these changes.**



**LAWRENCE J. KUPFER**  
Executive Director, Virgin Islands  
Water and Power Authority



**The plan builds from 3 major themes with the ultimate goal of firmly positioning The Virgin Islands as a robust leader in energy sector innovation.**





# WAPA's strategic transformation plan addresses its current challenges

Despite the huge challenges facing WAPA in the wake of the major storms in 2017, we have defined a clear path forward. By focusing on financial stability, grid reliability and resilience, and generation transformation, we will build a strong electric utility for all Territory residents, visitors, and businesses.



**Rate Design  
and Adequacy**



**Financial Health**



**Unreliable  
Generators**



**Funding to Install New  
Units and Support  
Infrastructure**



**Grid Vulnerable  
to Hurricanes**



**Economic  
Challenges**





**Air Quality  
Challenges**



**Sufficient Cash  
Flow**



**Dependence  
on Traditional  
Generation**



**Secure Federal  
Funding for  
Transformation**



**Improve  
Customer  
Satisfaction**



**Refinancing to  
Reduce Interest  
Expenses**



# Three Strategic Themes



Despite enduring the most damage ever to its system in 2017, WAPA is well underway on its plans to 1) finish stabilizing the system, 2) rebuild its electrical grid to much better withstand catastrophic hurricanes, and 3) replace old, inefficient, and dirty power plants with modern conventional generators and renewable resources.

## Theme 1 Financial and System Stabilization



**Restoration of  
Financial Health**



**Secure Federal Funding  
for Transformation**



**Rate Design  
and Adequacy**



**Short-Term Integration  
of New Units**



## Theme 3 Generation Sector Transformation

Complete Installation  
of New Units



Install Emergency  
Generator Sets and  
Microgrid on St. John



Integrate Solar PV and  
Battery Storage Gradually



Sustain Most Viable  
Existing Generators



Lease Generating Sets Until  
New Capacity Online

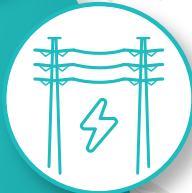


## Theme 2 System Resiliency

Launch Program to  
Underground Circuits



Continue Composite  
Pole Program



Complete Substation Repair  
and Hardening Program



Develop Microgrids  
and Redundancy





# Theme 1

## Financial and System Stabilization

WAPA's financial condition continues to be precarious in the aftermath of Hurricanes Irma and Maria in September 2017. The Territory was already enduring slow loss of population and economic contraction before the hurricanes. Because of an extreme dependency on costly fuel consumed in old, inefficient generating units, WAPA's rates are higher than other electric utilities in the Caribbean.

After the hurricanes struck, revenue dropped precipitously, but costs did not fall as fast. This put further pressure on WAPA's financial condition. The Authority was forced to rely on its fuel and new generation suppliers for credit at high interest rates.

Now that the system has been stabilized, and considerable Federal grants will be forthcoming, WAPA will be able to:

- Continue its efforts to extend the use of liquefied propane gas in new generating units. This will provide WAPA with a **highly efficient, very reliable, and less costly generating mix**. Because fuel oil is more costly than propane, the fuel component of WAPA's bill will likely decline faster than the base component required to pay for the fuel oil to propane conversion.
- Integrate renewable capacity (primarily solar) and associated battery energy storage at strategic locations around the Territory. **This will both improve reliability and displace conventional energy production and the temporary use of leased generating units until permanent capacity is installed. Renewable projects will be fast tracked.**
- **Steadily rebuild its transmission and distribution system to be much stronger and able to withstand severe hurricanes** such as those that struck the Territory in 2017.
- **Refinance high-cost, outstanding debt. This will enable WAPA to pass along further savings to its customers.** The Authority may even be able to tap low-cost Rural Utilities Service funding once its financial condition is stronger.
- Refinance upfront investments made by suppliers for engines, **LPG delivery, storage, and vaporization equipment.**

**Under various FEMA and HUD programs, WAPA may be eligible for over \$2 billion in funding that will enable it to fundamentally reshape its electric system becoming less costly, much cleaner, and far more resilient over time.**



Hurricanes Irma and Maria had a devastating effect on the U.S. Virgin Islands. In addition to the property damage and the widespread destruction of WAPA's electrical grid, the post-storm economic downturn was also very severe. The important tourism sector – which represents over 12% of the Territory's economy – is still recovering.

**8,400**  
**composite poles**  
**will be installed**





# Theme 2

## System Resiliency

**WAPA** is eligible for significant **Federal Emergency Management Agency (FEMA)** and the **Department of Housing and Urban Development (HUD)** funding programs to both restore and upgrade its electrical system. FEMA funding under a special program can be obtained when it can be shown that infrastructure upgrades result in lower Federal exposure later. The idea is to build infrastructure robust enough to withstand major storms and flooding.

The Authority is planning a massive program to place about half of its transmission and distribution (T&D) circuits underground. **Such circuits would also provide underground service directly to customer homes** and premises thereby further enhancing the system's ability to withstand major hurricanes and other storm events. In addition, another large program to install composite poles is already underway. When complete, an estimated **8,400 wood poles will be replaced with much more resilient composite poles**. These poles will be able to better withstand major hurricanes such as the two September 2017 hurricanes, Irma and Maria.

**While costly, these new programs will reduce costs in the long run because recovery from future storms will be much faster and less costly as there will be far less damage to repair.**

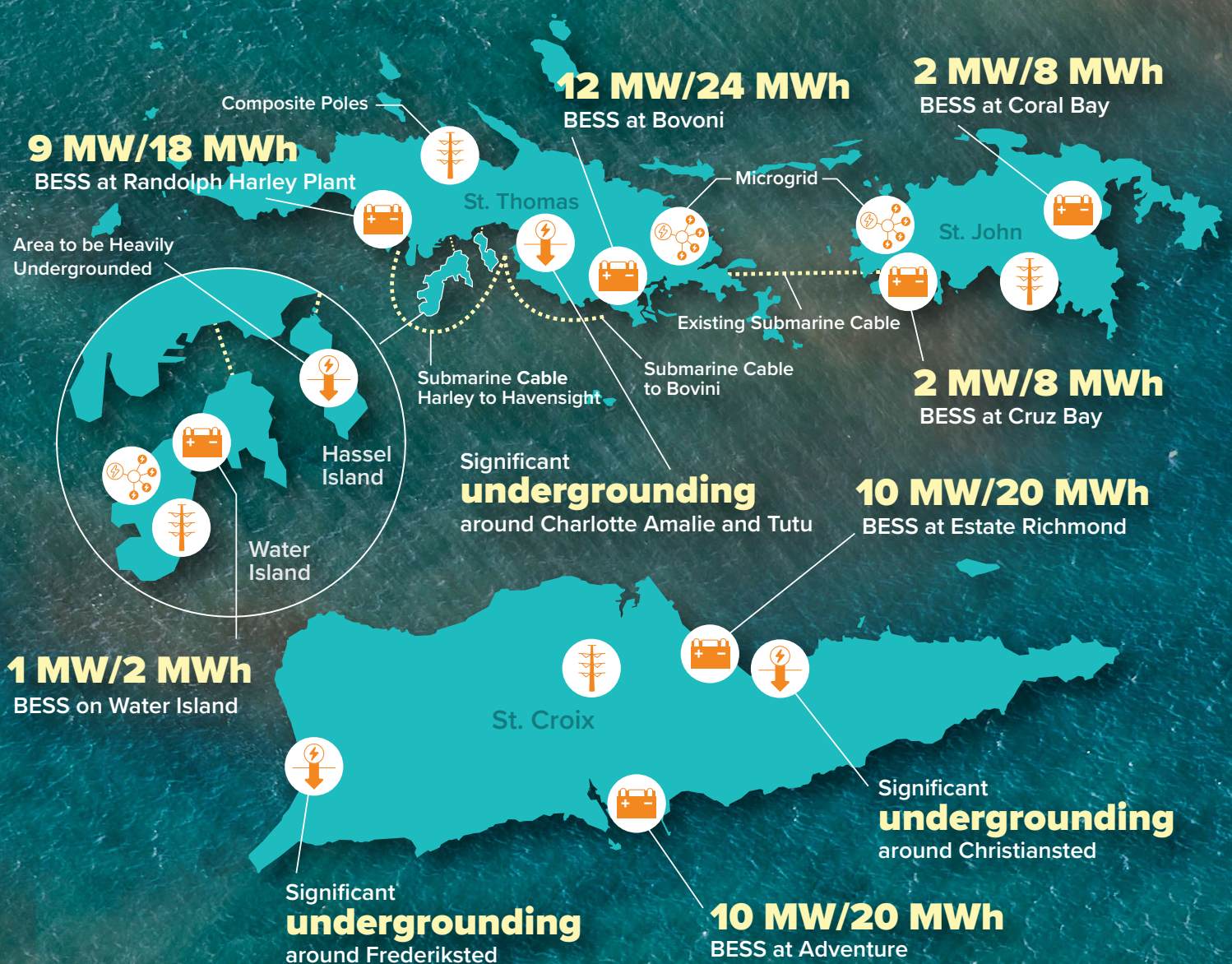
WAPA's substations and communication networks are also being repaired, strengthened, and upgraded. These initiatives will also result in **improved resilience during future hurricanes** as well as **faster recovery times**.

The three programs outlined – **undergrounding, composite poles, and substation hardening** could take 5-10 years to accomplish. Implementation planning needs to be done in parallel with the availability of funds and construction resources needed to perform the work. Benefits, however, will accrue quickly because the work will be first concentrated on **strengthening circuits that serve the most critical loads like medical facilities** and have exhibited the most reliability problems in the past.



**WAPA will be installing composite poles and undergrounding feeders to make its system far more resilient to the next major hurricane that strikes USVI. This will limit damage and accelerate restoration times considerably.**

The map belows shows where new microgrids will be developed and facilities undergrounded.





# Theme 3

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## Generation Sector Transformation

**WAPA's old, obsolete, and inefficient generating units will be replaced by high efficiency units burning much cleaner propane instead of fuel oil.**

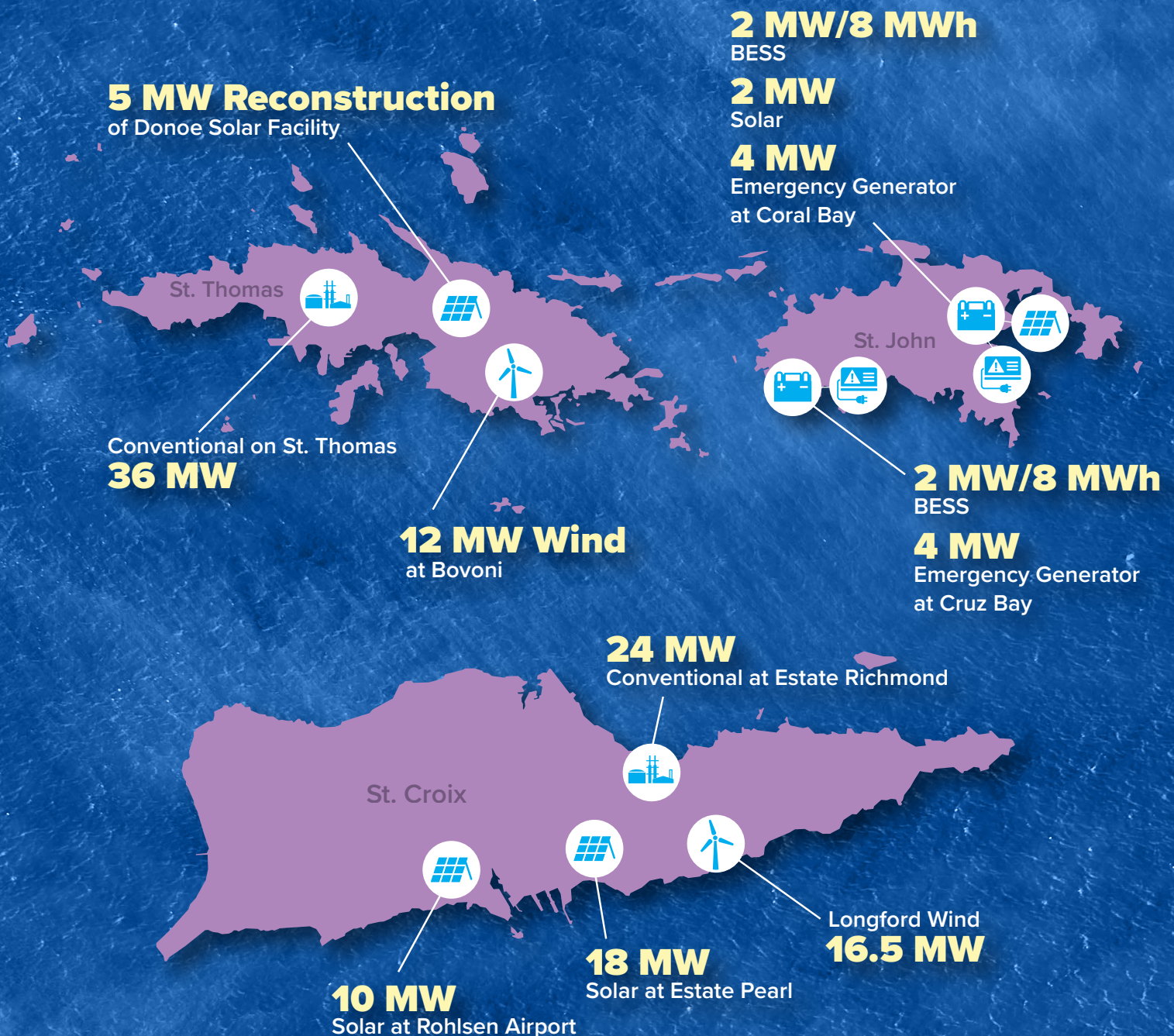
In addition, the installation of over **50 megawatts of renewable solar and wind capacity** will displace production from conventional generators.

**WAPA's generating fleet is in the process of being completely transformed.** When this process is complete, WAPA will:

- Use reciprocating internal combustion engine (RICE) or combustion turbine technology that is **highly efficient**, dual fuel with the primary fuel being propane, **cleaner, and less costly to operate.**
- **Retire old units** that are inefficient, “dirty” to operate in terms of emissions, and dependent on costly fuel oil.
- Use propane to provide most of the electric energy produced using conventional generation technology. This conversion will reduce carbon dioxide emissions by about **35%**, **sulfur dioxide emissions by over 90%**, and **reduce other emissions such as nitrous oxides and particulate matter significantly.**
- Have a baseload fleet of units that are smaller in size, **reducing overall generation capacity requirements and in turn, fixed costs.**
- Gradually install distributed, renewable energy capacity on St. Croix, St. John, and St. Thomas along with battery energy storage equipment to **optimize system operation and costs.** Over time, this **renewable capacity will contribute an ever-growing portion of the Territory's electric energy requirement in line with mandated renewable energy targets.**
- Encourage the installation of **solar panels on customer rooftops.**



Because of the poor thermal efficiency and condition of WAPA's older units, replacement units are economic right away. The map below summarizes likely resource additions over the next 24-48 months, consistent with WAPA's 2019 integrated resource plan (IRP).





ACCESS TO LOW-COST FINANCING  
TO SUPPORT INITIATIVES



ACHIEVE A STABLE AND SUPPORTIVE  
REGULATORY COMPACT THAT  
PROVIDES ADEQUATE RATES



SECURE FEDERAL FUNDING  
FOR TRANSFORMATION

RESTRUCTURE EXISTING FINANCIAL  
OBLIGATIONS TO REDUCE INTEREST  
EXPENSE

FINANCIAL  
AND SYSTEM  
STABILIZATION



SYSTEM  
RESILIENCY



INSTALL STRONGER COMPOSITE  
POLES WHERE UNDERGROUNDING  
IS NOT FEASIBLE

STORM HARDEN SUBSTATIONS  
AND COMMUNICATIONS NETWORK



PROTECTING SUBSTATIONS AND  
COMMUNICATION NETWORKS FROM  
FUTURE WIND AND FLOODING DAMAGE

UNDERGROUND BACKBONE  
TRANSMISSION SYSTEM AND  
FEEDERS SERVING CRITICAL LOADS

STRENGTHENING THE ELECTRICAL GRID TO WITHSTAND  
FUTURE HURRICANES THROUGH UNDERGROUNDING  
AND STRONGER OVERHEAD DESIGNS







RESTRUCTURING HIGH-COST FINANCIAL  
OBLIGATIONS WITH FUEL AND  
GENERATING EQUIPMENT SUPPLIERS

INTEGRATE NEW GENERATING  
UNITS AND ACHIEVE OPERATING  
STABILITY

OBTAIN ADEQUATE RATES

## CORE CHALLENGES

## KEY INITIATIVES

### GENERATION SECTOR TRANSFORMATION



GRADUALLY INTEGRATE SOLAR PV  
AND BATTERY ENERGY STORAGE

COMPLETE CONVERSIONS TO LPG  
FOR 95% OF THERMAL CAPACITY

INSTALL ANOTHER 70 MW OF  
CONVENTIONAL UNITS



INSTALLING ADDITIONAL GENERATING  
UNITS TO PROVIDE HIGHLY EFFICIENT  
AND RELIABLE BASELOAD CAPACITY



INTEGRATING RENEWABLES AND ENERGY  
STORAGE CAPACITY TO REDUCE EMISSIONS  
AND DISPLACE COSTLY FUEL USAGE



STEADILY IMPROVE ENERGY EFFICIENCY THROUGH  
ECONOMIC UTILITY PROGRAMS



