

# EDIN-USVI Clean Energy Quarterly

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The Energy Office used Recovery Act money to support the installation of this 448-kW solar photovoltaic (PV) system at the Cyril E. King Airport on St. Thomas. The locally based contractor broke ground in March 2011, and the PV panels that are soon to be mounted on the stands pictured will be producing clean energy from this summer's sun.

*Photo from Don Buchanan, Virgin Islands Energy Office*

## Local EDIN Working Groups Leading the Charge Toward Energy Independence

There's an energy revolution under way in the U.S. Virgin Islands (USVI), and the international partnership for Energy Development in Island Nations (EDIN) is providing critical technical support to the forces on the ground. Local working groups have been leading the charge to reduce the islands' dependence on fossil fuels since EDIN launched its USVI pilot project in 2009. Their efforts have won grassroots support that is gaining momentum just as another spike in world oil prices drives home the urgency of the territory's transition to a sustainable energy future.

Like many island communities, the USVI is almost 100% dependent on fossil fuels. Through the EDIN project, clean energy champions in the USVI are tapping in to the technical expertise of the National Renewable Energy Laboratory (NREL), as well as financial and technical support from the U.S. Department of Energy (DOE) and the U.S. Department of the Interior (DOI), to help the territory reduce its fossil fuel-based energy consumption 60% by 2025.

In support of the USVI's bold commitment to fundamentally changing the way it uses energy, EDIN, in partnership with the Virgin Islands Energy Office (VIEO) and the Virgin Islands Water and Power Authority (WAPA), is working to identify and implement viable energy efficiency and renewable energy technology solutions to the territory's energy challenges. The EDIN partners have been working closely with on-island EDIN working groups focused on five key areas: policy and analysis, education and workforce development, energy efficiency, renewable energy, and transportation.

Over the past year, these five groups have been laying the groundwork for a clean energy future for the USVI and the Caribbean. Highlights of their recent progress are featured inside.

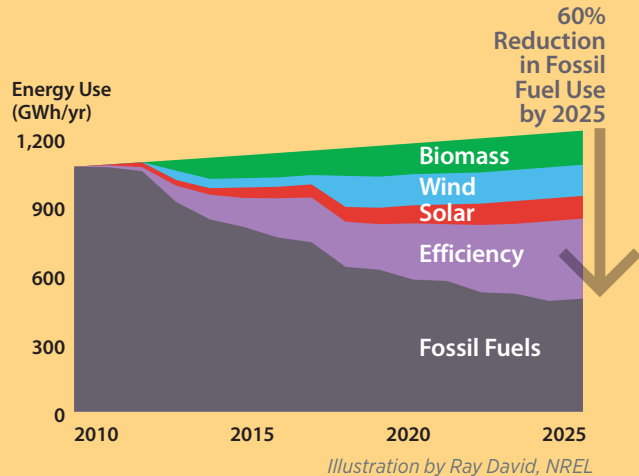


### Key EDIN-USVI Events

April 7-9, 2011	EDIN-USVI clean energy workshop, University of the Virgin Islands (UVI) campus, St. Thomas
April 7, 2011	EDIN-USVI Meet & Greet, 6:30-7:30 p.m., Emerald Beach Resort
March 7, 2011	Solar PV ground breaking at Cyril E. King Airport on St. Thomas
February 7, 2011	Gov. John P. de Jongh Jr. signs contract with energy service company (ESCO) for energy retrofits at 11 USVI schools

# Policy and Analysis

There are no silver bullets. To achieve the 60% goal by 2025, the USVI will need to deploy a variety of clean energy technologies.



## Policy and Analysis Working Group Nears Completion of Energy Road Map

The Policy and Analysis working group has been gathering data and conducting analysis that will inform its comprehensive USVI Energy Road Map.

The report, which is nearing completion, will lay out the activities and initiatives necessary to reach the territory's goal of a 60% reduction in fossil fuel use by 2025. Preliminary findings suggest that while many of the efforts necessary to achieve this goal are already under way, significant work remains to be done.

WAPA has increased the efficiency of its operations by adding a heat recovery steam generator (HRSG) at its power plant on St. Croix and has plans for similar work on St. Thomas. NREL analysts estimate that transitioning water desalination to reverse osmosis technology, which has already begun on St. Croix, will reduce the energy required to desalinate water by nearly 80%.

While a variety of private and public sector energy efficiency and renewable energy projects are also moving

forward, meeting the 60% goal will require further investment by businesses and individuals in solar hot water, energy efficiency, water efficiency, and other technologies. Utility investment in renewable energy technologies, including waste-to-energy (WTE), wind energy, and solar PV, will also play a critical role.

The final results of the road map analysis will be presented in April 2011 at the EDIN-USVI workshop on St. Thomas, where USVI stakeholders will have an opportunity for review and comment before the report is published.

# Education and Workforce Development

## Education and Workforce Development Working Group Wages Campaign to Vlenergize the Virgin Islands

This working group has launched a public awareness campaign that aims to build grassroots support for the territory's clean energy goals. The Vlenergize campaign kicked off in December 2010 with a flurry of articles, TV news features, promotions, and ads encouraging Virgin Islanders to break free of their total dependence on fossil fuels by embracing energy efficiency and renewable energy solutions.

## Vlenergize Campaign Sings Virtues and Benefits of Energy Efficiency

The Season of Lights presented a golden opportunity for EDIN to shed some light on energy efficiency in the USVI.

The "Vlenergize Your Holidays" campaign rolled out in December and January with a populist message ("Energy Revolution ... We Are the Solution") focused on how the small, everyday actions of individuals and businesses can add up to big savings in energy and money.

The campaign kicked off in December with a booth the Energy Office sponsored at the TuTu Park Mall on St. Thomas. Featuring the dynamic new EDIN-USVI banners (left) and a light-emitting diode (LED) Christmas light display donated by WAPA, the Vlenergize booth was an opportunity for the Energy Office to share EDIN's clean energy agenda with throngs of holiday

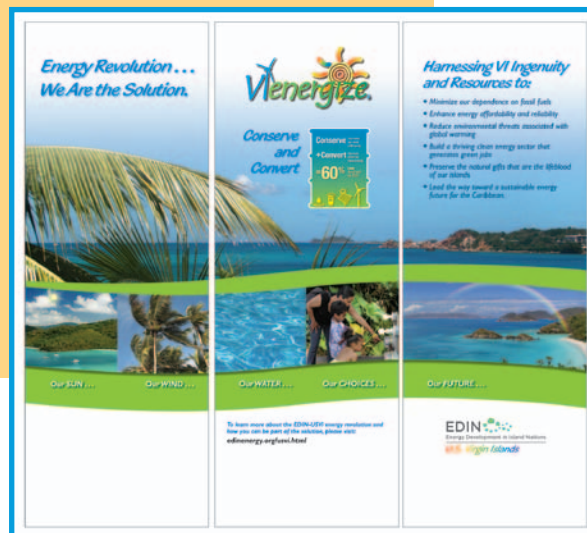


Illustration by Ray David, NREL

shoppers by distributing EDIN energy efficiency postcards and other literature.

In January, the *Vlenergize* campaign jingle made its debut at the Bordeaux Fair on St. Thomas, where it was broadcast from the Energy Office booth using solar-powered loud speakers. Written and produced by local Calypso master Camille “King Derby” Macedon, the jingle delivers a hopeful and empowering message about the path to a clean energy future for the USVI through the youthful voices of King Derby’s protégé junior Calypsonians.

The *Vlenergize* campaign also got some airtime during the Christmas Crucian Festival on St. Croix, which is broadcast live on several VI radio stations. Da VIBE 107.9 FM and six other stations ran commercials touting the virtues and benefits of energy efficiency measures for VI residents and businesses.

In February, the Energy Office launched a series of radio spots featuring the *Vlenergize* jingle. The commercials aired as often as 20 times a week on 14 stations.

### Vlenergize Jingle Lyrics

*“If you want to be a partner, let us stick together*

*All of us is the solution to our energy revolution*

*With sun and wind power, less net meter*

*Vlenergize your lights and TV for efficiency*

*Vlenergize your gas and water, save our energy*

*If you do what I say, you will cut down your utility bill today”*

## Energy Efficiency

### Energy Efficiency Working Group Picks Up Steam as Local Energy Champions Get on Board

On the energy efficiency front, EDIN continues to gain momentum as local clean energy champions step up and join the ranks of the Energy Efficiency working group (EEWG).

A determined band of architects, builders, hotel owners and managers, radio personalities, vendors, and representatives from multiple VI government agencies are providing the input and support needed to address a variety of cultural and financial obstacles the EEWG must overcome to meet defined efficiency targets.

Genie Lupo of Asencios Construction has accepted the post of on-island lead for the working group. She contributes a great passion for sustainable building, a strong business background, and a firm commitment to the actions required to reduce energy consumption, increase efficiency, and achieve the USVI’s 60% goal.

To establish a baseline for building energy use in the USVI, the EEWG has developed and released a comprehensive, user-friendly online survey, which can be accessed via the EDIN page at [vienenergy.org](http://vienenergy.org). The feedback gathered will inform the ongoing building modeling EDIN is conducting to identify the most cost-effective, high-yield energy efficiency measures for advancing the territory’s clean energy goals.

Tangible evidence of EEWG progress on the ground includes ESCO projects

that will bring energy and water efficiency upgrades to 11 island schools as part of the Virgin Islands Energy Alliance Program (see the article below for details). Another example is the VIEO’s work with the South Eastern Energy Alliance to develop a program envisioned as a one-stop shop for small business energy efficiency and renewable energy building upgrades. The project is funded by a DOE BetterBuildings grant.

### School Energy Makeovers to Save \$11 Million

Eleven Virgin Islands schools are first in line for building efficiency upgrades that will make them more energy efficient, friendlier to the environment, and cheaper to operate, thanks to American Recovery and Reinvestment Act (ARRA) funding.

The VIEO, which is funding the retrofits through a \$6.9 million ARRA grant, said the projects are intended to demonstrate benefits of clean-energy technology development in the Virgin Islands. This project focusing on the Department of Education is part of a comprehensive strategy the Energy Office is pursuing to advance the goal set by the

governor in 2009 to reduce the territory’s dependence on fossil fuel 60% by 2025.

“We are starting the important work of making our government and public institutions energy efficient, an environmental and economic imperative for our territory,” said Gov. John P. de Jongh Jr., who signed the contract with Energy Systems Group LLC on February 7. “By taking advantage of stimulus funding, we will implement clean technologies and energy efficiency measures that will guide us into the next decade and beyond,” de Jongh said.

*“We are starting the important work of making our government and public institutions energy efficient, an environmental and economic imperative for our territory. By taking advantage of stimulus funding, we will implement clean technologies and energy efficiency measures that will guide us into the next decade and beyond.”*

— Gov. John P. de Jongh Jr.



Photo by Rebecca Ottaway, NREL/PIX 18597

The energy savings captured as a result of reduced consumption, which de Johngh said are guaranteed to save the government more than \$11 million over a 10-year term, will be used in part to offset operational costs for the Department of Education and to fund similar equipment upgrades in other public schools and agencies.

Phase 1 of the work, slated to begin this spring, will focus on reducing building energy consumption through energy-efficient lighting retrofits and water conservation measures.

**VI Nonprofits Take Leadership Role on the Clean Energy Front**

Local nonprofits are breaking ground on the path toward a clean energy future for the USVI as they forge ahead with leading-edge energy projects made possible by the Recovery Act.

A nearly 80% boost in Discretionary Grant Program funding in 2010 enabled the Energy Office to award nearly \$1 million to local schools, churches, community foundations, youth organizations, and other nonprofits for energy efficiency and renewable energy projects aimed at reducing their energy use and lowering their utility bills.

The windfall also enabled the VIEO to raise the cap on individual grants from \$20,000 to \$50,000 and expand the scope of the program to fund a wider range of energy-saving and energy-producing projects.

Grant recipients are investing in a variety of energy efficiency and renewable energy technologies, including wind, solar PV, solar water heating, LED lighting, compact fluorescent and high-efficiency fluorescent bulbs, Sola-Tube daylighting, solar outdoor lighting, insulating radiant barrier window film, ceiling insulation, and high-efficiency air-conditioning.



PV panels installed at the Montessori School on St. Thomas. Photo from Don Buchanan, Virgin Islands Energy Office

In addition to helping nonprofit organizations save energy and money, these projects are intended to help reduce the Virgin Islands' carbon footprint and set new standards for the territory.

The larger awards have enabled a number of grantees to opt for large renewable energy systems, including a 10-kilowatt (kW) wind generator and a 10 kW PV system, that will contribute significantly to their energy needs while lowering their operating costs.

The Montessori School received a \$50,000 grant for upgrading and expanding its PV system (see photo, left), which was installed and partially funded by an earlier VIEO grant.

Legal Services of the Virgin Islands is deploying multiple energy efficiency technologies, such as insulating radiant barrier window film, ceiling insulation, solar water heating, and solar outdoor lighting, at a cost well below the funding limit.

“When one considers that many of the projects have life cycles of 15 to 25 years, the projected energy savings of 843,087 kilowatt hours per annum for projects approved to date can make a difference,” said Joseph Daniel, VIEO energy operations coordinator.

The program is targeting nonprofit organizations, in part because their financial resources tend to be limited and in part because their prominent role in the community will enable them to share project benefits and lessons learned with large numbers of residents, helping advance the USVI's clean energy goals.

Organization	Award	Project	Location
Boy Scouts of America	\$50,000	Solar generation	St. Thomas
The Garden School Inc.	\$28,675	Energy education classes and solar pump	St. Croix
Giffit Hill School	\$49,948	PV system	St. John
Humane Society	\$50,000	Indoor and outdoor lighting upgrades	St. Thomas
Legal Services of the Virgin Islands	\$36,000	Solar outdoor lights, ceiling and window insulation, solar water heating	St. Thomas
Lutheran Church of the Reformation	\$47,000	High-efficiency air-conditioning and lighting	St. Thomas
Montessori School	\$50,000	PV system	St. Thomas
Nana Baby Children's Home	\$50,000	Solar water heater and new lighting	St. Thomas
Pistarckle Theater	\$44,000	Air-conditioning and lights	St. Thomas
St. Ann's Catholic Church	\$50,000	Efficient lighting and air-conditioning	St. Croix
St. Croix Animal Shelter	\$45,000	Indoor and outdoor lighting upgrades	St. Croix
St. Croix Country Day School	\$50,000	Lighting upgrades	St. Croix
St. Croix Foundation	\$50,000	PV system with battery backup	St. Croix
St. Croix Reformed Church	\$50,000	Wind turbine	St. Croix
St. Joseph's High School	\$46,192	Lighting controls, motion detectors, energy-efficient appliances	St. Croix
St. Thomas Reformed Church	\$50,000	Outdoor solar lighting	St. Thomas
University of the Virgin Islands Community Engagement and Lifelong Learning Center	\$50,000	Education program	St. Thomas
Virgin Islands Environmental Research Station	\$50,000	PV system and solar water heater	St. Thomas
WTJX	\$50,000	Solar-powered lights	St. Thomas

# Renewable Energy

## Renewable Energy Working Group Studies Various Options; Seeks to Maximize ROI

The Renewable Energy working group is tapping NREL and private sector expertise to identify the most cost-effective solutions for increasing renewable energy generation and optimizing electrical transmission in the territory.

Preliminary analysis conducted by NREL and HOMER Energy LLC has assisted this working group's efforts to identify the conditions under which wind and solar technology solutions would become cost effective for the USVI. They used the HOMER hybrid optimization software modeling tool to assess the economic and technical feasibility of increasing the contribution of renewable sources of electrical generation on St. Thomas and St. Croix (for details, see the full story, below right).



Photo from the Virgin Islands Energy Office

NREL is also monitoring the development of a 16.5 megawatt (MW) WTE plant and conducting analyses on the potential to add woody feedstocks from dedicated energy plantations into the resource mix as a supplemental fuel. Discussions with various stakeholders to address potential benefits and drawbacks of WTE in the territory are ongoing.

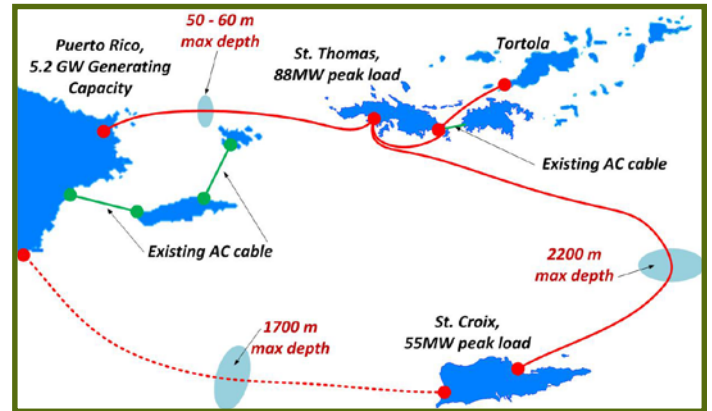
## Study Examines Feasibility of Inter-Island Cable

One proposed solution for addressing the territory's energy challenges is an electrical interconnection between Puerto Rico Electric Power Authority (PREPA), WAPA,

and the utility in the British Virgin Islands (BVI). Proponents suggest an undersea cable system connecting these island grids could decrease the cost of energy for the USVI, increase WAPA system reliability, reduce spinning reserve requirements, and increase the potential for high-penetration renewable energy in the USVI.

A study to determine whether they're right is currently under way. In October 2010, WAPA signed a contract with Siemens PTI to conduct a DOE-funded feasibility study examining the technical and economic potential of a subsea electrical interconnection of the PREPA, WAPA, and BVI grids. The participants of the study, which kicked off in October 2010, include DOE/NREL, WAPA, PREPA, and Siemens.

The study is focused on options for a 50-mile cable between Puerto Rico and USVI, a 10-mile cable between USVI and BVI, and an 80- to 100-mile cable between St. Thomas and St. Croix (with a direct connection between Puerto Rico and St. Croix as an alternative).



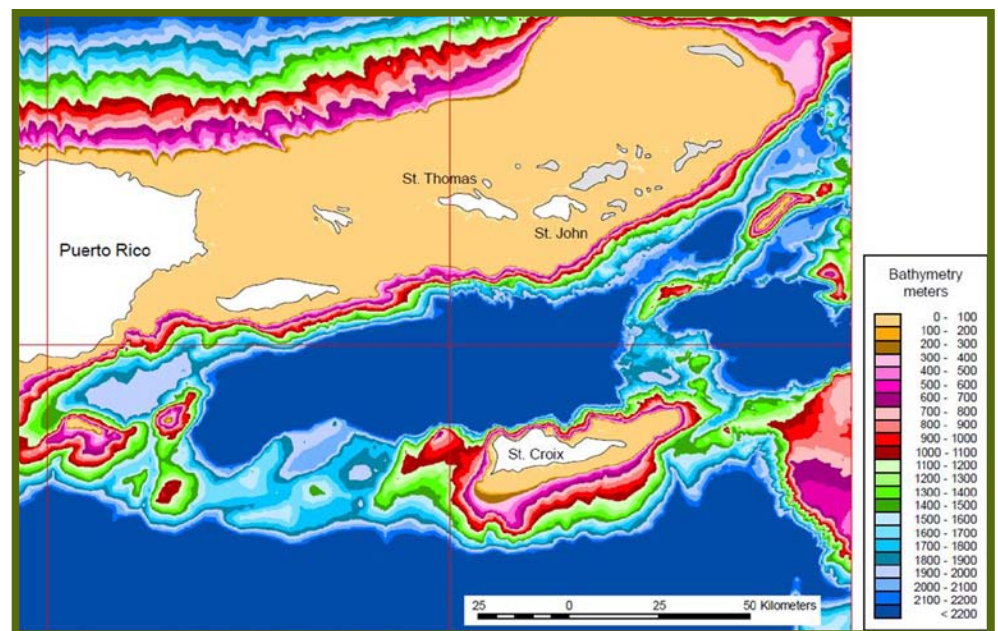
Map of cable routes under study. Illustration by Vahan Gevorgian, NREL

The objectives of the study are to:

- Determine power capacities, types, and requirements of the three interconnections
- Perform a power system study and identify necessary infrastructure reinforcements
- Estimate project costs
- Demonstrate potential benefits in terms of generation cost and reliability.

## Computer Modeling Sheds Light on Solar and Wind Economics

Through the use of computer modeling, EDIN is making significant headway in assessing the economic and technical feasibility of increasing renewable electrical generation in the territory. To assist



Bathymetry map of Puerto Rico-USVI area. Illustration by Steve Haymes, Vahan Gevorgian, NREL

## Interconnection Study Project Timeline



the Renewable Energy working group in identifying the most cost-effective renewable energy technology solutions for the USVI, NREL has conducted a preliminary analysis using the HOMER hybrid optimization software tool.

HOMER can model conventional power systems, such as diesel generators and combustion turbines, along with renewable energy systems such as wind turbines, PV systems, and batteries. The software uses local solar and wind resource data and component data to simulate hour-by-hour operation of renewable energy systems and load profiles to rank the economic and technical feasibility of various system configurations according to total net present cost.

NREL’s modeling analysis was aimed at helping WAPA determine the economic feasibility of installing a mixture of renewable energy on St. Thomas and St. Croix, including 5 MW of PV and 15 MW of wind on each island. The NREL team worked with the utility to gather the data needed to model the present base case for power plants on St. Thomas and St. Croix.

The base case model for St. Thomas, which represents the energy generated for electricity, was created from fuel curves that subtracted the energy content of the steam used for desalination units from the energy inputs to the turbines. NREL used solar resource data available on the

HOMER website and wind resource data provided by VIEO that revealed an average annual wind speed of 7.39 meters per second (based on 2006 wind resource testing using a 30-meter anemometer).

NREL added 5 MW of PV at \$7.50 per watt to the base case model for St. Thomas and performed a sensitivity analysis on the capital cost of PV with increased fuel price. The current analysis indicates that while PV is not cost effective at the current installed cost of \$7.50 per watt without subsidies or customer contributions, it will be cost effective if the installed cost drops below \$5.50 per watt or fuel prices increase from \$0.44 per liter (\$1.70/gallon) to \$0.60 per liter (\$2.30/gallon) in the future.

Wind is a different story, however. When wind turbine generators were added to the HOMER model, analysis revealed that increasing levels of wind power on St. Thomas would be cost effective. Specifically, 15 MW of wind could reduce the consumption of diesel fuel for power generation by approximately 9%. Because small changes in turbine location and height can have a large impact on project economics, NREL performed a sensitivity analysis on the annual average wind

speed and increasing fuel cost. The graph below illustrates that wind turbines are cost effective even at the present fuel cost of \$0.44/liter (\$1.70/gallon) and at reduced wind speeds as low as 5 meters per second (dark blue shaded area).

WAPA installed a new HRSG in June 2010 at its generating facility on St. Croix and recently provided NREL with performance data from June to December 2010. The new data will enable NREL to establish a current base case model for St. Croix that will inform an updated analysis of the impact of increasing renewable energy (wind, PV, and WTE) contributions on St. Croix.

Plans to gather higher-resolution wind data at promising locations on St. Thomas and St. Croix are under way and will inform a more rigorous analysis NREL will perform in the future.

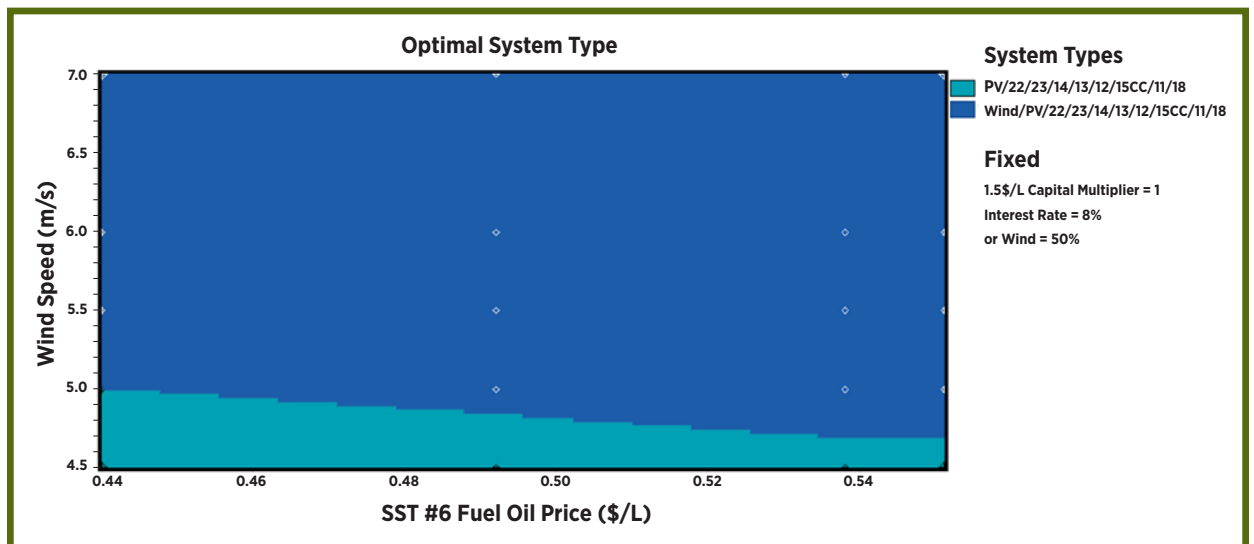
### Virgin Islanders Take Advantage of VIEO Sun Power Loan Program

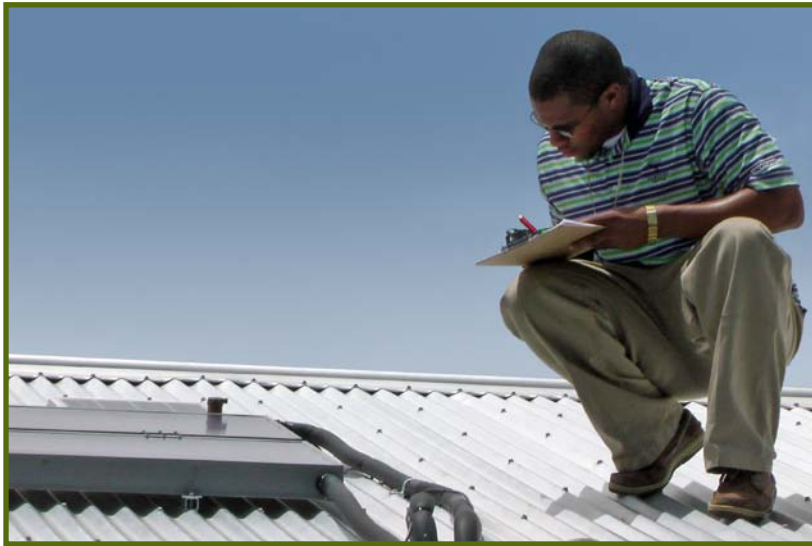
For Virgin Islanders looking to reduce their utility bills, solar water heating offers a lot of bang for the buck.

According to an analysis performed by NREL, when the VIEO Sun Power Loan program, rebate, and tax credit are factored in, installing a solar water heater will save a family of four \$250 per year right off the bat—and annual savings will double once the 5-year loan is paid off.

With that kind of return on investment, the Energy Office has had to work hard to keep up with demand. Of the 450 applications submitted to date for the

This graph shows that the high cost of fuel makes wind power cost effective even at modest wind speeds as low as 5 meters per second. *Illustration by HOMER Energy LLC*





An Energy Office intern inspecting a solar collector, one of 300 solar water heater installations approved for residents under the VIEO Sun Power Loan and rebate programs. *Photo from Don Buchanan, Virgin Islands Energy Office.*

no-money-down, low-interest Sun Power Loan, the VIEO reports that the majority have been processed, and 340 loans have already closed.

In addition to saving homeowners money, the program is laying a foundation for the thriving clean

energy economy EDIN is working to build in the USVI. According to VIEO estimates, when all the loans are processed, the resulting solar water heating installations will generate more than \$2 million in revenues for the local solar water heating industry.

### WAPA Recycles Waste Heat to Boost Efficiency at St. Croix Plant

WAPA has completed upgrades at the St. Croix power plant that have improved electrical generation efficiency. A new heat recovery system captures waste heat from two combustion turbines to make enough steam to power a 19 MW steam generator—without using a single drop of additional oil.

Using waste heat to make steam has allowed WAPA to idle diesel boilers, saving about 1,750 gallons of diesel fuel per hour when the plant is running at full load.



WAPA plant on St. Croix. *Photo by Dan Ollis, NREL/PIX 18598*

## Transportation

### Transportation Working Group Pursues Virgin Islands Transportation Transformation

The Transportation working group has tapped in to the expertise of companies that have published reports on USVI transportation in the past, such as PB Americas Inc., NuStats, and Lea Elliott, in performing a comprehensive assessment of the current transportation fuel use in the USVI. Their work will inform the USVI 2025 Transportation Petroleum Reduction Plan.

The report will outline technologies and methods for reducing the USVI's reliance on petroleum for transportation, assess the feasibility of these methods, and identify key contacts for implementation. The working group is using an NREL model, combined with Hawaii drive-cycle data, to estimate fuel sav-

ings from projects that improve traffic flow (an estimation that has been omitted from nearly all petroleum reduction plans in the past).

In other efforts to expand the data on USVI transportation, the group is working with UVI on a survey of taxi drivers to quantify their annual fuel use. Since nearly all taxi drivers in the USVI drive 12-passenger vans and safaris, the survey will also seek to identify methods of encouraging downsizing and to determine whether water taxis are a fuel-efficient alternative.

The working group is also laying the

groundwork for proposed projects, including converting waste grease from the Ritz-Carlton to biofuel for use in government vehicles and putting geotrackers on buses to address the root causes of the resistance to using public transportation on the islands.



Safari parked on a St. Thomas street. *Photo by Adam Warren, NREL/PIX 18599*

If you are interested participating in the transformation of the USVI's energy future, we welcome your help!

Please contact anyone on this list below to get involved. We look forward to hearing your ideas and working with you.

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To learn more about the EDIN-USVI energy revolution and how you can be part of the solution, please visit:

[edinenergy.org/usvi.html](http://edinenergy.org/usvi.html)



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