PHASE 3: PROJECT PREPARATION

3.1 Involve Stakeholders in Policy and Operational Reform Efforts

At the end of the opportunity road map process in Phase 2, a Strengths-Weakenesses-Opportunities-Threats analysis identified potential near-term projects to begin making the energy vision from Phase 1 a reality.

When selecting which near-term actions to take, the leadership team and working groups need to consult subject matter experts and other stakeholders, many of whom may be affected by project implementation. Many of these stakeholders will have participated in Phase 2, and based on the priorities they identified at that time, will also have input about which projects to pursue first. Without limiting their input, the project preparation consultations with stakeholders should identify actions that address specific problems with practicable solutions that can be accomplished within a reasonable timeframe and defined budget. Also, after projects are identified, the team members must be ready and willing to explain why they were selected and others were not. This transparency can help maintain interest in supporting the overall effort.

Phase 3 Describes How To:

- ☐ 3.1 Involve Stakeholders in Policy and Operational Reform Efforts
- ☐ 3.2 Identify the Staff Resources Needed to Complete Near-Term Projects
- ☐ 3.3 Set a Budget and Analyze Risks
- ☐ 3.4 Identify Financing Options for Near-Term Project(s)
- ☐ 3.5 Develop Performance, Measurement, and Reporting Plans

3.2 Identify the Staff Resources Needed to Complete Near-Term Projects

Near-term projects can focus on a variety of actions, such as overhauling policies, designing utility-led programs for ratepayers, assessing renewable resources, conducting feasibility studies, updating the electricity grid, and developing a workforce to invest in human capital. The team should use stakeholder input about priorities to select projects that will accomplish specific objectives, rely on or build the strengths of those who will be implementing the projects, are central to realizing the Phase 1 vision, and create value for those impacted by the project.

Project selection must balance the level of effort with the expected benefit, taking into account resources and team strengths. Poor decisions can divert resources from more beneficial efforts, erode the confidence of the project team, and reduce momentum among external stakeholders.

3.2.1 Establish a Project Team

Having identified where project priorities match the Phase 2 road map, stakeholder interests, and the Phase 1 vision, assemble a team that can complete the project. Project teams will vary in size, but each team must have someone to fill the following roles and responsibilities (even if one person has more than one role):

- **Project lead.** The person who ultimately bears responsibility for the success or failure of the project, the project lead oversees plans, budget, and schedules; delegates responsibilities; and closes out the project.

- **Champion.** The person who initially proposed the project, or obtained approval for it. This person will seek out additional resources as needed to ensure project success, and can positively impact decision makers. The champion is not necessarily a chief executive or agency head, but is typically in a senior supervisory role for the initiative.
- **Subject matter expert(s).** People who understand the process, policy, technology, or service that is the focus of the project.
- **Project execution staff.** Project staff members are responsible for undertaking the actions set out in the project plan. These may include data collection, reporting, construction, and equipment management.

3.2.2 Select at Least One "Quick Win" Project in the Initial Round of Projects

Among the near-term actions identified in Phase 2, it is important to select at least one "quick win" project that will produce a demonstrable benefit in a short timeframe. Quick wins are important to build morale among project teams, demonstrate success to potential investors, and maintain community support for medium- and long-term projects.

Quick win projects generally have some or all of the following features:

- Low financial cost
- Deliverable in less than a year
- Established ability to act according to law and institutional authority
- High likelihood of energy cost savings or community investment
- Prominent locations, such as a large public building, airport, school, or church
- Prominent project partners, such as well-respected politicians, businesspeople, and community leaders.

Examples of quick win projects in the Caribbean include:

- **Solar water heating (SWH).** SWH can save electricity costs and interior square footage with a minimal capital outlay.
- **Streamlined interconnection policies and procedures.** A streamlined, well-documented process will support and encourage the development of a thriving solar distributed generation industry.
- **Distributed generation.** A modest distributed generation installation (e.g., wind or solar) can serve as a pilot project and learning opportunity.
- **Workforce development program.** This project can adapt educational or utility training resources to invest in the labor force needed to implement medium- and long-term projects. Topics can include energy retrofit training, building energy management, and solar PV installation.
- **Energy operations and maintenance (O&M).** Organizing a group of public and private stakeholders to implement energy O&M best practices can save money from day one and creates lead-by-example opportunities.

3.2.3 Define Clear Roles and Responsibilities for Different Governmental Entities Involved in Near-Term Projects

Project teams do not operate in a vacuum. It is important to manage expectations and ensure the adequate participation of everyone involved in a project, both directly and indirectly. One useful analytical tool to aid in this process is a responsibility assignment matrix—Responsible-Accountable-Consulted-Informed (RACI) matrix.

A RACI analysis describes who is responsible for doing work (R), who is accountable for work being completed (A), who must be consulted during the course of work (C), and who must be informed of the progress being made (I).

Responsibility Assignment Matrix

PROJECT: Issue RFP*		DEPARTMENT: Public Utility			UPDATED: Jan. 20XX		
Step/ Action	**Description**	**Project Lead**	**Subject Matter Expert**	**Utility Leadership**	**Energy Ministry**	**Public Works Ministry**	**Governor**
1	Define project size and eligible technology	R	C	A	C/I	I	I
2	Draft RFP	A	C	I	I		
3	Publish RFP			R	A	I	C

* Request for proposals

Completing a RACI matrix like the example in this table can guide decision-making and communications through each step of the project, helping the right people contribute to a project in a timely fashion on the way to project success.

Building Momentum: U.S. Virgin Islands School Retrofits Deliver Solid Return on Investment, Validating Ongoing Investments in Energy Efficiency

The Energy Development in Islands Nations (EDIN)-U.S. Virgin Islands (USVI) project provides an example of how achieving significant success early in the project execution phase addresses the common challenge of building support and momentum for a clean energy project or initiative.

As an EDIN project partner, USVI was able to tap into a broad spectrum of technical assistance and project development support from the U.S. Department of Energy and the National Renewable Energy Laboratory (NREL), which included identifying optimal energy efficiency and renewable energy solutions and a roadmap for achieving the territory's goal of reducing fossil fuel use 60% by 2025. NREL's initial USVI resource assessments identified energy efficiency measures as "low-hanging fruit"—projects with potential to achieve the greatest energy savings for the least cost.

In October 2011, the USVI achieved what would become one of its most visible and impactful successes toward the 60% goal when building energy efficiency upgrades were completed in 11 USVI schools. The energy services company that performed the retrofits guaranteed the USVI government a cost savings of $1.2 million annually, and the results exceeded expectations. Ongoing monitoring by the Virgin Islands Energy Office showed the retrofits saved $1.3 million in energy costs in the first year and $1.7 million in the second year, which helped offset operational costs for the Department of Education.

To build on this success, the USVI government authorized $35 million in funding in 2013 to install lighting and water retrofits in 34 more schools and other Department of Education facilities. Pointing to the very aggressive energy efficiency goals that have been established for the USVI government, EDIN-USVI Director Karl Knight said, "This project demonstrates what is possible—what the potential return on our investment can be."

Energy efficiency measures offer significant savings with minimal upfront cost and therefore present a prime opportunity to build momentum during the execution phase of a project. By producing cost savings that exceeded projections, the school retrofits built credibility for the EDIN-USVI project by providing a highly visible example of progress toward the territory's clean energy goal. They also validated ongoing government investments in energy efficiency by yielding strong returns over the first 2 years. This, in turn, helped build momentum for the EDIN-USVI project by motivating stakeholders and inspiring the community as a whole to become engaged in the effort.

3.3 Set a Budget and Analyze Risks

Once priority projects have been chosen and the team identified, setting a budget is next in project preparation. The budget accounts for project costs, described in hours of time and dollars spent on material, adjusted for project risks. The project lead should consult with subject matter experts and other project participants, and look at costs for similar projects, even projects in other jurisdictions; experience may save the project team from repeating mistakes and missing opportunities.

Common cost items include:

- Staff time
- Travel and meetings
- Data collection and reporting
- Information technology license fees
- Insurance
- Site acquisition and preparation
- Capital expenses, training, and specialized equipment
- Consultant services.

As often as possible, base these cost estimates on experience and information from suppliers. Contingency costs are typically expressed as a percentage of total cost, and should be included to allow for impacts from risk.

3.3.1 Analyze Project Risk

Effectively mitigating risk begins with an analysis of a project's known risks and response options, which include changes to the schedule, budget, and staffing. Phases 1 and 2 will have laid the foundation for determining risk. The goal in Phase 3 is to articulate root causes of specific risks, and assign them a probability value—such as low, medium, or high. Analyzing and addressing a project's risks can be critical to its "bankability" and attracting the right vendors.

Identified risks can be entered into a matrix that plots the severity of impact and likelihood of occurrence to visually represent which ones justify advance planning. Also, risks can be entered into a "risk register" that can be updated for the life of the project.

3.3.2 Common Types of Risk

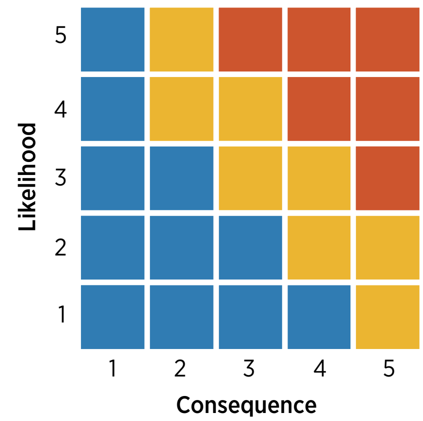
Project risks can be dealt with in several ways. One is changing the project plan to avoid risks. Another is changing the project structure to transfer risks to the party that can most effectively bear them. Certain kinds of risk may require addressing the root cause before it arises. This is known as mitigation or contingency planning, and can be critical to shaping "bankable" agreements. Common types of risk and approaches to addressing them are described below:

- **Technology risk.** This risk arises from the main technology's failure to meet output specifications despite proper design, manufacturing, and installation. Root causes can be addressed as follows:
  - Complete assessments to match the technology to the project location and needs
  - Rely on previously demonstrated or commercial technologies
  - Train the workforce in the proper use and maintenance of the technology
  - Identify alternative technologies that may be used in a contingency plan.

Risk Reporting Matrix

Likelihood

Level	Likelihood	Probability
1	Not Likely	~10%
2	Low Likelihood	~30%
3	Likely	~50%
4	Highly Likely	~70%
5	Near Certainty	~90%



Consequences

Level	Technical Performance	Schedule	Cost
1	Minimal or no impact	Minimal or no impact	Minimal or no impact
2	Minor reduction in performance	< 1 month schedule slip	< 1% cost increase
3	Moderate reduction in performance	1-2 months schedule slip	< 1-4% cost increase
4	Significant degradation in performance	3-5 months schedule slip	< 5-9% cost increase
5	Severe degradation in performance; will not meet key technical thresholds	≥ 6 months schedule slip	≥ 10% cost increase

Source: DOD, Risk Management Guide for DOD Acquisition

Once a technology has been chosen, adequate warranties from a vendor that can honor them addresses this risk.

- **Legal risk.** Legal risk stems primarily from changes in law, or the application of law, that would negatively impact the project. Through the collaborative efforts of diverse stakeholders in Phases 1 and 2, many legal risks will be mitigated. Contract provisions, such as indemnity, conditions present, and warranties can also address legal risk.
- **Performance risk.** Many performance risks can be controlled by drafting suitable project specifications and by selecting of capable and experienced vendors. The latter depends in part on transparency in the selection process. In negotiations with vendors, risk can be addressed through adequate warranties and liquidated damages provisions, as well as construction bonding requirements. Other performance risks have operational barriers as root causes, such as interconnection and dispatch requirements. In some instances, changing these root causes is its own project, but they can be addressed independently through relationship management and facilitated meetings. Even with the best project partners, unexpected equipment delivery delays or labor unavailability can arise, so it is important to account for performance risks in the budget.
- **Payment risk.** Payment risk is addressed through a combination of creditworthy customers and suppliers, credit enhancements, firm obligations to pay for performance, and credit insurance, as appropriate.

- **Cooperation problems.** For specific projects, cooperation problems can be reduced by setting up joint trainings between the project team and the implementing government agencies. These trainings or other facilitated meetings can help establish realistic expectations to avoid serious disagreements that would impact project schedule or budgets. An independent alternative dispute resolution or mediation facility may be appropriate as a last resort.

3.4 Identify Financing Options for Near-Term Project(s)

Many potential financing sources, including private debt and equity and public international or multilateral funds, are available to energy infrastructure projects. Financing solutions and partners will vary by project size, technology, partners, and other project- and location-specific factors. The sources and options described below can be combined or adapted to suit the needs of a particular project.

3.4.1 Sources of Funding and Capital

- **Organization for Economic Co-Operation and Development (OECD) officially supported export credits.** Under the Sector Understanding on Export Credits for Renewable Energy, Climate Change Mitigation, and Water Projects, OECD countries have agreed that any public trade finance support for renewable energy and energy efficiency projects will have interest rates at least 1.2% above 10-year OECD country debt and a maximum term of 18 years. This trade finance support often depends on a certain percentage of project value or project partner ownership originating in the OECD country providing the support.
- **Multilateral development banks and finance institutions.** These international public institutions, which include the Caribbean Development Bank and the Global Environment Facility, often have climate change mitigation or adaptation programs that could support renewable energy generation or energy efficiency projects. Unlike bilateral public support, there are not typically any domestic content requirements, but other requirements do often impact the type of project, project design, and/or repayment.
- **Private financial institutions.** Although international public financial participation in a deal can lower interest rates, private foreign direct investment is by far the largest source of possible funds and is based on the creditworthiness of project partners, not their home jurisdiction or other predefined eligibility requirements, such as additionality.
- **Private capital markets.** For large projects or a portfolio of projects—typically more than $10 million U.S. dollars (USD)—private capital markets may be willing to participate in the financing structure. Institutional investors, such as pension funds, are beginning to show an appetite for long-term clean energy infrastructure bonds, and the OECD estimates the size of this market in 2014 to be $20 billion USD.
- **Domestic policy support.** Although likely not sufficient to finance a project, domestic policies can lower the overall financing cost of capital and infrastructure projects. These types of policies include modified tax treatment, such as investment incentives or accelerated depreciation; government backstops, such as loan loss reserves or other interest rate buy-downs; and dispatch incentives, such as feed-in-tariffs or loading orders.
- **Repurposing public funds.** For smaller projects, public funds may be eligible for repurposing to support a project, such as relying on educational resources for the bulk of a workforce development program. Additionally, energy use reduction equipment could receive priority treatment in the commitment of facilities maintenance funds.
- **Refining legislative authority.** Some public finance support structures can be built through amendments to the legislative authority of existing institutions. This approach can sometimes take longer, but can also be very effective as part of a package to implement the Phase 1 vision.

Avoiding Excessive Solar Curtailment on Kaua‘i

Because island grids are small, the impact of adding variable generation—either at the sub-transmission or the distribution level—can have a negative impact on the central generating plants and the quality of power delivered to the customers.

In anticipation of these challenges, the Kaua‘i Island Utility Cooperative (KIUC) reached out to the U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL) in 2010 for more information on ways to overcome integration challenges and for potential solutions. One of KIUC's primary concerns for meeting its commitment to generate at least 50% of its electricity using renewable energy by 2023 by integrating higher levels of variable renewable energy into the island's electricity system was coordination with its under-frequency load-shedding schemes.

To address these concerns, the DOE and NREL team performed an economic and technical analysis, discussing specifically how to model photovoltaic (PV) inverters in the electricity grid (which were the key components to modeling high penetration of PV on the Kaua‘i grid), and modeling an initial base case of electricity production and use on Kaua‘i. Different types of PV inverter models were analyzed to ensure the stability of the electrical system during disturbances.

Additionally, the team conducted power system modeling and simulations to accurately plan for overall grid quality. At the time of the study, KIUC derived the majority of its power from diesel and naphtha (96%) and had about 7% renewable energy installed on its system. Because so much diesel power was used, the study reviewed potential renewable-diesel hybrid electrical power systems to supply required loads. Because these types of systems may include fossil fueled generators, along with renewable energy, the components have to be combined with storage devices, inverters, and charge controllers to meet load demands. However, adding variable generation such as PV can create potential high ramping rates on the diesel generators.

Given this additional challenge, the team then analyzed electrical power system models to better understand the impacts of high penetrations of PV on the power system, finding that the planned projects by KIUC had a balanced mix of renewable energy and would have a low impact on the generation system.

Following the completion of the studies, KIUC installed a 1.2-megwatt (MW) solar PV system on one of its electrical distribution feeders demonstrating high penetration levels of solar. According to KIUC, during sunny days the PV system can supply 90% of the demand required by the distribution circuit to which it is connected. The preliminary results from monitoring the circuit indicated that overall power quality had not been compromised, helping Kaua‘i meet its goal of 50% renewable electricity generation by 2023.

1.2-MW PV array on Kaua‘i. *Photo by Jamie L. Keller, NREL 21774*

3.4.2 Finance Structures

The simplest finance structure is a private financial institution making an unsecured loan directly to a consumer. More complex financing structures are justified when banks perceive undue risk, whether due to consumer credit history or technology, or where consumers perceive high transactions costs, such as identifying reliable service providers or products. Public financial participation in projects can serve as credit enhancements to reduce these transaction costs for both private financial institutions and consumers, as well as eliminate the financial and administrative resources needed for direct public funding. Some credit enhancements are described below.

- **Loss reserve (partial sovereign guarantee).** A loss reserve uses a pool of public resources to reduce repayment risk on loans made by private lenders in support of projects imbued with a public purpose. In exchange for active participation of private lenders at lower interest rates, the reserve will disburse funds on non-performing debt in a given portfolio, up to the amount of the reserve. This approach improves the credit evaluation of loans that are negatively impacted by a lack of borrower credit history or technology performance, such as the lack of loan performance history in the residential energy efficiency retrofit market. Loss reserves can partially wrap a portfolio of loans or a bond series, depending on the need of the project. Loss reserves, compared to direct subsidies, consume fewer public administrative resources and rely on the ability of private lenders to minimize transaction costs. Property Assessed Clean Energy programs, in which consumers repay loans for distributed generation or energy efficiency retrofits through their property tax bill, typically include a loss reserve.
- **Sovereign guarantee (full wrap).** In contrast to loan loss reserves, which partially wrap a portfolio of smaller projects, this form of contingent explicit liability is capped at the amount of the total project. Sovereign guarantees are sometimes sought for large infrastructure projects when lenders or vendors perceive disproportionate legal, foreign exchange, or political risks.
- **Utility-led energy services and on-bill repayment.** Increasingly, electric utilities are offering nontraditional services, such as distributed generation or efficiency retrofit financing. Because the utility often has access to lower cost capital than does the individual consumer, this structure can allow the utility to broaden its energy business while lowering transaction costs, in part because the consumers repay through their utility bills.

3.5 Develop Performance, Measurement, and Reporting Plans

With an idea about the project focus and its financing structure, the project team can begin to shape performance and reporting plans. Regular communication throughout the project term increases the chances of success by identifying potential problems in time to develop effective solutions. To ensure value in this communication, the project team should determine the actions and metrics it requires vendors and other participants to prioritize.

Performance plans are often organized around milestones, or key actions that need to take place in sequence to successfully proceed toward project completion. Performance plans should include schedules, anticipated approval pathways, and risk and change management strategies, particularly for longer projects.

Milestones depend on project type and project participants, but can include:

- Equipment delivery and acceptance from procurement schedules
- Percentage of workers trained
- Number of installations, such as homes retrofitted or SWHs
- Attaining financing or completing RFP awards
- Passing key risks into new project stages, such as obtaining all permits and beginning construction
- Communications for performance recognition, such as dollars raised or spent.

Reporting plans should provide a uniform, simplified way to gather the key information needed for the project team and other stakeholders to determine progress. Report information, the timing of reports, and the report approval process should be consistent, and reflect who needs what information and by when. The specific information required varies based on project size and type, but should generally include:

- Project name, any identifying number, and date of submission and period covered by report
- Status summary
- Performance and milestone updates
- Progress toward reaching metrics
- Issues that have arisen or have a reasonable likelihood of arising and mitigation strategies
- Budget status and expenditures.

3.6 Phase 3 Resources

Lessons Learned

- Solar Hot Water Heater Industry in Barbados
- Greensburg Implements High-Efficiency Building Codes to Achieve Long-Term Energy Savings
- U.S. Virgin Islands Establishes Interconnection Standards to Clear the Way for Grid Interconnection

Sample

- 10 Important Features of Bankable Power Purchase Agreements for Renewable Energy Power Projects

Worksheet

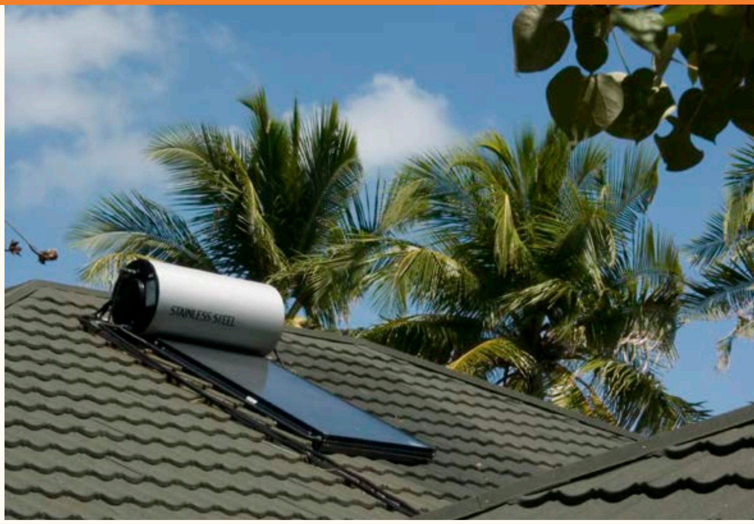
- Responsible-Accountable-Consulted-Informed Matrix
- Risk Register Matrix

Information Resources

LESSONS LEARNED

Solar Hot Water Heater Industry in Barbados

Barbados is addressing the challenge of offsetting high fossil fuel costs by using its abundant solar resources to power solar water heaters (SWHs) across the island. Barbados offers a valuable example of how to successfully execute market implementation of a commercialized renewable energy technology.



Rooftop SWHs are being successfully used in Barbados as a result of effective financial incentives and government support. *Photo from iStock 6923507*

Challenge

Before realizing the SWH success, Barbados had to overcome several other challenges according to the Climate and Development Knowledge Network publication "Seizing the sunshine – Barbados' thriving solar water heater industry,"[1] including:

- **Access to startup capital.** Despite having secured government contracts for SWH installations, banks were unwilling to invest in SWH commercial and residential installations.
- **Lack of consumer awareness and confidence in solar technology.** Developing an effective product and ensuring that the size of the SWH was appropriate for each household were crucial for maintaining sufficient water temperature.
- **High upfront cost and inconsistent financial incentives to encourage consumers to invest in a new system.** There is a history of fluctuating tax credits for SWHs in Barbados, including a complete removal of incentives from 1992 to 1996, resulting in suppression of industry growth.

Solution

The factors that led to Barbados successfully overcoming the market barriers to widespread implementation of SWHs were local high-level government champions, financial support, regulatory certainty, and consumer acceptance.

The SWH industry first emerged in Barbados in the early 1970s in response to oil prices increasing threefold in one year. At the time, fossil fuels supplied 95% of the country's energy needs. In 1973, Canon Andrew Hatch of Christian Action for Development made a SWH out of an old oil drum and fixed it to the roof of his church.

Recognizing the potential of the technology, in 1973 James Husbands founded Solar Dynamics, the first SWH company on the island, and soon had the opportunity to demonstrate the technology to Prime Minister Tom Adams in his own home. Adams saw the benefit of the SWH when his annual gas consumption was reduced by 70%. With Husbands and Adams as local champions for SWH, momentum and public engagement around the initiative grew.

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[1] "Seizing the sunshine – Barbados' thriving solar water heater industry." Climate and Development Knowledge Network. Accessed Aug. 7, 2014. *http://cdkn.org/resource/cdkn-inside-story-seizing-the-sunshine-barbados-thriving-solar-water-heater-industry/*.

Next, government incentives brought competition to the business of manufacturing and supplying SWHs. Starting in the 1970s, the Barbados government introduced a series of measures to support the fledgling SWH industry.

By 2009 there were around 45,000 installed SWH systems in Barbados, or two in every five households. The government introduced further measures to support the industry by mandating SWHs for all new government housing developments. However, there were still challenges to getting early-stage funding from banks for commercial installation. To overcome this problem, the Barbados Institute of Management and Productivity provided a loan that could be quickly repaid after the project was completed.

Consumer acceptance was also key to SWH industry growth in Barbados. Once consumers saw that the technology was sized for their households and worked well, their confidence grew. This was important because other countries such as Jamaica had tried to establish a SWH industry to meet energy needs and reduce costs, but customers were dissatisfied because the installed SWHs were too small, resulting in water that was too cold.

High upfront costs were another barrier encountered by the SWH industry. To help address this issue, credit unions and distributors offered financial support, allowing consumers to spread the cost of the units over 3 years. Matching the credit term to the 3-year payback time of the SWH units meant that some consumers spent less money than if they had continued heating their water with gas.

Financial Incentives to Stimulate SWH Growth in Barbados

1974 – Fiscal Incentives Act

Just as the SWH industry was beginning to emerge, the government of Barbados introduced a tax exemption for the materials used to produce SWHs, saving 20% of the cost. The government also levied a 30% tax on electric water heaters, significantly increasing their price.

1977 – Government Purchase of SWH for State Housing

The government supported the growing SWH industry by mandating the installation of SWHs in new-build government housing developments.

1980–1992 – Homeowner Tax Benefit

In 1980, the government made the full cost of a SWH installation tax deductible to a maximum of $1,750 U.S. dollars (USD). This led to a peak in SWH installations in 1989 of more than 2,800 units. However, this incentive was stopped in 1992 as part of economic restructuring following the economic recession in the late 1980s.

1996 – Amended Homeowner Tax Benefit

In 1996, the Homeowner Tax Benefit was reinstated. In its amended form, Barbadians were allowed an annual tax deduction of $1,750 USD for home improvements, including mortgage interest, repairs, renovation, energy- and water-saving measures, and SWHs.

Key Elements of the Support Framework for the SWH Industry in Barbados

Direction of Influence	Factors That Helped Stimulate Growth of SWH Industry
Private Sector to Consumers	• High-quality products • Consumer guarantee • Finance to spread upfront cost of SWH • Community engagement and job creation • Clear quality of life benefits • Strong marketing and communications
Private Sector to Government	• Demonstrated the potential of the technology • Cost-effective technology that saves millions of dollars
Government to Consumers	• Involvement and participation through communications • Fiscal incentives (the Homeowner Tax Benefit) • Increased duty on gas and electric heaters
Government to Private Sector	• Fiscal Incentives Act 1974 • Government purchase of SWH for new-build developments • Created an environment of regulatory certainty and gave continuous support

Source: Climate and Development Knowledge Network

Key Takeaways

Today, the SWHs designed in Barbados are sold throughout the region, and Barbados is recognized as a leader in the SWH field. One company alone, Solar Dynamics, has installed more than 30,000 units on homes and businesses across the Caribbean.

Although challenges may vary by location, Barbados offers an example of why energy champions, financial incentives, and consumer confidence and acceptance are key to ensuring widespread adoption of a renewable energy technology such as SWHs to help offset high energy costs.

Key lessons for countries wishing to replicate Barbados' achievement include:

- Local finance partners can establish channels of funding for pioneering companies that are struggling to access credit.
- Financial incentives, such as tax credits, can help manufacturers and consumers adopt new technology.
- A stable regulatory framework can provide confidence for investors and consumers.
- High-quality products supported by an enthusiastic, locally sensitive marketing strategy will build consumer awareness of the benefits of new technology.
- Manufacturer or supplier performance guarantees reduce consumer risk and facilitate deployment.
- Consumer credit schemes from manufacturers, distributors, or installers can lower upfront costs to consumers.

> "It was very important that successive governments were consistent in their support. … Governments need the fortitude to commit to [financial and regulatory support] for the long term."
>
> —Leonard Nurse, Barbados Special Envoy for the Environment

LESSONS LEARNED

Greensburg Implements High-Efficiency Building Codes to Achieve Long-Term Energy Savings

On May 4, 2007, a massive tornado struck Greensburg, an agricultural community of about 1,400 people in south-central Kansas. Since then, city and community leaders and residents have been committed to rebuilding the town as a model sustainable community.

When the tornado struck, 11 people were killed, and more than 90% of the city's structures, most vehicles, and the electricity infrastructure were destroyed or damaged. Homes and businesses were leveled, displacing most of the town's residents.

The LEED Platinum K-12 school in Greensburg, Kansas.
Photo from Joah Bussert, Greensburg GreenTown, NREL 19952

Challenge

Moving forward quickly to rebuild homes and businesses after the tornado was a high priority for Greensburg. Recognizing an opportunity to not just rebuild, but to rebuild in a way that would sustain the local economy for the long term, the city began working with technical experts from a variety of organizations to identify the best ways to achieve this goal—a common challenge for communities faced with the need to rebuild from the ground up in the wake of disasters.

Solution

One of the first steps the City of Greensburg took was to adopt a resolution in December 2007 that all city-owned buildings (more than 4,000 square feet) be designed to a U.S. Green Building Council Leadership in Energy & Environmental Design (LEED) Platinum level with a minimum of 42% energy cost savings compared to standard buildings built to code. With the help of energy modeling and technical expertise from NREL and others, buildings such as City Hall and a business incubator were successfully built to LEED standards. This inspired other public and commercial building leaders to elect to achieve the same goal for the Greensburg school and the Kiowa County Memorial Hospital, among others.

The city also explored the possibility of formalizing green building codes, but lack of knowledge about building codes was a major challenge for Greensburg. City leaders expressed concerns about how residents, business owners, and builders would respond to perceived higher building costs for green buildings, and about how the city staff would learn the new energy codes or program requirements.

To date, Greensburg's per-capita ratio of U.S. Green Building Council LEED-certified buildings is one per approximately every 129 citizens. In a town of 900 people, that's the highest per-capita concentration of LEED buildings in the United States.

City leaders relied on the expertise of the National Renewable Energy Laboratory (NREL)[1] and IBACOS. Both organizations analyzed and summarized the rapidly changing field of green building codes and green building programs for city leadership and offered several options for consideration, including:

- Explore a partnership with the Kansas Building Industry Association and National Association of Home Builders to conduct a voluntary pilot program applying the National Green Building Standard.
- Establish a voluntary Greensburg Green Building Program focused on encouraging use of energy-efficient and sustainable practices in homes and businesses.
- Encourage or incentivize architects and builders to use ASHRAE's Advanced Energy Design Guides, which spell out climate-specific design recommendations for achieving 30% energy use improvement when compared to ASHRAE Standard 90.1.
- Adopt 2006 International Energy Conservation Code as the basic energy code because it applies to the residential and commercial sectors and has reasonably achievable energy requirements.

> "The technical assistance provided by DOE and NREL staff assures that Greensburg's city and county governments, businesses, and other buildings will continue to save large sums of money for a long time to come."
>
> — Daniel Wallach, Executive Director and Founder, Greensburg Greentown

After many discussions, the city approved a voluntary Greensburg Green Building Program in April 2009 that included partnering with the Kansas Building Industry Association to offer training, discount some services, and support public awareness about green building while giving builders a chance to understand green building techniques gradually. By seeking unbiased, third-party expertise on rebuilding with energy efficiency, Greensburg was able to explore numerous building energy code options, educate its leaders and residents on those options, and implement programs that led to the completion of numerous new and renovated buildings that meet or exceed the city's energy goals.

LEED-Certified Buildings in Greensburg

Greensburg boasts many LEED-certified buildings, including many "firsts" for Kansas and the country:

- City of Greensburg SunChips Business Incubator—the first LEED Platinum municipal building in Kansas
- Kiowa County Memorial Hospital—the first LEED Platinum critical access hospital in the United States
- Prairie Pointe Townhomes—the first residential LEED Platinum building in Kansas
- USD 422 Greensburg K-12 School—this LEED Platinum school is built to be 60% more energy efficient than standard code and generate electricity with an on-site wind turbine
- Kiowa County Courthouse—renovated with sustainable and energy-saving technologies while maintaining the structure's original design and achieving LEED Gold certification
- BTI-John Deere dealership—LEED Platinum facility that uses two wind turbines to generate 4.2 kilowatts (kW) and 1.9 kW of electricity and is a model for other John Deere dealerships.

[1] *Rebuilding Greensburg, Kansas, as a Model Green Community: A Case Study*, National Renewable Energy Laboratory.

Key Takeaways

Greensburg's efforts to rebuild green are paying off. When measuring the energy use of 13 commercial buildings (from 2010 through 2011), Greensburg buildings are saving a combined total of $200,000 in energy costs per year compared with average energy use of similar buildings. In addition, several major housing projects were built with energy efficiency features, including the Prairie Point Townhomes, which earned the first residential LEED Platinum rating in Kansas. Completed in July 2008 by Kiowa County, this low-income rental development was evaluated by NREL and IBACOS using the Home Energy Rating System Index, which projected that the homes would use 41% less energy than a standard home built to the 2003 International Energy Conservation Code. In addition, the complex, like the entire town of Greensburg, is powered by a community wind farm.

Faced with the daunting challenge of recovering and rebuilding sustainably after disaster, Greensburg provides an example—not only for communities recovering from disaster, but for any community striving to build a more sustainable future. Kaupuni Village, an affordable housing complex for low-income families in Oahu, Hawai'i, offers another example of building sustainably from the ground up on a much smaller scale. These examples provide lessons learned and may help others to avoid common pitfalls and barriers as they strive to integrate sustainable building practices into their strategic energy planning.

Lessons Learned

- Determine gaps and opportunities by comparing current local codes with the latest international standards.
- Educate key stakeholders, including city and business leaders and residents, about the benefits of the proposed changes and why updated codes should be used to meet the community's goals.
- Explore partnerships with reputable building organizations to leverage their expertise and resources.
- Demonstrate success with highly visible public buildings that can serve as living laboratories for incorporating energy efficiency and renewable energy into building designs.

Another LEED Example: Hawai'i's Kaupuni Village

Kaupuni Village is another example of the successful execution of a LEED-certified affordable housing community. Located on Oahu, Kaupuni Village comprises 19 single-family homes and a community center. Not only are the structures built to achieve net-zero energy and use 40% less energy than a standard home, but the entire community was built as a fully self-sufficient and sustainable environment in keeping with traditional Hawai'ian cultural values.

Set in the Waianae Valley of Oahu, Kaupuni Village is the first net-zero energy affordable housing community in Hawai'i. *Photo by Kenneth Kelly, NREL 20154*

LESSONS LEARNED

U.S. Virgin Islands Establishes Interconnection Standards to Clear the Way for Grid Interconnection

A 448-kW PV system installed at the Cyril E. King Airport on St. Thomas in April 2011. *Photo by Adam Warren, NREL 18953*

The Energy Development in Island Nations (EDIN)-U.S. Virgin Islands (USVI) pilot project offers a valuable example of how to translate technical analysis to an effective, efficient regulatory and policy environment that facilitates the integration of renewable energy into the existing electricity system.

Faced with electricity prices more than four times higher than the U.S. average, USVI Gov. John P. de Jongh Jr. set an aggressive goal in February 2010 to reduce the territory's almost total dependence on fossil fuel 60% by 2025. To achieve that goal, the governor and the EDIN-USVI project partners, including the U.S. Department of Energy and the U.S. Department of the Interior, the USVI government, Virgin Islands Energy Office (VIEO), and the Virgin Islands Water and Power Authority (WAPA), were committed to developing the territory's renewable energy resources and increasing its energy security. But there were a variety of hurdles to overcome.

Challenge

According to the VIEO, a lack of clearly defined interconnection procedures was among the most significant challenges for those working to install renewable energy systems in the territory. This is a challenge many communities face as they begin implementing long-term clean energy strategies and initiatives. In the USVI, the ad-hoc policies and standards that were in place were confusing and cumbersome, resulting in a high level of frustration that discouraged individuals and businesses from investing in renewable energy systems and projects.

To address this issue, the EDIN-USVI project team sought assistance from an objective party with the technical expertise needed to inform the development of transparent provisions and standard agreements designed to facilitate the timely, predictable, and cost-effective interconnection of renewable energy systems. To increase the speed and scale of renewable energy adoption, the USVI needed to clear the way for the integration of renewable energy generation onto the grid while maintaining the safety, reliability, and power quality of the electricity distribution system.

Solution

The EDIN-USVI team turned to Keyes, Fox & Wiedman, a law firm with deep expertise in renewable energy regulatory policy and interconnection standards, to perform an in-depth analysis of the territory's interconnection procedures and make recommendations. To inform its work, the firm worked closely with a renewable energy working group composed of private citizens, VIEO employees, WAPA employees and board members, private solar developers, and National Renewable Energy Laboratory technical advisors. It also leveraged the experience of others, including California and Hawai'i, drawing upon their lessons learned and the procedural models they have developed (specifically the Federal Energy Regulatory Commission's Small Generator Interconnection Procedure, California's Rule 21, and Hawai'i's Rule 14H) for grid interconnection.

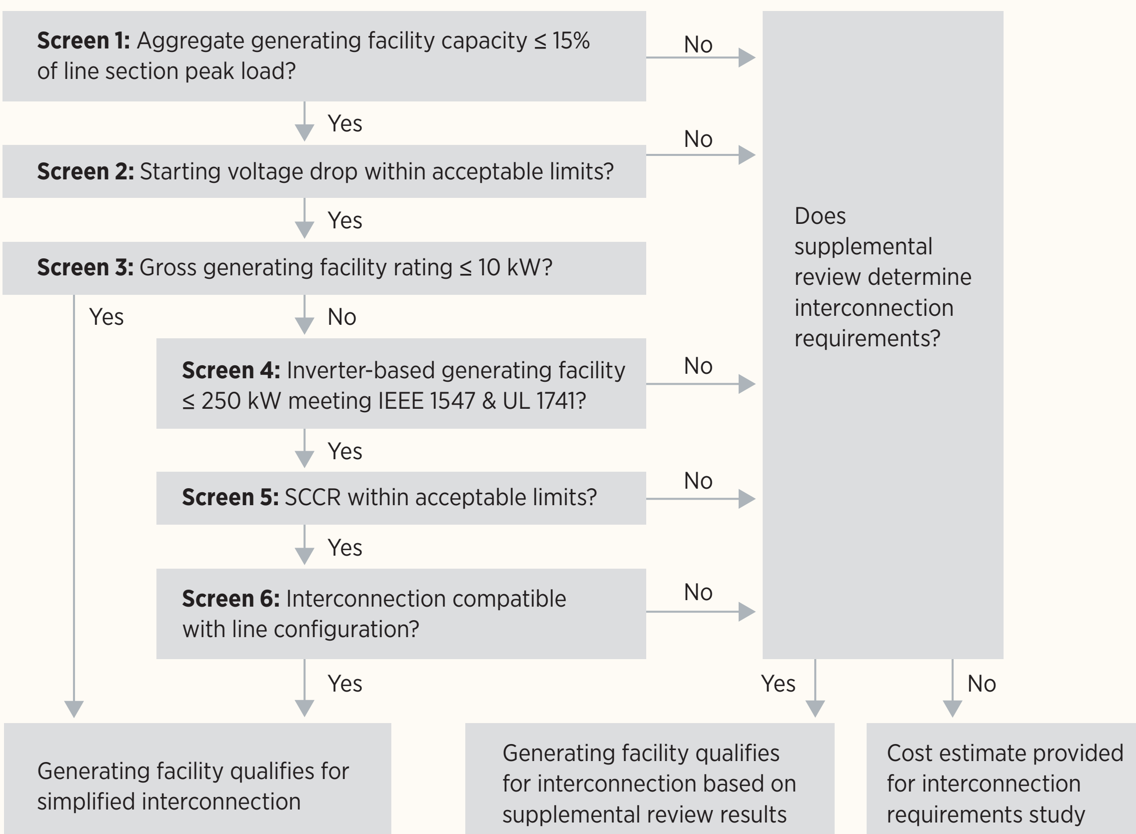
In April 2010, the firm presented the working group with a draft interconnection policy and interconnection agreement along with justification and examples supporting its recommended policies and rules, including:

- Provide multiple review levels for different system sizes and types
- Establish timelines
- Remove unnecessary technical requirements
- Provide interconnection rules that apply to all system types and fuel sources
- Include a simple dispute resolution procedure

Among the specific components of the draft interconnection procedures were:

- Timelines for each step
- Review screens
- Supplemental review requirements
- Study process
- Standard applications and agreements.

Proposed USVI Screen Criteria Process Flow



The working group shared the report's findings with a diverse set of stakeholders at a public meeting to ensure balance between the needs of the utilities, developers, and renewable energy offtakers. This collaborative process resulted in the establishment of a clear, well-defined, and streamlined interconnection process that contributed significantly to increasing the speed and scale of renewable energy deployment in the USVI. By August 2014, the territory had reduced its fossil fuel use by 20%, and St. Croix was on track to produce 25% of its power from solar and wind.

"In 2014, renewable energy projects for residential and commercial customers tied into the electric grid reached 5 megawatts on St. Croix and 10 megawatts in the St. Thomas/St. John District," said VIEO spokesperson Don Buchanan. "The utility has almost completed a 4 megawatt solar installation on St. Croix. It is expected to be online by November. The peak megawatt usage on St. Croix, population 50,000, is now about 39 megawatts."

Key Takeaways

Clean energy policies and regulatory measures play a key role in advancing island clean energy goals. The establishment of a clear and well-defined interconnection policies and procedures has been a significant factor in the success USVI has achieved in pursuit of its 2025 goal. The USVI tapped into outside technical expertise and leveraged model interconnection standards developed by similar communities to develop a draft interconnection procedure, and then it worked collaboratively with local stakeholders and project partners to ensure that the procedure it ultimately adopted would encourage and promote renewable energy development without compromising the safety and reliability of the electricity distribution system.

Key lessons learned for USVI interconnection standards include:

- Seek assistance from legal and technical experts with experience in grid interconnection issues to inform the development of interconnection standards.
- Leverage the experience of communities pursuing similar clean energy goals, drawing upon the lessons they have learned and the models they have developed.
- Work collaboratively with key stakeholders to incorporate their insights and ideas, and strive to achieve balance in addressing their diverse interests and needs.
- Develop a website that clearly communicates essential information about interconnection standards and streamlines the process for users.

> "What we're attempting to do is integrate a very large portion of renewable energy into our system. Think of it as a pilot for how to integrate renewables as a large proportion of the grid."
>
> —Karl Knight, Director, VIEO; WAPA board member

Sample: 10 Important Features of Bankable Power Purchase Agreements for Renewable Energy Power Projects

From Overseas Private Investment Corporation, U.S. Department of Commerce, U.S. Agency for International Development, and the U.S. Trade and Development Agency (*http://www.opic.gov/sites/default/files/files/10%20Elements%20of%20a%20Bankable%20PPA.pdf*)

A bankable power purchase agreement (PPA) is essentially a long term offtake agreement executed with a creditworthy offtaker and having a sufficient tenor to enable repayment of debt by providing an adequate and predictable revenue stream.

1. Dispatch Risk

There are two structures generally accepted by lenders for mitigating the risk that the offtaker may not dispatch the generating facility.

> **Take or Pay:** The offtaker pays a fixed tariff comprising a capacity charge (a fixed amount that is paid for available capacity - no dispatch required) and an output charge (an amount paid in respect of energy actually delivered). This permits the power producer to cover its fixed costs with the capacity charge, including debt service, fixed operating costs, and an agreed equity return.
>
> **Take and Pay:** The offtaker must take and pay a fixed tariff for all energy delivered (no dispatch required). If energy cannot be physically taken by the offtaker and output is "curtailed," energy will be calculated and paid for on a "deemed" delivered basis.

2. Fixed Tariff

It is important that the revenue of any PPA, whether "take or pay" or "take and pay," be a certain amount per kilowatt-hour generated to adequately cover the cost of operating the facility, repay the debt and provide a reasonable return on equity.

3. Foreign Exchange

In order to avoid subjecting the power producer to currency risk, the PPA should be either denominated in or linked to an exchange rate of the currency of the power producer's debt, and there should be no limitation or additional approvals required to transfer funds to offshore accounts as required.

4. Change in Law or Change in Tax

The agreement should explicitly state which party takes the risk of the law or tax regime changing after the date of the agreement in such a way as to diminish the economic returns of the transaction for such party (e.g., increase in taxes on power producers reducing the producer's returns). In order for PPAs to be bankable, most lenders require the offtaker to take this risk.

5. Force Majeure

The agreement should excuse the power producer from performing its obligations if a force majeure event (an event beyond the reasonable control of such party) prevents such performance. The allocation of costs and risk of loss associated with a force majeure event will depend on the availability of insurance and in some cases the degree of political risk in the country/region.

6. Dispute Resolution

The agreement should provide for offshore arbitration, in a neutral location, under rules generally acceptable to the international community (e.g. United Nations Commission on International Trade Law, or London Court of International Arbitration, or ICC).

7. Termination and Termination Payments

The PPA should set out clearly the basis on which either party may terminate the PPA. Termination by the offtaker may leave the project with no access to the market and thus should be limited to significant events. The agreement should provide that if the PPA is terminated for any reason, then in case of transfer of the facility to the offtaker, the offtaker shall provide a termination payment at least equal to the full amount of the power producer's outstanding bank debt, and in the case of the offtaker's default, a return on equity.

8. Assignment

The PPA should allow collateral assignment of the agreement to the power producer's lenders with the right to receive notice of any default and to cure such default. Additional step-in rights are generally set forth in a separate direct agreement between the lenders and the offtaker.

9. Offtaker Payment Support

Depending upon the size of the project and the creditworthiness of the offtaker and the development of the energy sector in a certain country, short term liquidity instrument, a liquidity facility and/or a sovereign guaranty will be required to support the offtaker's payment obligations.

10. Transmission or Interconnection Risk

The PPA should indicate which party bears the risk of connecting the facility with the grid and transmitting power to the nearest substation. The more significant these risks (due to terrain, distance, populated areas), the more the lenders will require the offtaker to bear all or a significant portion thereof.

Worksheet: Responsible-Accountable-Consulted-Informed Matrix

PROJECT: **DEPARTMENT:** **UPDATED:**

Step/ Action	Description	Project Lead	Subject Matter Expert	Management	Partner Organization	Stakeholder 1	Stakeholder 2
1	Project Step						
2	Project Step						
3	Project Step						
4	Project Step						
5	Project Step						
6	Project Step						

Worksheet: Risk Register Matrix

Type of Risk	When Risk Can Occur	Response to Risk	Consequence of Risk (e.g., High/Low)	Likelihood of Occurrence	Priority
e.g., contractor goes bankrupt	e.g., most likely to occur before commercial operations begin	Assignment or re-bid of contract; Agreement requires early warning of financial trouble	Medium, significant delays could result	Low, adequate screening protocols in place	Low

Information Resources for Phase 3

These information resources and useful links are illustrative, not comprehensive.

A Guide to Community Shared Solar (U.S. Department of Energy [DOE] 2012). This publication covers the planning and implementation of a community solar program, including examples of operational projects.

A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects (DOE 2014). This report describes lessons learned from series of projects that are intended to advance the deployment of plug-in electric vehicles.

A Step by Step Tool Kit for Local Governments to Go Solar (California Energy Commission 2009). This guide describes how governments can support the development of a residential solar market.

Alternative Rate Mechanisms and Their Compatibility with State Utility Commission Objectives (National Regulatory Research Institute [NRRL] 2014). This analysis identifies and reviews alternative rate mechanisms that have come to the forefront in state utility regulation the recent past.

Clean Energy Finance Through the Bond Market (Brookings 2014). This paper provides an overview of issues regarding using public debt to support clean energy deployment.

Contingent Liabilities: Issues and Practice (International Monetary Fund 2005). This paper discusses the fiscal issues raised by contingent liabilities, which include sovereign guarantees.

Developing Renewable Energy Projects Larger Than 10 MWs at Federal Facilities (Federal Energy Management Program 2013). This detailed guide contains project development checklists relevant to U.S. utility-scale projects that could be the foundation for tailored project development checklists in other jurisdictions.

Energy Project Financing: Resources and Strategies for Success (Thumann 2008). This book provides a comprehensive treatment of financing energy projects, primarily in the context of building energy retrofits.

Evaluation of the Barbados Solar Water Heating Experience (Barbados 2003). This briefing provides a history of solar water heater deployment in Barbados, with supporting data.

Finance Mechanisms for Lowering the Cost of Renewable Energy in Rapidly Developing Countries (Climate Policy Initiative 2014). This publication contains three briefs describing mechanisms that governments can use to lower capital costs.

Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators (State and Local Energy Efficiency Action Network 2014). This guide provides an overview of the current state of on-bill programs and provides actionable insights on key program design considerations for on-bill lending programs.

Key Principles for Effective Strategic Workforce Planning (U.S. General Accounting Office 2009). This report describes the key principles of strategic workforce planning and provides illustrative examples of these principles.

Mitigating Commercial Risks in Project Finance (International Bank for Reconstruction and Development 1996). This brief describes major tools to allocate risk in large projects.

Overview of Regulatory Incentives in the Context of Public Policy Goals (NRRL 2008). This report describes general categories of regulatory devices to meet policy goals and provides criteria for assessing their effectiveness.

Project Selection Criteria: Greece-Italy Territorial Cooperation Programme (European Regional Development Fund 2007). This policy document demonstrates one real-world method to effectively evaluate proposals, including relevant screening checklists.

Risk Management Guide for DOD Acquisition (U.S. Department of Defense 2008). This guide discusses a variety of program risks, and how to address them, during the public contracting process.

Saving Energy in Commercial Buildings Checklist (NREL 2011). This checklist provides a succinct, comprehensive overview of the variety of measures a commercial building can undertake to improve the efficiency of energy and water use.

Solar Powering Your Community: A Guide for Local Governments (DOE 2011). DOE developed this comprehensive resource to provide a framework for a comprehensive solar plan for a community by introducing a range of policy and program options.

The **Building Energy Codes Program Resource Center** (*http://www.energycodes.gov*) provided by DOE's Office of Energy Efficiency and Renewable Energy (EERE) contains a comprehensive collection of information and tools designed to support the development and enforcement of energy codes.

The **Clean Energy Group website** (*http://www.cleanegroup.org/ceg-projects/clean-energy-finance/*) contains data, reports and educational material relating to clean energy finance.

The **Energy Data Management and Evaluation** website (*http://www1.eere.energy.gov/wip/solutioncenter/data_management.html*) provided by EERE contains information below about energy data management with resources to use in designing and implementing a data management plan.

The **Free Management Library** (*http://managementhelp.org/projectmanagement*) contains a variety of resources relating to project management, including feasibility and risk management.

The **Hawai'i Guide to Renewable Energy Facility Permits** (*http://energy.Hawai'i.gov/renewable-energy-project-permitting-in-the-state-of-Hawai'i*) provides information on the federal, state, and county permits required for renewable energy facilities in Hawai'i.

The **iSixSigma** website (*http://www.isixsigma.com/*) hosts a variety of resources, including tools and blogs, on project selection and process improvement.

The **LEADER Gateway** (*http://enrd.ec.europa.eu/leader/leader/leader-tool-kit/en/index_en.cfm*) provided by the European Commission is a local development method which facilitates local actors in developing an area by focusing on its endogenous development potential.

The **PSE&G Residential Solar Program website** (*http://www.njcleanenergy.com/renewable-energy/programs/utility-financing-programs/utility-financing-programs/pseg*) describes how the private utility responded to the policy goal of increasing residential solar deployment.

The **Project Management Knowledge Center** (*http://www.pmi.org/learning.aspx/*) hosts forms and resources on project management, some of which are free.

The Role of Pension Funds in Financing Green Growth Initiatives (Organization for Economic Co-Operation and Development 2011). This paper examines policies and finance options to encourage pension funds to help finance green growth projects.

The **State Utility Regulation and Clean Energy website** (*http://www.epa.gov/cleanenergy/energy-programs/suca/resources.html*) provided by the U.S. Environmental Protection Agency provides a variety of reports on designing and implementing energy efficiency policies and programs.

The **System Advisor Model (SAM)** makes performance predictions and cost of energy estimates for grid-connected power projects based on installation and operating costs and system design parameters that you specify as inputs to the model.