PHASE 6: PROCESS IMPROVEMENT

Not long after a program ends or a project closes out, collecting insights from team members and other stakeholders provides information critical to improving the next project. By incorporating the learning that comes from project development and execution into subsequent projects, the team will accelerate progress toward realizing the Phase 1 vision and help ensure that the progress made to date will be a part of lasting change.

After a few projects have been completed, the information collected in Phase 6 can help the community reassess opportunity pathways from Phase 2 under new conditions and ensure that the next round of Phase 3 project selections take the next steps toward realizing the energy vision.

Phase 6 Describes How To:

- ☐ 6.1 Conduct Closeout Interviews with Project Partners and Stakeholders
- ☐ 6.2 Collect Lessons Learned and Identify Skills Development
- ☐ 6.3 Report Results of Review to Management, Project Partners, and the Public

6.1 Conduct Closeout Interviews With Project Partners and Stakeholders

The project team, project partners such as vendors, and other stakeholders such as customers and neighbors, all have unique perspectives on the conduct and outcomes of a project. For those involved with the project, the project lead should solicit specific feedback on the accuracy of schedule and budget estimates, the process of changing schedules or budgets, team member performance, risk identification and management, and project communications. Other stakeholders should be included because their input was considered in Phases 1–4, and a project review can identify to what extent the project met their expectations. Closeout interviews can also ask respondents to identify lessons learned or areas where improvement is needed, as well as overall satisfaction with the project.

Interviewing stakeholders and partners at the end of a project can help the project team identify lessons learned, areas for improvement, overall team member performance, and more.
Photo by Ted Sears, NREL 17434

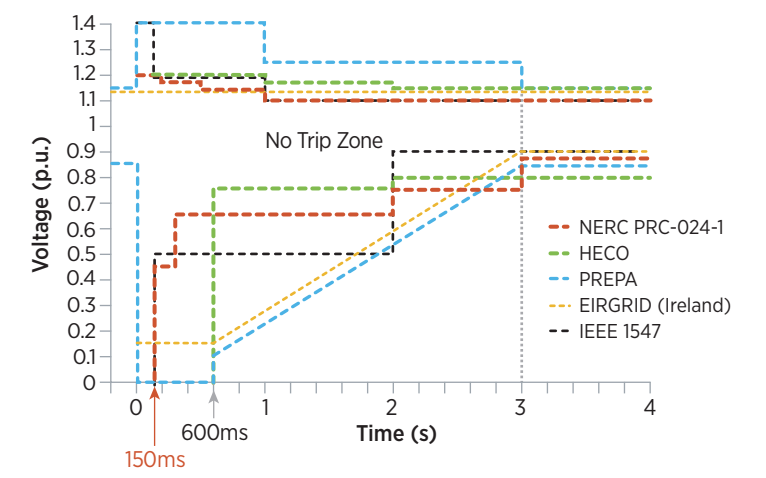
Updates to Generator Interconnection Minimum Technical Requirements in Puerto Rico

Puerto Rico has a significant opportunity to develop renewable resources, such as wind and solar, and undertook revisions to its interconnection procedures. Interconnection procedures govern how generating facilities, including renewable resources, are incorporated into the electric grid, and involve meeting minimum technical requirements (MTRs).

Because many MTRs were written to address relatively large fossil fuel-fired power plants, they can prove to be an unintentional barrier to the development of renewable and distributed energy projects. At Puerto Rico's request, the U.S. Department of Energy and the National Renewable Energy Laboratory (NREL) analyzed the MTRs that applied in Puerto Rico against the generally accepted practices of utilities in the United States and Europe, as well as the technical aspects of wind and solar photovoltaic projects. NREL's recommendations for improvements or additional study fell into several categories, including:

- Voltage fault ride-through
- Voltage regulation system, reactive power, and power factor requirements
- Short-circuit radio influences
- Frequency ride-through and response
- Ramp rate control
- Power quality.

Staff from the Puerto Rico Electric Power Authority (PREPA) participated in the review, and ultimately incorporated some recommendations into revised MTRs in August 2012. For other recommendations, utility engineers responded with a technical rationale for not modifying some of the requirements. By seeking out and considering the results from the analysis, Puerto Rico worked to address the significant challenges presented by high renewable penetration, and provided project developers and other stakeholders with clear guidance on the MTRs and the rationale behind them.



As part of its analysis, NREL developed this comparison between low-voltage ride-through requirements and high-voltage ride-through requirements for PREPA, North American Electric Reliability Corporation, and other islands systems such as the Hawaiian Electric Company and EirGrid while also incorporating Institute of Electrical and Electronics Engineers Standard 1547 clearing times. *Figure by NREL*

Reducing Maui Wind Curtailment

Island power grids such as Hawai'i's do not have the advantage of geographically diverse resources, which helps smooth out variable renewable generation output on interconnected power systems. This makes the integration of high levels of renewable energy a challenge, requiring utilities to regularly review their operations to ensure that the intermittent nature of the renewable energy does not compromise the reliability of the electricity system.

The island of Maui has a high percentage of wind and solar power compared to larger islands such as Oahu, thanks to wind power plants, distributed solar power, and a 10-megawatt battery energy storage system. However, a lack of familiarity with renewable resources created operational challenges, and the utility curtailed wind and solar energy because of concerns about grid reliability on this smaller island.

To help the utility meet its renewable energy targets, the HCEI leadership team convened a technical review committee (TRC) to evaluate potential mitigation strategies for reducing curtailment. The TRC included local stakeholders and national and international experts, and delivered the Hawai'i Solar Integration Study (HSIS), which assessed integration challenges for dynamic wind and solar resources and how to address those challenges—exactly what Maui was looking for.

HSIS developed a new method for calculating reserve requirements, based on simulations of how often solar and wind resources would be curtailed to maintain grid control parameters. At the time of the study, contingency and operating reserves were pooled together on Maui, and HSIS evaluated whether operating reserves could be allocated to cover variability of wind and solar resources.

The top mitigation measure identified for Maui was to upgrade the utility's combined-cycle units to enable it to switch between single- and dual-train operations as needed. The new method, with new control technology, allowed for different operational behavior, with significantly different reserve requirement curves. The HSIS found that switching could increase wind and solar penetration from 23.5% to 25.1%, reduce curtailment from 23.1% to 17.9%, and increase the percentage of additional renewable energy that was actually delivered to 94%. Other potential mitigation strategies included relaxed operating schedules for the utility's four oil-fired units and a change in the commitment process to increase the priority of operating reserves.

The Maui Electric Company and Hawaiian Electric Company are now in the process of implementing mitigation strategies identified in the HSIS to reduce wind curtailment on Maui, including reducing minimum power levels of thermal units and switching from dual-train to single-train operation.

Other island communities facing the common challenges associated with increasing levels of renewable energy penetration will benefit from the mitigation strategies identified in the HSIS and the lessons Maui learns as it works to achieve balance between state clean energy goals and system reliability requirements.

Thanks to the information provided in the HSIS, the Maui Electric Company and HECO are implementing mitigation strategies to reduce wind curtailment on Maui. *Photo from iStock 30420596*

6.2 Collect Lessons Learned and Identify Skills Development

Regardless of success or failure, the experience gained from each project can highlight opportunities to improve the next project. For example, the project team may have identified a way to streamline the permitting process, facilitate communications between project partners, select the most suitable vendor, or even project documentation processes. Using the closeout interviews, the project team should identify lessons learned from their experience on the project. By articulating these lessons, the experience from one project can transfer knowledge of the solution to improve Phase 4 of the next project. It can also help project teams balance consistency of approach with tailoring processes to meet their unique needs.

In addition, the project team likely gained new and developed existing skills. By keeping track of these developments, the project team will inform the project identification process in the next iteration of Phase 3.

6.2.1. Lessons Learned Key Features

- Provide basic information on who, what, where, and why.
  - The [technology/program/policy] project completed by [who] in [where] represents/demonstrates successful implementation of [Phase #].
- Identify the common challenge that is topic of this lessons learned.
  - When undertaking this type of project, one will need to address [common challenge in Phase #].
- Explain why this is a common challenge, with as much specificity as possible.
  - This common challenge arises because it involves [technology risk/financing risk/social risk/changing status quo]. This results from [add detail on challenge that relates to solution].
- Discuss replicable actions (i.e., the how).
  - [Who] addressed [common challenge] in completing the project by [how].
- If appropriate, provide history of reaching the decision point to provide context for course of action taken.
  - [Who] chose this project because [it lowers cost, etc.].
- Highlight reasoning behind decision (i.e., the why).
  - [Who] chose this solution because [why].
  - Indicate alternatives that may suit different circumstances.
- Conclude, emphasizing replicable actions, decisions, or paths to success.
  - This [how] addressed [common challenge] by [resolving tech/social conflict, etc.], and may be useful for others as they [implement Phase #].

6.3 Report Results of Review to Management, Project Partners, and the Public

The review of the project will generate useful information that can save time and resources in the next project, so it is important to communicate the results of the review. As the final step in completing the project, share the lessons learned, skills developed, and other information with other project teams, senior leadership, project partners, and stakeholders who participated in the project. Beyond making sure the project review was worth the effort, sharing this information is important if policy changes or other larger issues need to be addressed for future projects. Sharing this information with project participants demonstrates that their input was a valuable part of the project and was put to good use, not only in this project but in others as well.

6.4 Phase 6 Resources

Lessons Learned

- Energy Permitting Wizard Helps Reduce Project Barriers in Hawai‘i

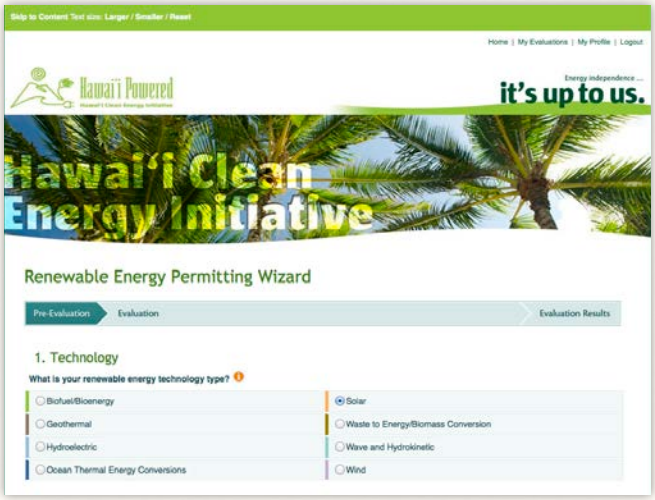
Worksheet

- Project Skills Register

Information Resources

LESSONS LEARNED

Energy Permitting Wizard Helps Reduce Project Barriers in Hawai‘i



Similar to many jurisdictions, the complex permitting process for renewable energy projects has been identified as a critical barrier to renewable energy development in Hawai‘i. The inability of project proponents to reliably predict the duration, outcome, and cost of the permitting process increases the investment risk for renewable energy projects, preventing the construction of projects that align with the state’s clean energy goals.

The Hawai‘i Clean Energy Initiative (HCEI) is a multiyear partnership between the U.S. Department of Energy and the state of Hawai‘i to encourage collaboration between state utilities, business leaders, policymakers, and citizens committed to reducing the state’s dependence on imported fossil fuels. With the support of the National Renewable Energy Laboratory (NREL) and others, HCEI has been involved in streamlining Hawai‘i’s permitting processes to help alleviate delays, improve the feasibility of renewable energy projects throughout the state, and aid Hawai‘i as it strives to achieve 70% clean energy by 2030.

To specifically address these permitting challenges, HCEI and its partners developed the Renewable Energy Permitting Wizard to assist project teams with siting and designing a project according to the permitting requirements identified, resulting in more appropriate project siting and shortened permitting timelines.

Challenge

Prior to the development of the Renewable Energy Permitting Wizard, there was no central resource providing information on multijurisdictional (federal, state, and county) permits required for renewable energy or other projects in Hawai‘i. People looking to determine the permitting requirements of a specific project needed to consult multiple sources and/or agencies, which required considerable time and resources. Because permitting impacts the financing of projects, reducing the permitting time or reducing the number of permits required can significantly impact total project costs.

The project team held three meetings with county planning agencies and local renewable energy professionals to identify and discuss Hawai‘i’s permitting processes. Through these meetings, a number of renewable energy project developers and industry professionals identified specific permits that were so difficult or time consuming to obtain that the developer either considered stopping or completely halted work on a project.

Project developers and industry professionals identified the following as the greatest barriers to renewable energy use in Hawai‘i:

- Utility permitting and Public Utilities Commission processes can take a long time
- Community and political opposition to renewable energy

- Environmental agency inflexibility
- Unsuccessful implementation of the mandate to expedite permit reviews for renewable energy projects
- Large number of permits required and therefore large number of agencies involved in the process
- Unclear regulations and associated interpretations
- Applicant confusion about permitting requirements resulting in the frequent submission of incomplete applications.

Solution

During the stakeholder meetings, industry representatives identified four main streamlining priorities:

1. Standardized checklists
2. Permit application templates (e.g., digital and Web-based)
3. Reduce level of application detail as appropriate
4. User fees for expedited permit review.

In order to act on these recommendations, the Hawai‘i Department of Business, Economic Development, and Tourism (DBEDT) partnered with NREL to develop a series of guidebooks to provide project developers with a comprehensive resource on permitting renewable energy projects in Hawai‘i. These guidebooks summarize the types of permits that a renewable energy project developer may need to acquire and provide information on how to determine if a permit would be necessary based on the specifics of the project. Permit packets were also developed for each permit to provide more detailed information on the permit requirements and the process for applying for the permit.

DBEDT decided to use the information provided in the initial guidebooks to develop an online permitting tool that would help renewable energy project developers quickly determine the permits that would apply to a renewable energy project in Hawai‘i. The tool works by presenting a series of questions about the proposed project and based on responses, a list of permits potentially required is displayed with typical timeframes for each permit. The Permit Packets available through the Renewable Energy Permitting Wizard provide details and relevant information for each individual county, state, and federal permit. The tool allows developers to understand early in the planning phase not only the expected timeframe for acquiring permits, but also how altering the design or location of the project could change which permits are needed.

Key Takeaways

The Renewable Energy Permitting Wizard helps utilities, developers, and policymakers meet Hawai‘i’s renewable energy goals by simplifying and expediting review. The tool helps those proposing renewable energy projects understand the county, state, and federal permits that may be required for their individual project and works for projects ranging in size from residential solar installations to large utility-scale facilities. The Permitting Wizard also provided information on the processing of more than 160 federal, state, and county permits, and links to the various agencies and other resources needed to satisfy permitting requirements.

Such insights can also be used by permitting agencies and other organizations pursuing the difficult task of improving the permitting process for renewable energy projects in Hawai‘i and elsewhere.

Worksheet: Project Skills Register

Skill	Project Management	Budget	Training	Technical Writing	Document Management	Project Coordination	Vendor Selection
Team Member Name	Proficiency: Interest:	Proficiency: Interest:	Proficiency: Interest:	Proficiency: Interest:	Proficiency: Interest:	Proficiency: Interest:	Proficiency: Interest:

Information Resources for Phase 6

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

Post Implementation Survey (Pennsylvania 2008). This is a real-world project closeout survey for project team members.

Project Closeout: Guidance for Final Evaluation of Building America Communities (National Renewable Energy Laboratory 2008). This evaluation demonstrates a real-world example of a comprehensive closeout review of a large project.

Project Closeout Template (U.S. Centers for Disease Control and Prevention 2006). This template provides a useful foundation for an energy project closeout form.

The **Cornell Project Management Methodology website** (*http://www2.cit.cornell.edu/computer/robohelp/cpmm/CPMM_Guidebook.htm*) hosts a variety of project management templates, including a project closeout checklist.