

Federal Environmental Symposium

Your Agency's First Solar Project Panel Project Implementation Phases & Best Practices

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Presenters



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Presentation Overview

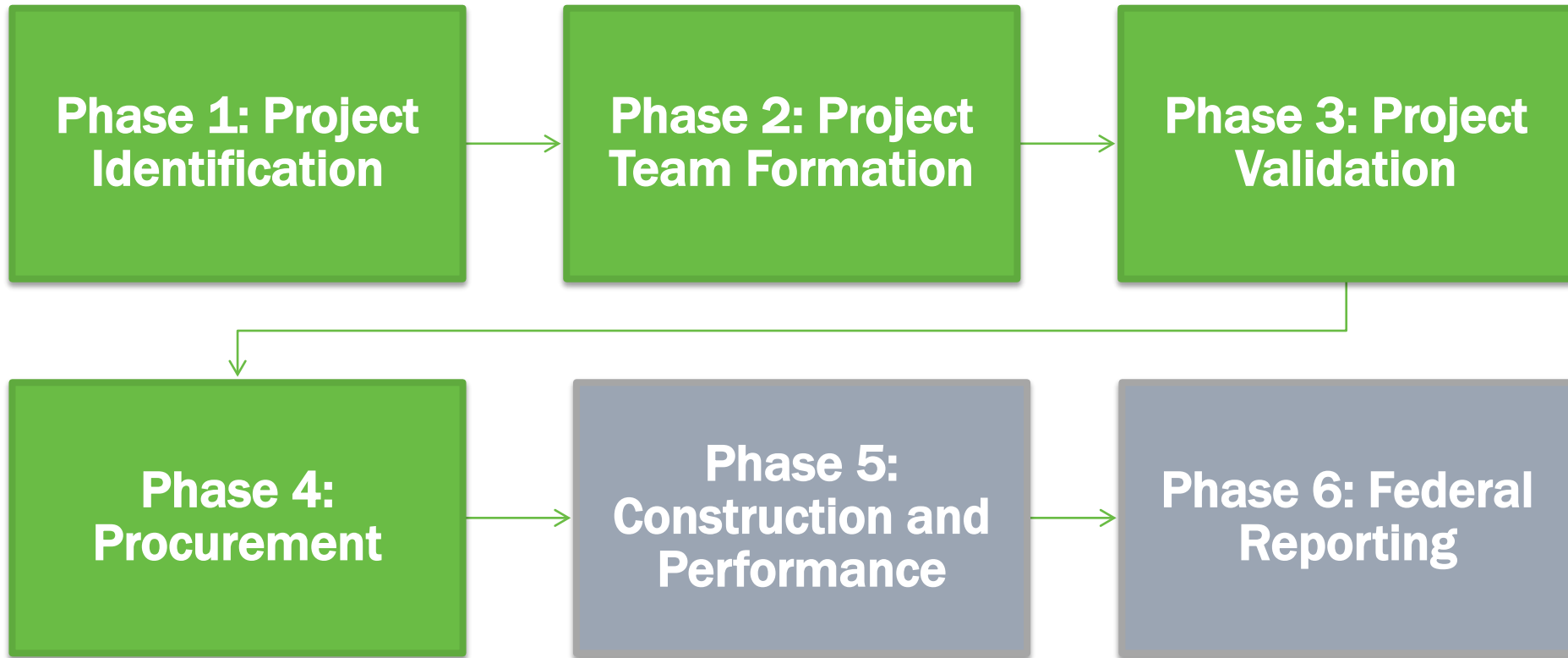
- Photovoltaic Basics
- Project Implementation Phases and Best Practices
 - Phase 1: Project Identification
 - Phase 2: Project Team Formation
 - Phase 3: Project Validation
 - Phase 4: Procurement
 - Phase 5: Construction and Performance
 - Phase 6: Federal Reporting
- FEMP Resources

Solar Photovoltaics (PV)



- PV panels convert sunlight into electricity
- Declining costs have made PV cost-competitive in the US and globally
- There are no moving parts, no fuel costs, and the electricity generated is renewable

Project Implementation Process



Phases may be executed concurrently

Phase 1: Project Identification

1. Define goals of the PV screening analysis

- Purpose of the project
- Project ownership

2. Collect and review project screening data

- Start with readily available data
- Obtain more detailed data if project appears feasible

3. Conduct a PV screening

- Adjust data and analysis goals if needed
- Run additional iterations to refine analysis



Iterative
process

4. Select sites for in-depth assessment

- Techno-economic potential
- On-site project champion
- Agency mission compatibility

Purpose of Initial Screening

The purpose of a PV screening is to quickly and efficiently downselect to viable sites to reduce potential costly investments of time and money in unlikely projects

What a PV screening provides...

- Initial go/no-go decisions
- Initial indicator of technical and economic viability

...and what it doesn't

- Final answers or results
- Investment grade audit results

Step 1. Define Goals of Analysis

Examples of analysis goals and considerations

Purpose of the project

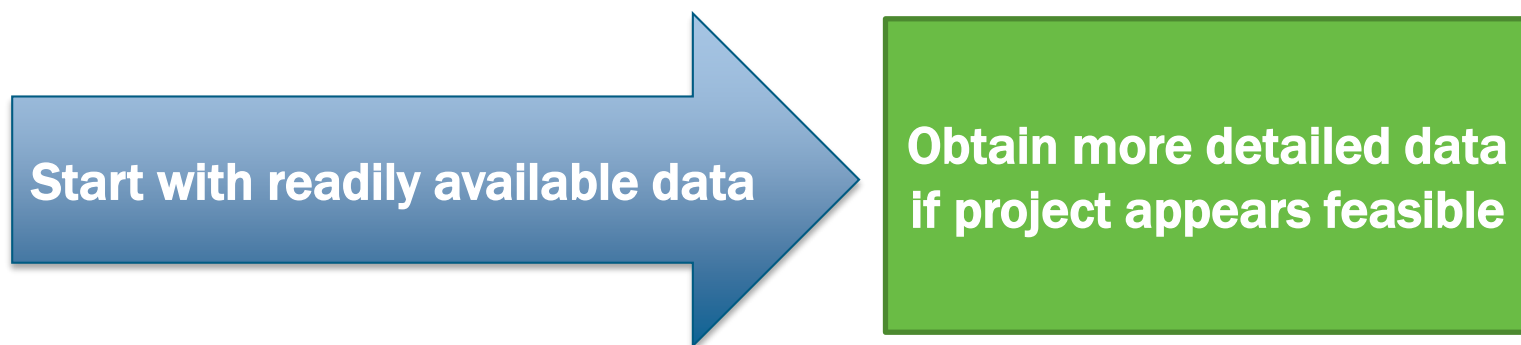
- Minimize life cycle cost of energy
- Increase resiliency at site
- Achieve net zero

Project ownership

- Direct funded
- Alternative financing

Step 2. Collect and Review Data

Data	Purpose
Site Location	Resource data
Electric loads	Sizing the system
Utility cost & rate structure	Cost to beat for the PV
Space available for PV	Sizing the system
Technology cost & energy generation	Cost & of energy produced from PV
Incentives	Lowers cost of PV project

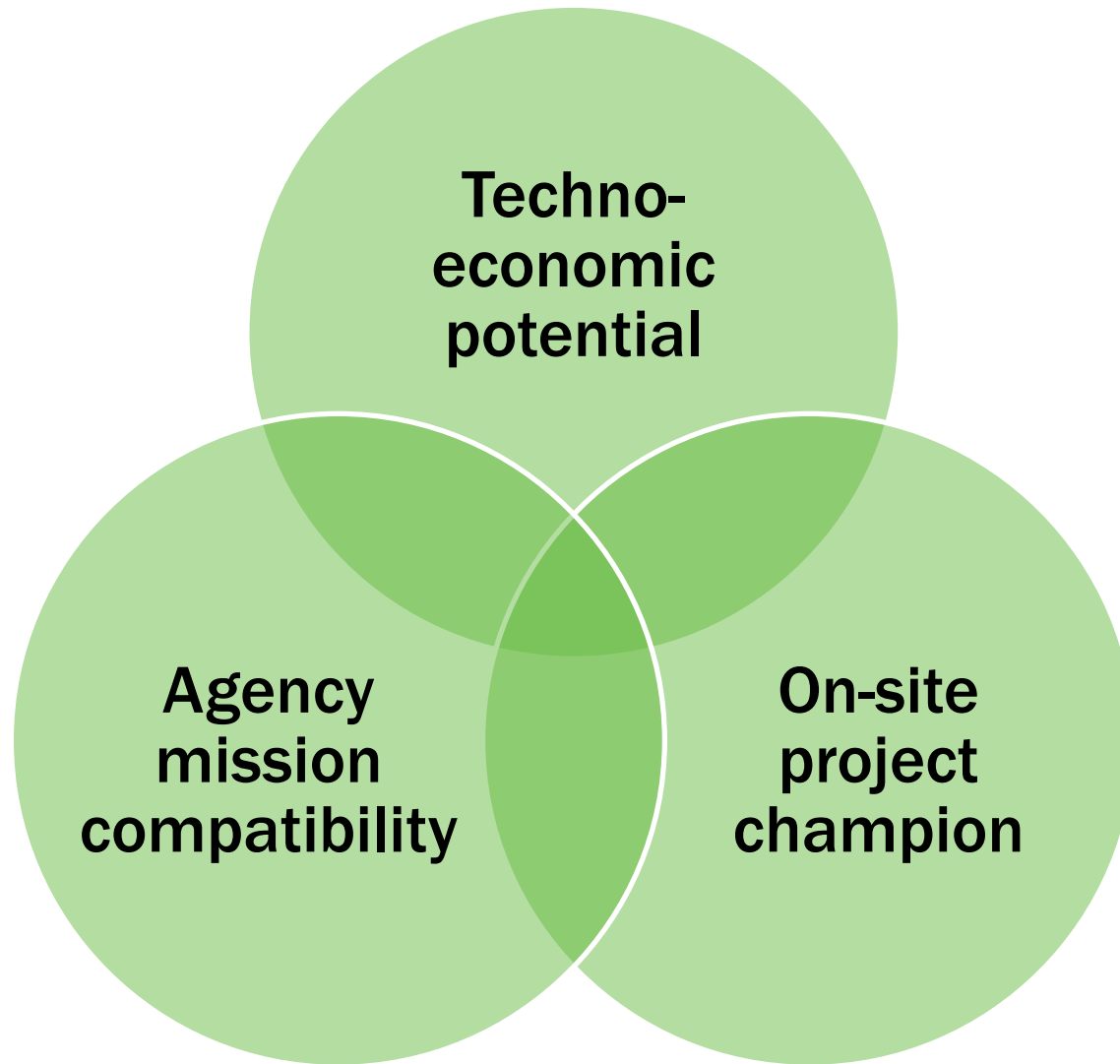


Step 3. Conduct a PV Screening

- PV modeling tools account for the many factors that impact project potential
- Publicly available tools can be used to gauge initial potential, optimize system sizing, and refine project economics

	Expertise and Effort Needed	Required Inputs	Key Outputs
FEMP DG Screening Tool	Low	<ul style="list-style-type: none">• Location	<ul style="list-style-type: none">• Map interface with geospatial layers• High-level economics
PVWatts Calculator	Low	<ul style="list-style-type: none">• Location• System configuration	<ul style="list-style-type: none">• PV energy generation (no economics)
REopt Lite Web Tool	Medium	<ul style="list-style-type: none">• Location• Energy Consumption• Rate tariff	<ul style="list-style-type: none">• Optimized system size and dispatch• High-level economics
System Advisor Model (SAM)	High	<ul style="list-style-type: none">• Energy Consumption• Rate tariff• Detailed system configuration• Financing inputs	<ul style="list-style-type: none">• Detailed technology performance• Detailed economic modeling

Step 4. Selecting Sites for In-Depth Assessment



PV Screening Considerations



Resource



**Technology
Costs &
Incentives**



**Utility Cost &
Consumption**

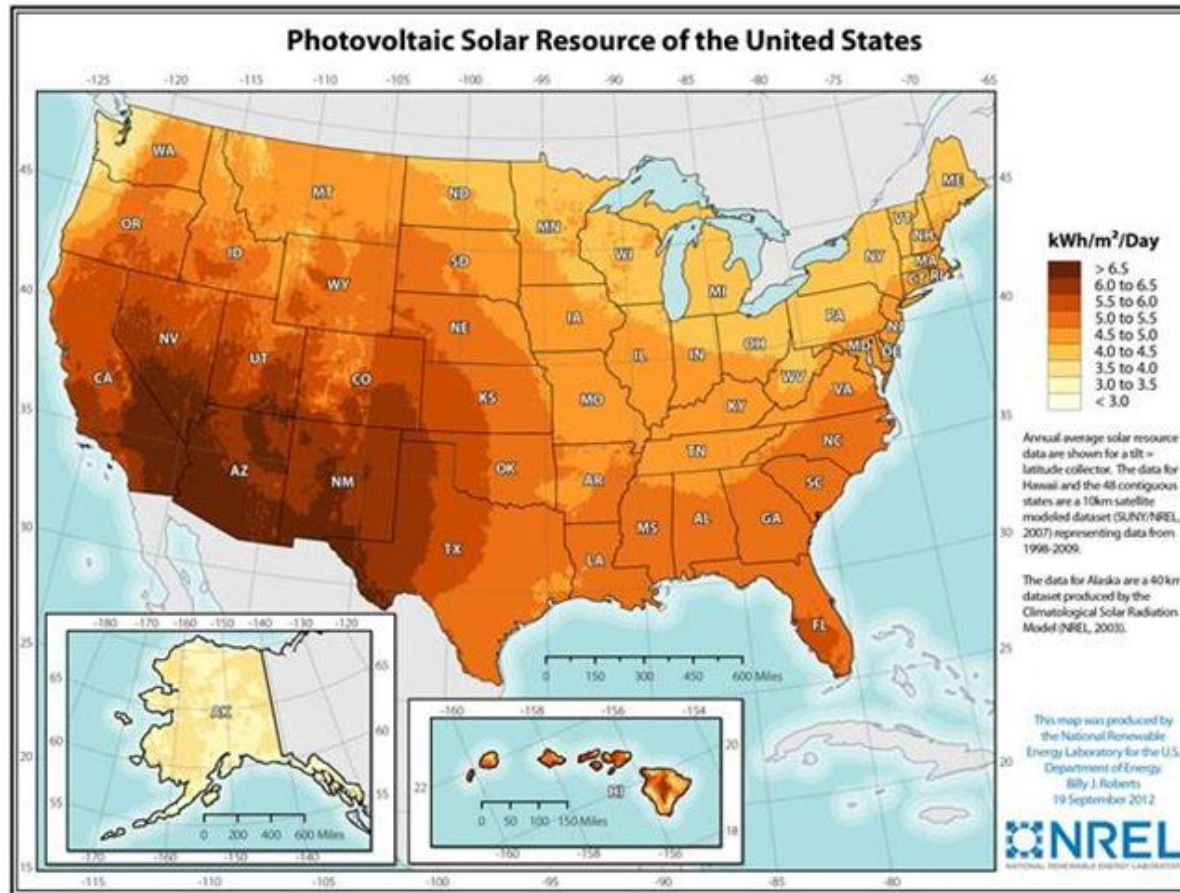


**Space
Available**



**Financial
Parameters**

PV Resource



Solar resource across the continental U.S.
only varies by a factor of 2

PV Costs

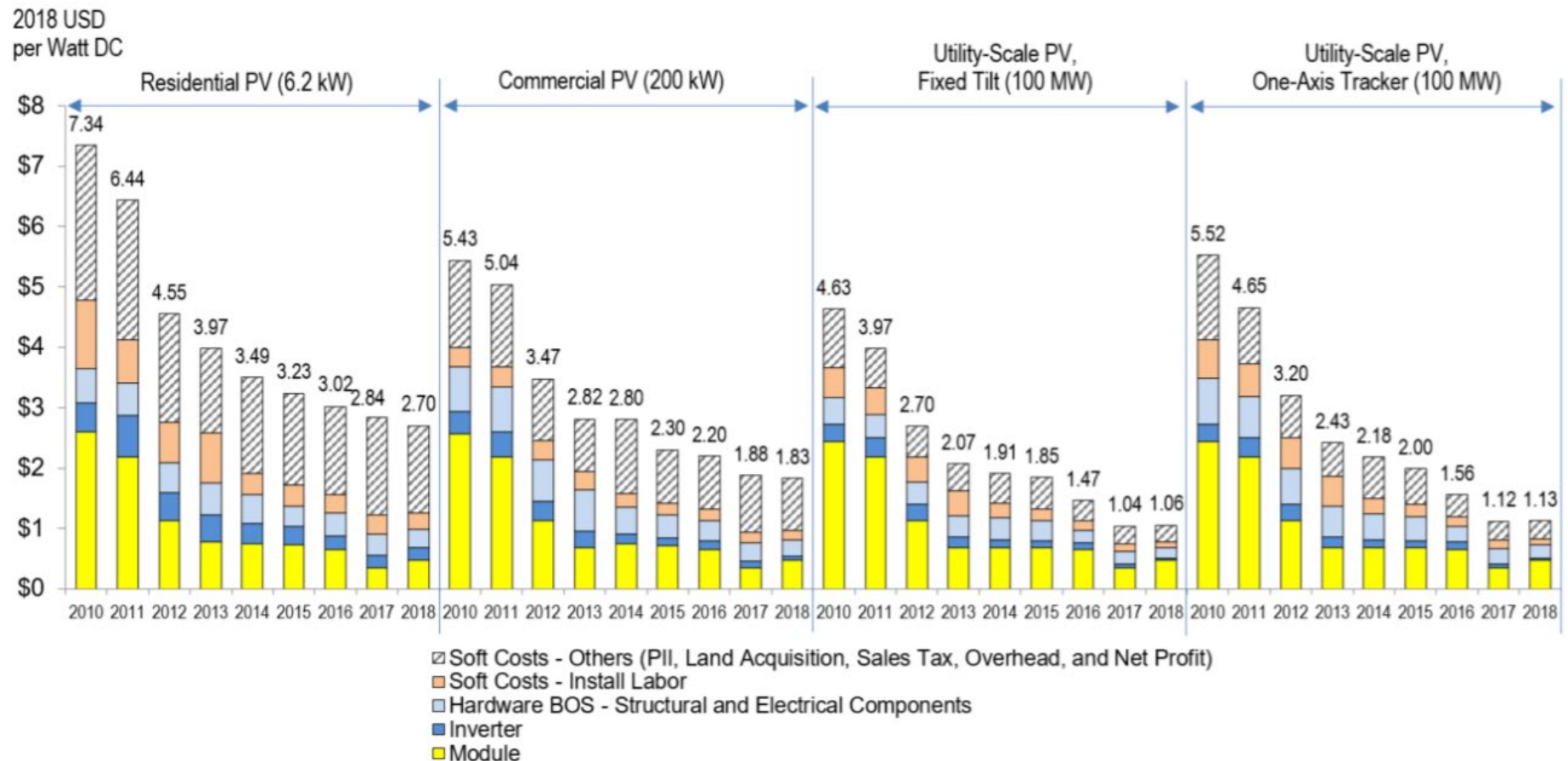
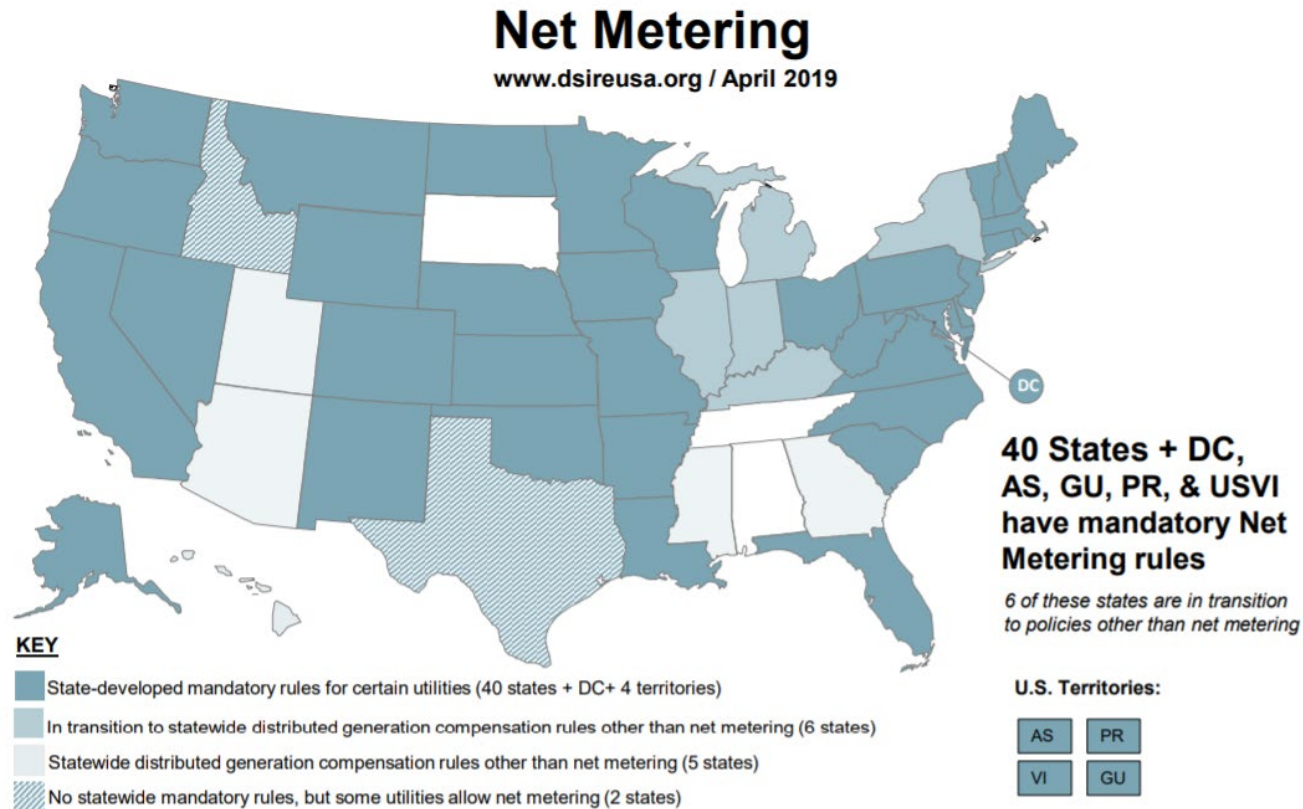


Figure ES-1. NREL PV system cost benchmark summary (inflation adjusted), 2010–2018

PV cost trend by application
<https://www.nrel.gov/docs/fy19osti/72399.pdf>

Incentives

Incentive Type	How they work	Unit
Capacity	Based on the total installed size of the system	\$/kW
Production	Based on electricity production	\$/kWh
Net metering	Credit if generation exceeds load	kW



PV Investment Tax Credit (ITC)

- For developers (federal agencies not eligible)
- Declines from 30% to 10% by 2022
- ITC amount is based on the “commence-construction” year. See table below and [IRS Notice](#)*
- [FEMP fact sheet available](#)

Solar Investment Tax Credit Deadlines

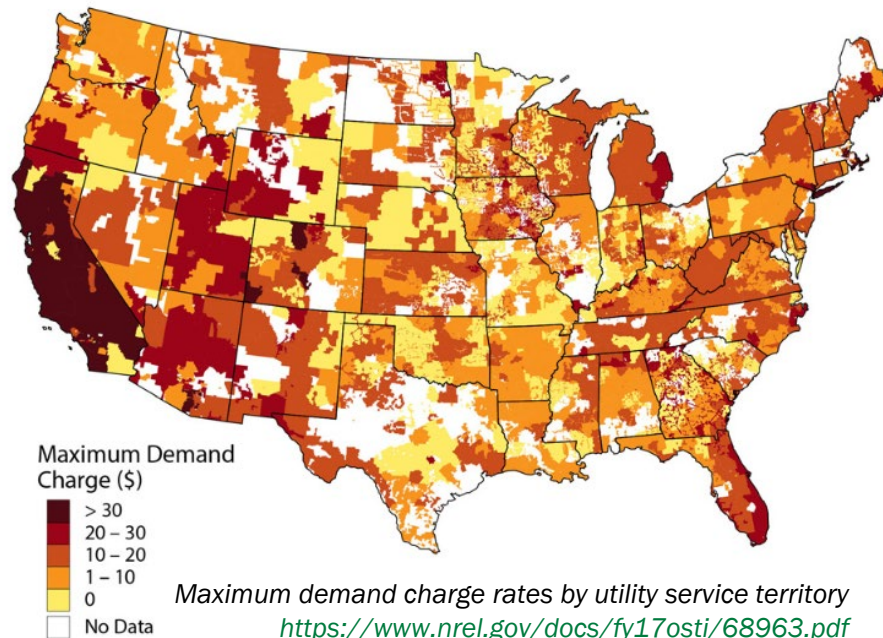
Year of Commence Construction	Deadline for Placement in Service	ITC Amount
2019	End of 2023	30%
2020		26%
2021		22%
2022 onward	2022 onward	10%



*The third-party project owner should seek tax advisor advice when applying this IRS Notice

Utility Cost and Structure

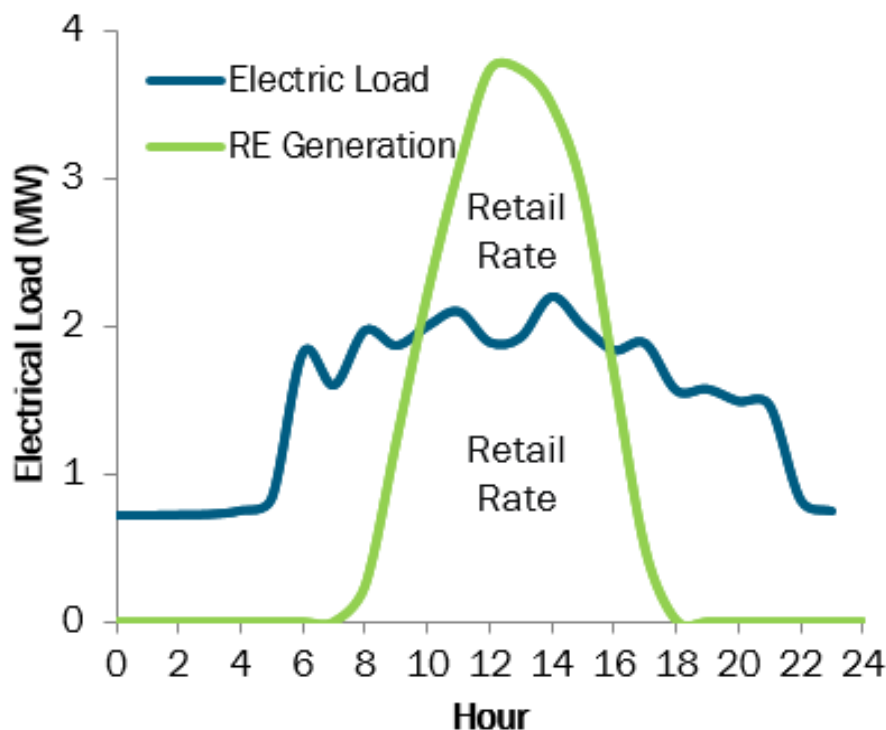
Bill component	How it's billed	How PV can help
Energy Charges	Amount of kWh consumed (can vary by time of day)	PV can reduce the kWh purchased
Demand Charges	Based on highest demand (kW) of the month	PV can reduce the kW if production coincides with monthly peak, but this is not guaranteed
Fixed Charges	Fixed cost per month	PV cannot offset these



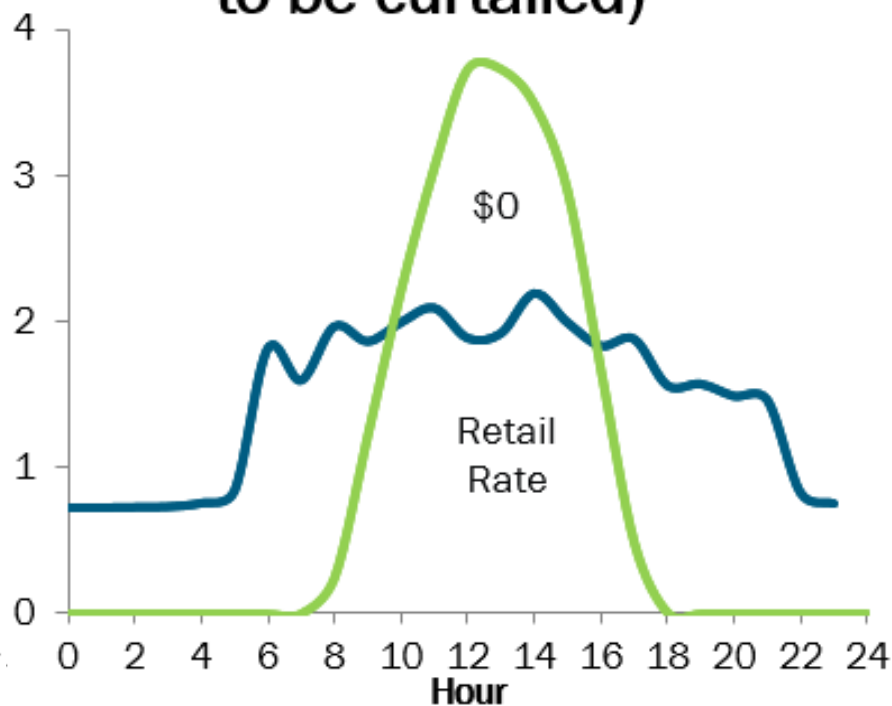
Utility Cost and Consumption

What is your site load compared to the estimated PV generation?

Net metering



No Credit (may need to be curtailed)



Space Available for PV



Potential Carport PV Area

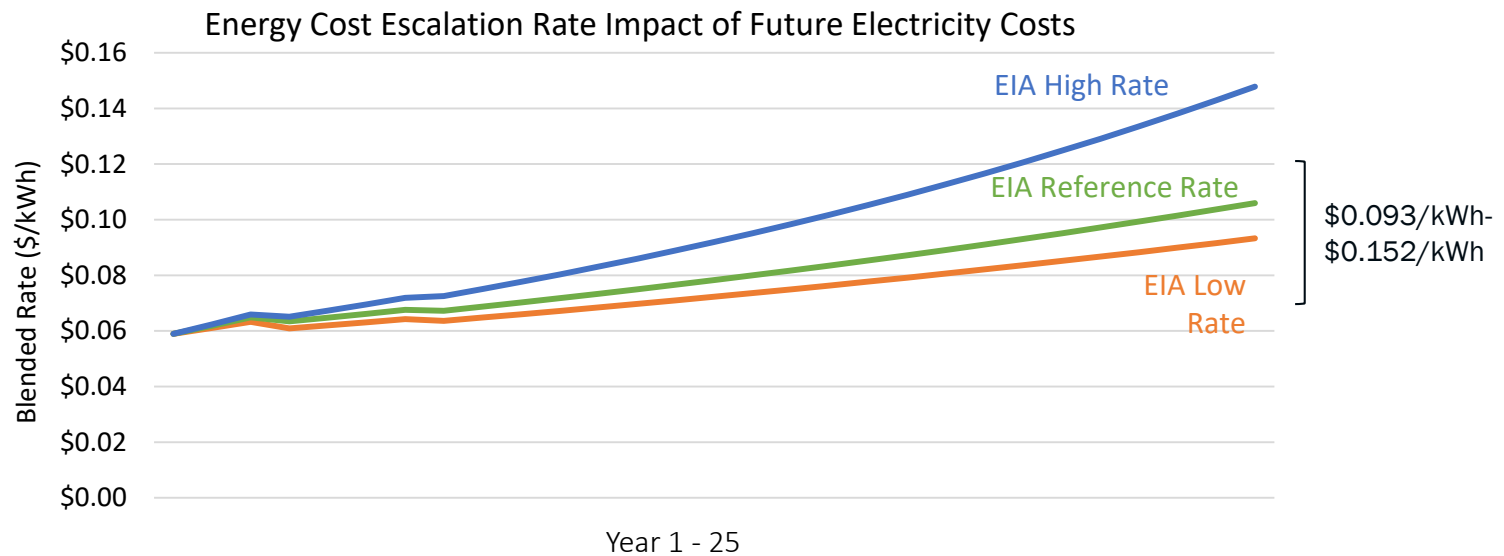
Potential Roof PV Area

Potential Ground PV Area

- **Where you install the PV system impacts:**
 - Packing density
 - System cost
 - The tilt and orientation
 - The viewshed of your site
- **Typical packing density:**
 - Ground: 5 acres/MW
 - Roof/carport: 10 Wdc/ft²

Financial Parameters

Parameter	Description	Impacts on PV
Inflation Rate	General expected inflation rate	Future O&M costs
Utility Cost Escalation Rate	How electricity costs are expected to change	Costs that PV is offsetting



Building Life Cycle Cost: <https://www.energy.gov/eere/femp/building-life-cycle-cost-programs>

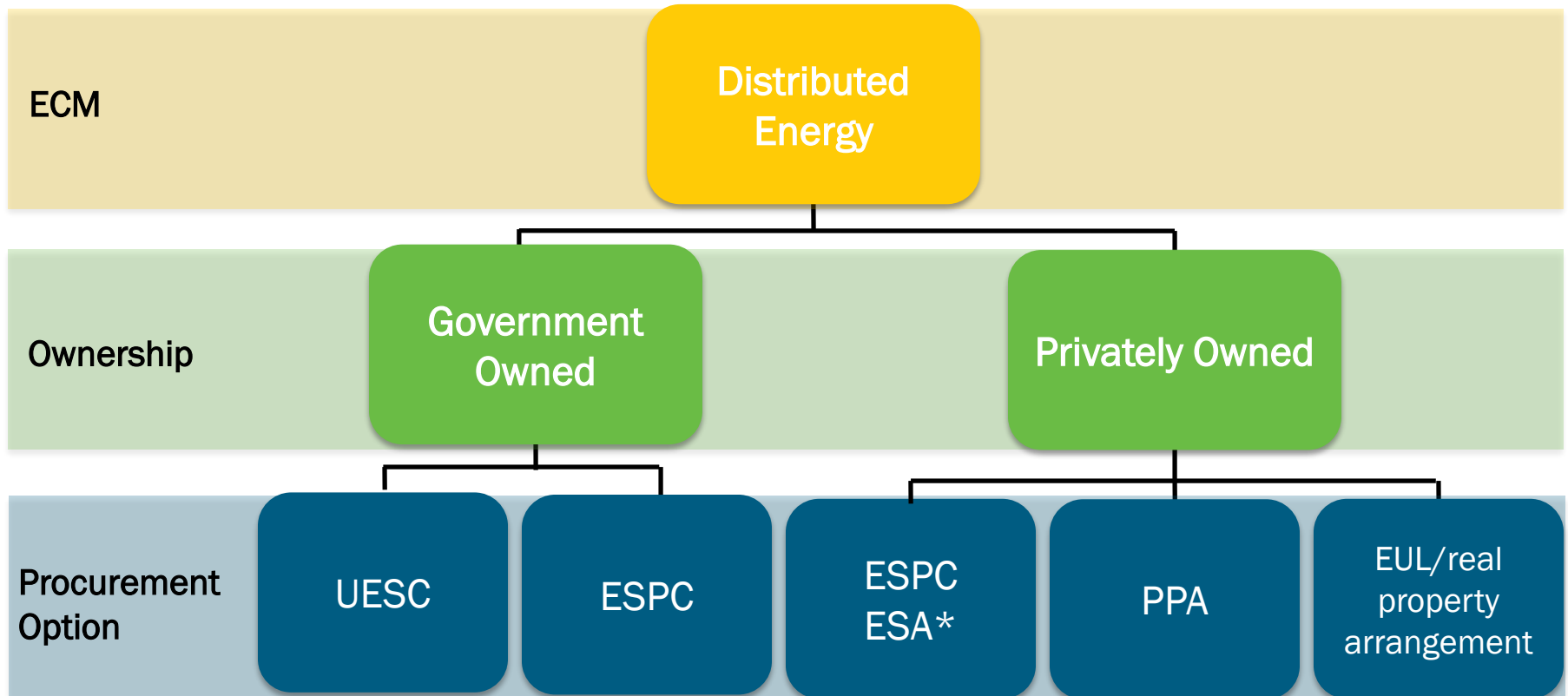
PHASE 2: Project Team Formation

- **Step 1:** Engage an Energy Champion and Contracting Officer
- **Step 2:** Include Pertinent Personnel and Others Affected by the Project
- **Step 3:** Engage External Experts and Stakeholders
- **Step 4:** Develop a Project Team Plan and Scope

PHASE 3: Project Validation

- **Step 1:** Refine Initial Screening Results through Feasibility Studies
- **Step 2:** Identify and Resolve Project Barriers
- **Step 3:** Select a Procurement Option

DE Project Procurement Options



Legend & Abbreviations

ECM	Energy Conservation Measure	ESPC ESA	ESPC Energy Sales Agreement
UESC	Utility Energy Service Contract	PPA	Power Purchase Agreement
ESPC	Energy Savings Performance Contract	EUL	Enhanced Use Lease

*System is privately owned initially, government must retain title by end of the contract (OMB Memo requirement)

PV Project Considerations/Potential Barriers



Legality of Third-Party
Electricity Sales



Land, Building, &
Electrical



Project Goals



Project Acceptance



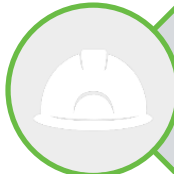
Economic Viability



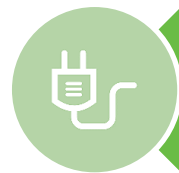
Cybersecurity



Agency Mission
& Approval
Requirements



Construction



Utility Coordination



Operation &
Maintenance

*Not a comprehensive list.

PHASE 3: Project Validation

- Other considerations may apply depending upon the agency and project
- Conduct an initial investigation of each topic
- Some activities, such as National Environmental Policy Act (NEPA) and interconnection, may also be addressed during other phases

PHASE 3: Project Validation

- **Legality of Third-Party Electricity Sales**
 - Are third party electricity sales allowed in your state and utility service territory?
 - Check the [Database of State Incentives for Renewables and Efficiency \(DSIRE\) website](#) and discuss with your utility
- **Project Goals**
 - What are key project goals (resilience, cost savings, other)?
- **Economic Viability**
 - What is the serving utility's cost and rate structure?
 - What are potential incentives that can be applied to your project?
 - What is the site load compared to the estimated PV generation?

PHASE 3: Project Validation

- **Agency Mission & Approval Requirements**
 - Does your project support or potentially conflict with agency's mission?
 - What are your agency's approval requirements?
 - Who owns the land/buildings, and who pays the utility bill?
- **Utility Coordination (*early and often!*)**
 - What are the serving utility's interconnection requirements and process?
 - Who signs the interconnection agreement (early review by agency legal and/or contracting officer)?
 - What incentives, cost impacts, and policies (such as net metering) apply?

PHASE 3: Project Validation

- **Land, Building, & Electrical**

- What type and size of PV system is best suited to your site, based on available space and shading constraints?
- What are the electrical considerations?
- What are the NEPA and other applicable requirements (such as the National Historic Preservation Act)?
- How will site access be granted (separate site access agreement or terms and conditions in the main contract)?
 - License, easement, lease, [FAR 52.241-5 Contractor's Facilities](#), other

- **Project Acceptance**

- How can you ensure that your project is designed and installed as intended?
- What are system acceptance testing requirements?
- What are the utility requirements?

PHASE 4: Procurement

- **Step 1:** Develop an Acquisition Plan
- **Step 2:** Complete All Solicitation Documents
- **Step 3:** Award a Contract

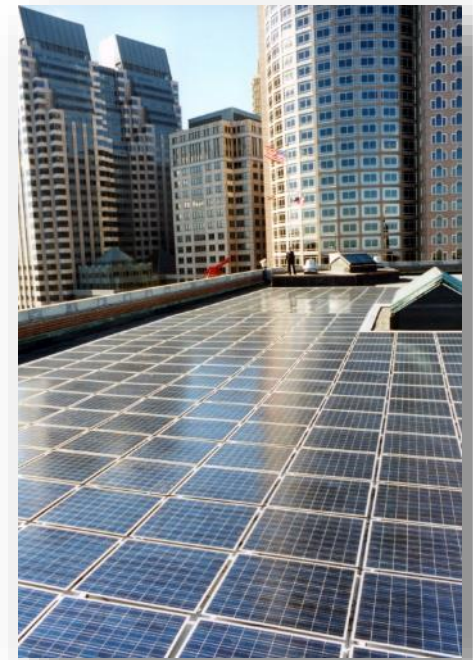
PHASE 4: Acquisition Plan and Small Business

Develop an Acquisition Plan

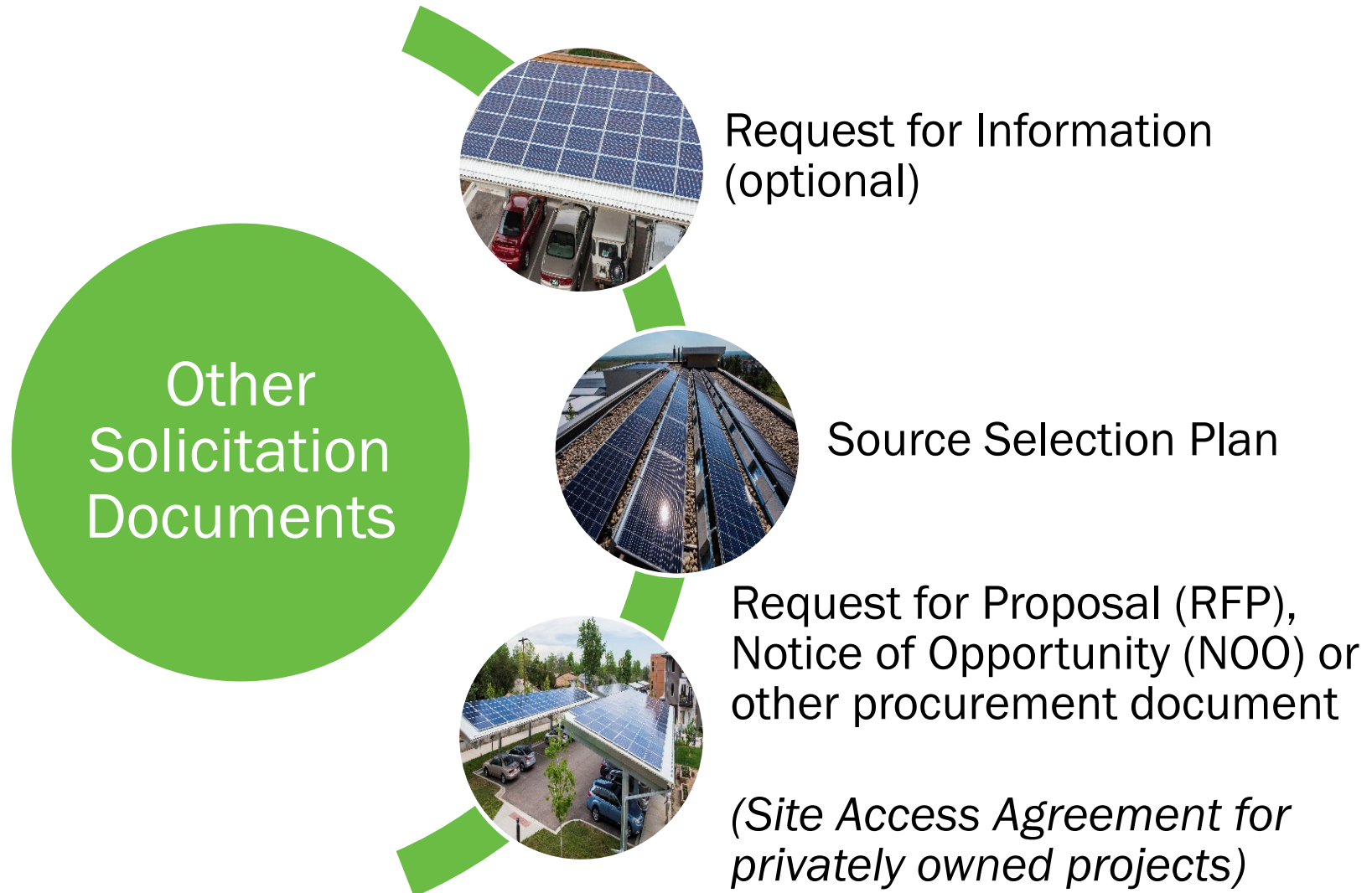
- How acquisition will be planned, executed and managed
- Identifies milestones
- Work with Contracting Officer to develop

Small Business Utilization

- Comply with agency small business policies
- May require a Sources Sought and/or other market research



PHASE 4: Other Solicitation Documents



Best Practices in Solicitation Development

Best Practices

Start with templates/examples (FEMP or other)

Involve legal and contracting early on for high-level decisions

Engage contracting officer as much as possible

Engage agency experts as needed

Solicit input from team members on evaluation criteria

Working meetings for real-time document editing

Document sharing and version control plan



Procurement Document Contractual Issues

- **Cancellation ceiling/termination liability**
- **Buy American Act/Trade Agreements Act**
 - These requirements will apply to all components of the PV project
 - Ensure that all subcontractors are aware of these requirements
- **Davis Bacon Act/McNamara-O'Hara Service Contract Act**
- **FAR clause selection**
- **Evaluation criteria**
- **Other**

FEMP Resources



FEMP DE Program Resources

- [Distributed Energy](#)
- [ESPC ESA website](#)
- [ESPC ESA Toolkit](#) (for site-specific stand-alone contract vehicle, including editable templates to download)
- [“Procurement Specifications Templates for Onsite Solar Photovoltaic: For Use in Developing Federal Solicitations”](#)

Distributed Energy Implementation Process

Explore FEMP's six-phase process for implementing distributed energy projects.



[Learn More](#)

ESPC ESAs

Learn about this project structure, which uses the multiyear ESPC authority to implement distributed energy projects.



[Learn More](#)

Project Assistance

Request technical assistance from FEMP for a federal distributed energy project.



[Learn More](#)

Resources

Explore FEMP's resources to help plan and implement distributed energy projects.



Distributed Energy Procurement Options

Learn about federal government procurement options for distributed energy projects.



[Learn More](#)

Technologies

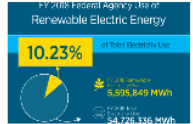
Explore distributed energy technologies that provide energy efficiency opportunities for use in federal applications.



[Learn More](#)

Agency Renewable Electricity Use

Find out how federal agencies are progressing toward meeting goals.



[Learn More](#)

Case Studies

Browse case studies of successful distributed energy projects.



ESPC ESA Webinar #5

*Join our next ESPC ESA Webinar on December 10:
DOE IDIQ ESPC with an ESA*

- Will provide instructions and resources for financing ESAs through the DOE IDIQ ESPC contract vehicle
- Topics to be covered include:
 - Overview of DOE IDIQ contract vehicle
 - ESA specific considerations for IDIQ ESPCs
 - Case studies

Register on the WBDG website:

<https://www.wbdg.org/continuing-education/femp-courses/femplw12102019>



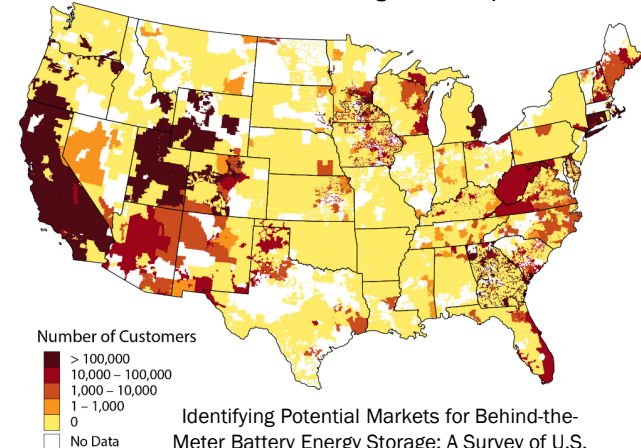
Future Offering - Utility Rate Analysis Assistance

Express interest now in future utility rate analysis support by contacting Tracy Niro at: tracy.niro@ee.doe.gov.

- Utility rate options are becoming increasingly more complex
- Understanding your rate options can help lower utility costs
- Federal agencies may want to review their electricity rate for several reasons:
 - Your site may qualify for multiple rates—which is optimal?
 - You're forecasting increased or decreased load at your site—which rate is optimal?
 - You're considering an energy project at your site—how will it impact your utility costs?



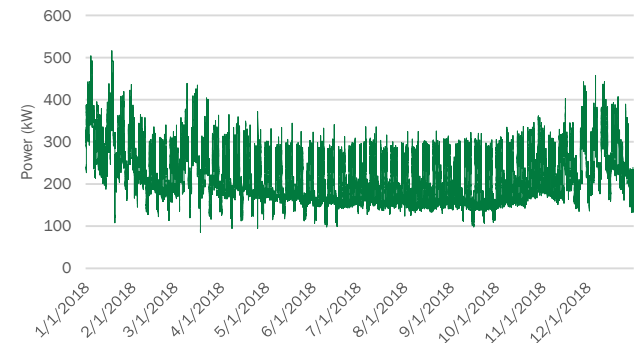
Number of commercial customers who can subscribe to tariffs with demand charges over \$15/kW



Identifying Potential Markets for Behind-the-Meter Battery Energy Storage: A Survey of U.S. Demand Charges

<https://www.nrel.gov/docs/fy17osti/68963.pdf>

2018 Load Data - Office Building



Ask for Project Assistance

- Request help with your project today!
- Fill out a quick and easy application through the FEMP portal

Submit a Request
[Here](#)

ENERGY.GOV

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Federal Energy Management Program

[FEMP Assistance Request Portal](#) » FEMP Technical Assistance for Distributed Energy Projects

FEMP Technical Assistance for Distributed Energy Projects

To request technical assistance for federal distributed energy projects, fill out the fields in the three form categories below. A FEMP project specialist will review your request and contact you shortly. [Contact FEMP](#) with questions.

* Required

+ Contact Information

Project Information

Project Name *

Project Location *

Project Description and Status *

Briefly describe the project you are pursuing and the current status of it.

Project Champion and Team Members

FEMP Distributed Energy Procurement Contacts



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Disclaimer

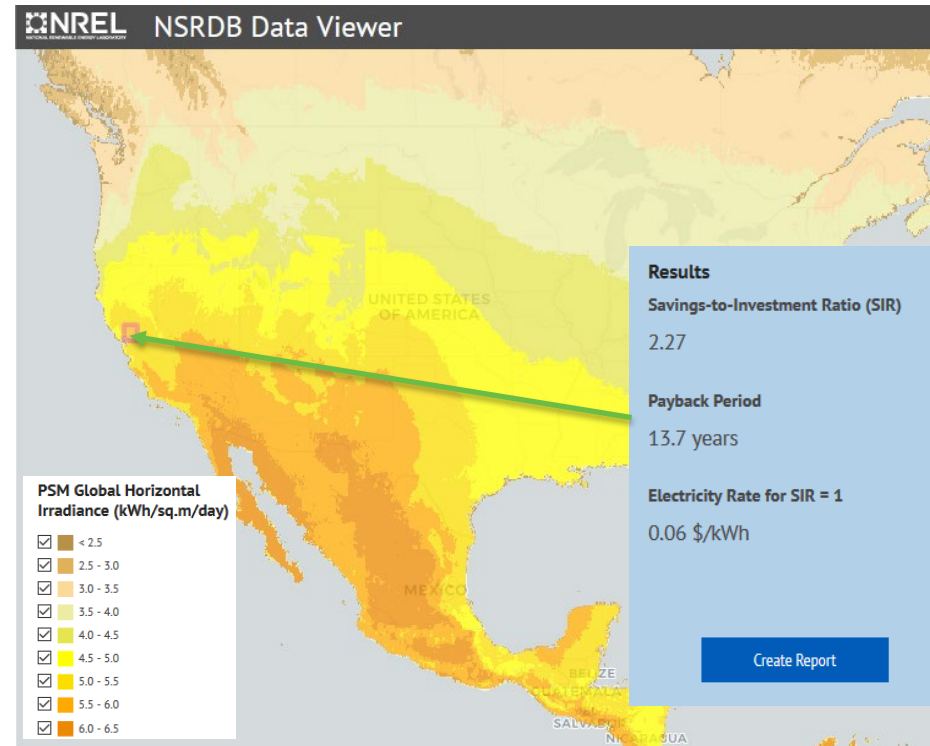
This work was authored in part by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08G028308. Funding was provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy's Federal Energy Management Program. The views expressed in the presentation do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the presentation for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

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Backup Slides

FEMP DG Screening Tool

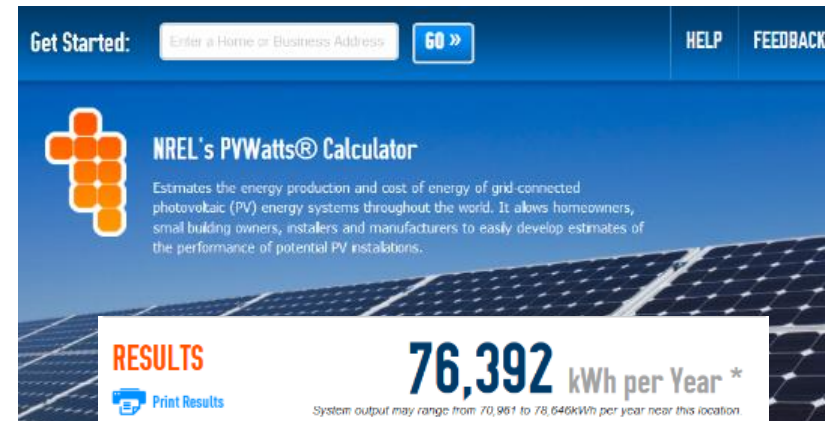
- Leverages interactive resource maps and data layers for simple user experience
- Allows user to click anywhere on the map for high-level metrics including:
 - Savings to investment ratio (SIR)
 - Payback period
- Generates summary report for PV, wind solar hot water, solar vent preheat



<https://maps.nrel.gov/femp/>

PVWatts

- PVWatts uses solar resource data and energy production models to estimate energy production from PV systems in a given location
- Users enter their location and PV system size in a simple interface
- Estimates annual and hourly energy production



<http://pvwatts.nrel.gov/>

REopt Lite Web Tool

- REopt Lite offers a no-cost subset of NREL's more comprehensive REopt model
- Evaluates the economics of PV and battery storage at a site
- Optimizes PV and battery system sizes and battery dispatch strategy to minimize life cycle cost of energy
- Sizes PV+storage systems to sustain critical load during grid outages

<https://reopt.nrel.gov/tool>



Step 1: Select Your Technology

Do you want to evaluate PV, battery, or both?



Step 2: Enter Your Data

Enter information about your site and adjust the default values as needed to see your results.

Site and Utility (required)

* **Site location** ⓘ Homer, AK, United States

* **Load profile** ⓘ ☒ Simulated
☐ Custom Load Profile

* **Type of building** ⓘ Retail Store

* **Annual energy consumption (kWh)** ⓘ 116800

* **Electricity rate** ⓘ Homer Electric Assn Inc: Industrial
[URDB Rate Details](#)

[Show more inputs](#) [Reset to default values](#)

Financial ⓘ

PV ⓘ

Battery ⓘ

Resilience ⓘ

Get Results ⓘ

System Advisor Model (SAM)

- Platform combines detailed performance and financial models to estimate cost of energy
- Energy Performance:
 - Photovoltaics, detailed & PVWatts
 - Battery storage
 - Wind
 - Geothermal
 - Biomass
 - Solar water heating
- Financials
 - Behind-the-meter (residential & commercial)
 - Power purchase agreements (single owner & equity flips)
 - Simple LCOE calculator

<http://sam.nrel.gov/download>

