Solar-Plus-Storage Program Design: Frameworks and Examples

Developed for the Columbia River Inter-Tribal Fish Commission (CRITFC)

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Notice

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Communities LEAP Pilot Technical Assistance

The Communities Local Energy Action Program (LEAP) pilot competitive technical assistance opportunity aims to facilitate sustained, community-wide economic empowerment through clean energy, improve local environmental conditions, and open the way for other benefits primarily through the U.S. Department of Energy's clean energy deployment work.

This opportunity was open to low-income, energy-burdened communities that are also experiencing either direct environmental justice impacts or direct economic impacts from a shift away from historical reliance on fossil fuels.

CRITFC Communities LEAP Background

The Columbia River Treaty Tribes in the Pacific Northwest—the Nez Perce, Umatilla, Warm Springs, and Yakama—hold treaty-reserved fishing rights for the Columbia River, the largest river in North America flowing into the Pacific Ocean. The Columbia River was once one of the most productive salmon rivers in the world, and a critical resource to Tribes in the region. However, the Tribes have expressed that current operating regimes of hydropower dams throughout the Columbia River Basin do not fully account for Tribal fishing rights and have negatively impacted fish populations.

The four Tribes, through the Columbia River Inter-Tribal Fish Commission (CRITFC), prepared a vision for a more harmonized energy and water system in their 2022 Energy Vision for the Columbia River Basin. In it, the four Tribes envision a future where the Columbia Basin electric power system supports healthy and harvestable fish and wildlife populations, protects Tribal treaty and cultural resources, and provides clean, reliable, and affordable electricity.

To help realize the Energy Vision, CRITFC received technical assistance from the National Renewable Energy Laboratory (NREL) through the Communities Local Energy Action Program (LEAP) pilot with the goal of ensuring that the Tribes are fully informed and prepared to integrate their interests into regional power system planning.

Purpose of This Resource

Communities LEAP technical assistance aims to:

- Determine the power system impacts (reliability, costs) of operating Columbia River Basin hydropower generation to minimize impacts on fish populations.
- Determine the impacts of different levels of solar and wind energy deployment on hydropower operations.
- Identify alternative pathways beyond hydropower for providing the flexibility needed to integrate high levels of renewable generation (e.g., demand flexibility and solar and storage).

This resource aims to provide an overview of program and policy design frameworks for behind-the-meter (BTM) energy storage and solar-plus-storage programs and examples from across the United States. This information is intended to build CRITFC's understanding of potential policies and program designs that could support the deployment of solar photovoltaics (PV) and energy storage in the Pacific Northwest.

Acronyms

AMI: area median income

BESS: battery energy storage system

BTM: behind-the-meter

DER: distributed energy resource

DOE: U.S. Department of Energy

DPV: distributed photovoltaic

FERC: Federal Energy Regulatory Commission

FPL: federal poverty level

GHG: greenhouse gas

IRA: Inflation Reduction Act

ISO: independent system operator

ITC: investment tax credit

LMI: low- and moderate-income

NEM: net energy metering

NREL: National Renewable Energy Laboratory

PACE: property assessed clean energy

PPA: power purchase agreement

PV: photovoltaic

RTO: regional transmission organization

WAP: Weatherization Assistance Program

Contents

Background: BTM Solar-Plus-Storage

Distributed Energy Resources

- **Distributed energy resources (DERs)** are resources connected to the distribution system,* and include technologies such as solar PV, wind, energy storage, and diesel generators.
- Energy efficiency, demand response, and electric vehicles are also sometimes considered DERs.
- **Behind-the-meter (BTM)** DERs are customer-sited resources connected on the customer's side of the utility meter.

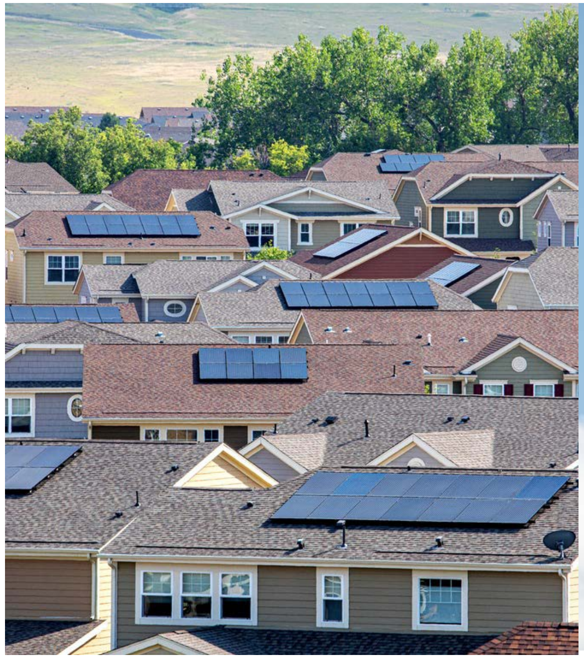


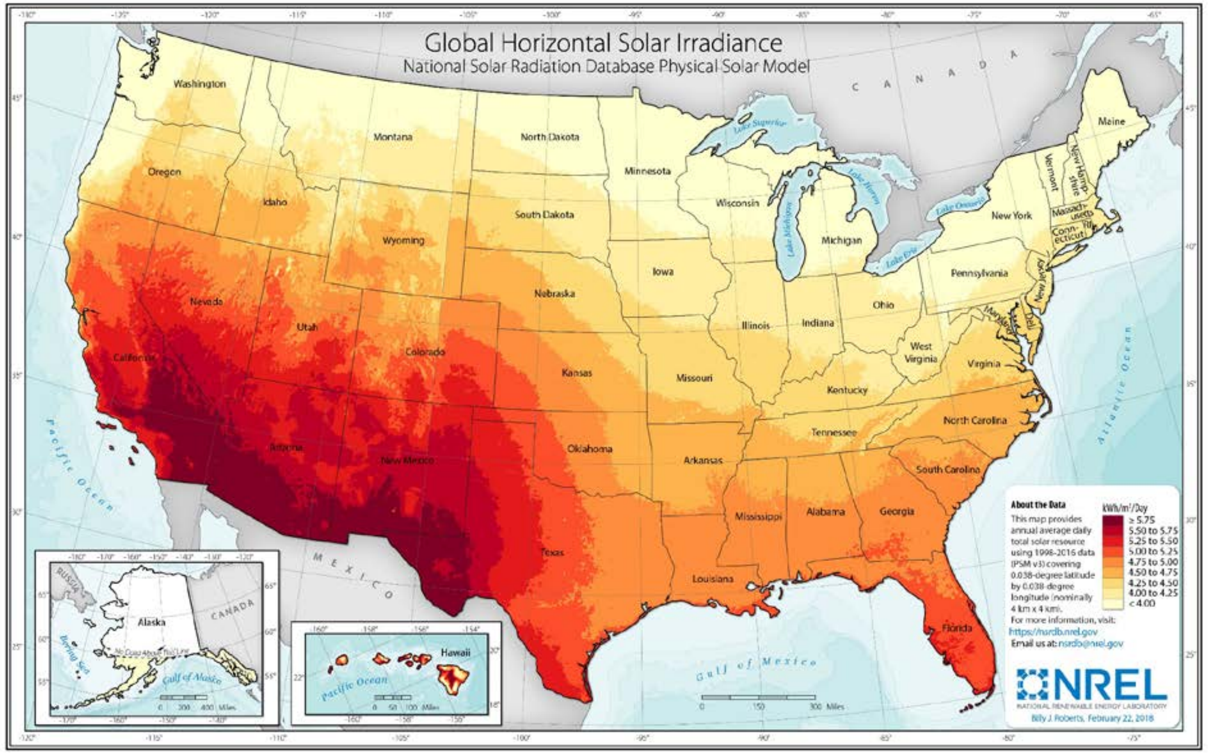
Photo by Werner Slocum, NREL 66338

Photo from Bergey Windpower

*The distribution system is the portion of the grid that delivers energy to end-use customers. The smaller, lower-voltage power lines and transformers in a residential neighborhood are examples of distribution system infrastructure.

Solar Photovoltaic Energy Basics

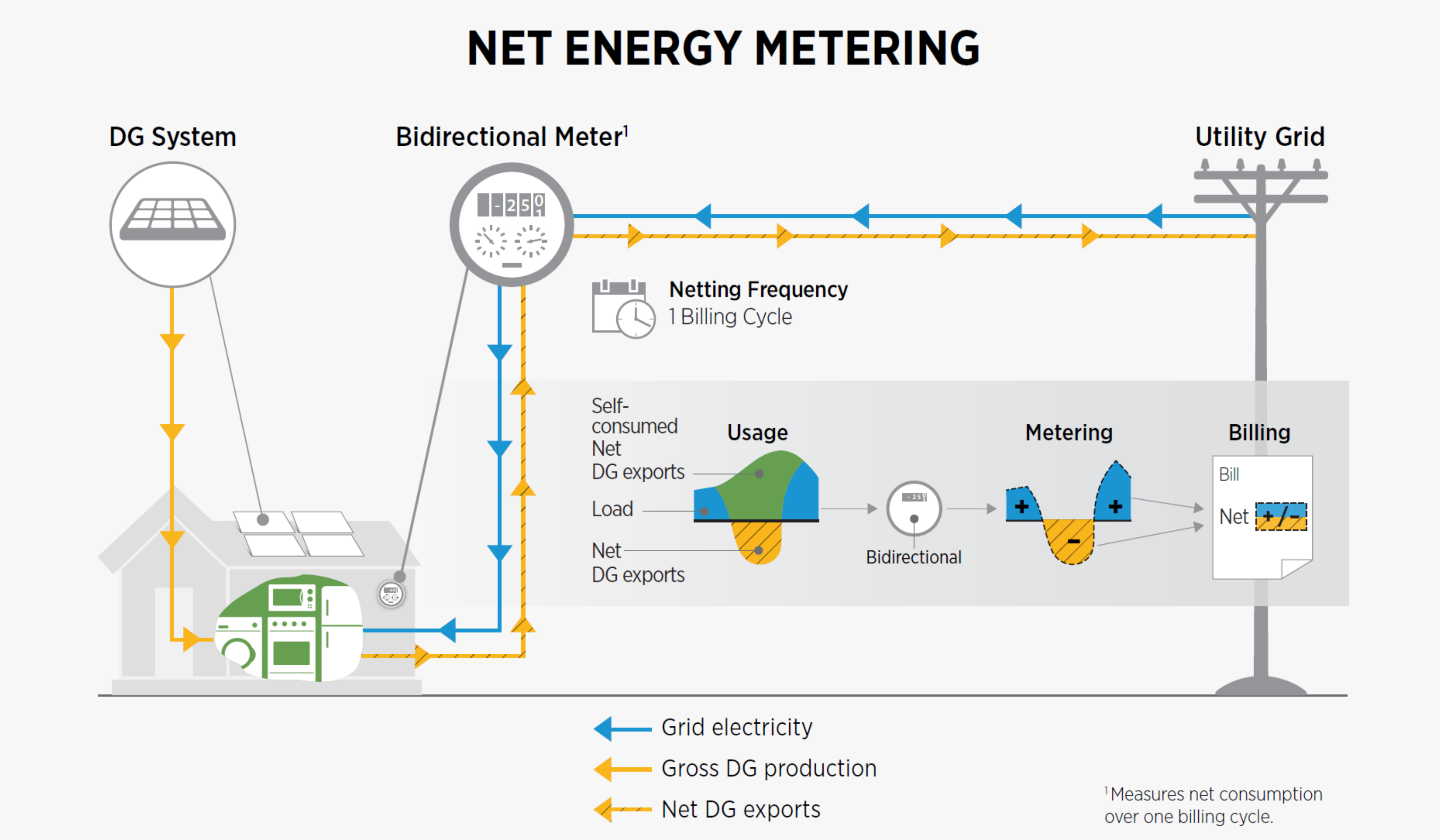
- Converts sunlight directly into electricity.
- **Solar irradiance:** The power from the sun that reaches a surface per area unit.
- Solar photovoltaics (PV) can work even with:
  - Cloud cover
  - Low irradiance *(see lighter yellow on the map).*



(Roberts 2018)

Residential Solar PV Compensation

Net energy metering (also referred to as net metering or NEM) allows solar PV system owners to export excess energy to the utility grid, receiving a credit that offsets consumption.



Net energy metering schematic. Image source: Aznar, et. al. 2017
"DG" = Distributed Generation

Battery Energy Storage Systems

- Battery energy storage systems (BESS) store energy and then supply that energy when needed, or at the most valuable time for the battery's owner.
- BESS can **add resilience and reliability to an energy system**, if designed to do so, by:
    - Providing back-up power during outages.
    - Storing excess renewable energy and supplying it during times of greater need.
    - Providing services to the grid to support reliable operations.

Utility-scale lithium-ion BESS installation. Photo by Dennis Schroeder, NREL 31411

BTM Solar-Plus-Storage

- BTM solar-plus-storage is the pairing of BTM solar PV and energy storage technologies, such as a batteries.
- Solar panels can make energy only when the sun is shining, so the ability to store solar energy for later use helps to keep the balance between electricity generation and demand.

Figure from U.S. Department of Energy, Solar-Plus-Storage 101

- Many solar-energy system owners are looking at ways to connect their system to a battery so they can use that energy at night or in the event of a power outage.
- Solar-plus-storage systems, if designed to do so, can provide backup power ranging from several hours to a half day or more.

Policy Design for BTM Solar-Plus-Storage

Policy Design for Solar-Plus-Storage Distributed Energy Systems

The following section provides summary information from these NREL publications:

An Overview of Behind-the-Meter Solar-Plus-Storage Regulatory Design: Approaches and Case Studies to Inform International Applications (Zinamen, Bowen, and Aznar 2020)

Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States (Cook et al. 2022)

This information is intended to provide background information on key decisions for solar-plus-storage program and policy design to contextualize the program case studies that follow, and to support CRITFC in considering how the recommendations from the 2022 Energy Vision may fit into a broader set of regulatory, policy, and program design considerations.

For more detailed information than can be found in this resource, please reference the publications above.

Overview of Regulatory Design Considerations

Zinaman, Bowen, and Aznar (2020) lay out key regulatory considerations for facilitating DPV-plus-storage program design. While the report groups regulatory issues into distinct topics and a series of steps, in reality, the issues are closely integrated.

The report is intended for both U.S. and international regulators, utilities, and policymakers. However, the report provides a structure that can help other stakeholders understand the key decisions and drivers behind solar-plus-storage program design.

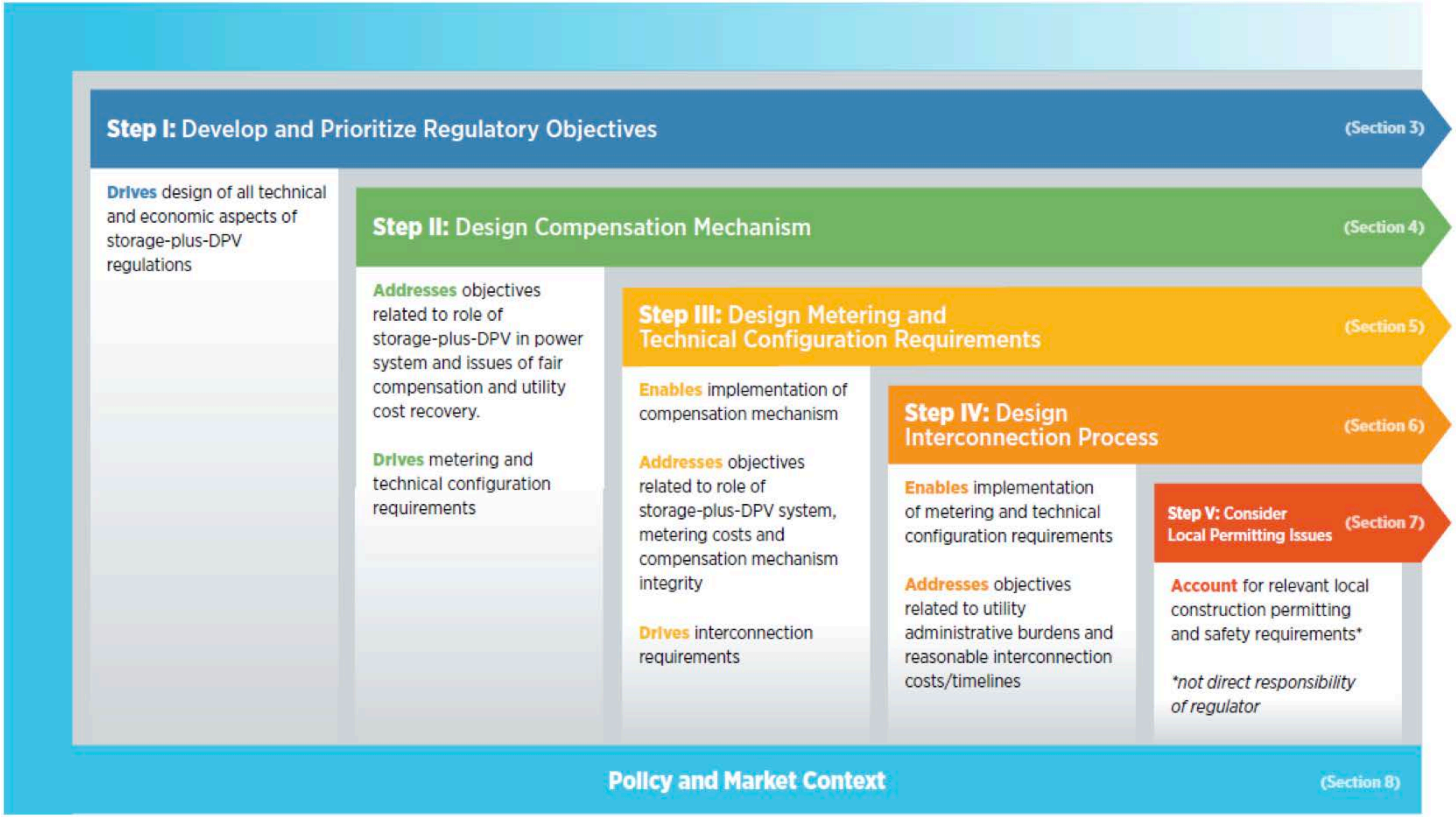


Figure from Zinaman, Bowen, and Aznar (2020)

Developing and Prioritizing Regulatory Objectives

The report presents a set of potential regulatory objectives that may influence design decisions for solar-plus-storage programs. Engaging in dialogue to weigh, balance, and prioritize these objectives can facilitate decision-making.

Approach to DPV-Plus-Storage Market	Desired Role of DPV-Plus-Storage Systems	Fairness and Equity Considerations	Program Administration	Transparency, Monitoring, and Safety
Potential Objectives				
• Constrain DPV-plus-storage deployment. • Enable DPV-plus-storage deployment. • Accelerate DPV-plus-storage deployment.	• Encourage self-consumption for DPV-plus-storage systems. • Utilize DPV-plus-storage to manage system peaks. • Enable full grid interactivity of DPV-plus-storage systems.	• Balance the financial interests of utilities, DPV-plus-storage customers, and nonparticipating customers. • Create fair and reasonable metering and interconnection requirements for customers and utilities. • Preserve the integrity of DPV compensation mechanisms.	• Reduce administrative requirements for utilities. • Avoid new requirements on existing systems.	• Promote real-time intelligence and transparency. • Track clean energy production. • Track users' gross electricity demand.

For more information, see section 3 in Zinamen, Bowen, and Aznar (2020) An Overview of Behind-the-Meter Solar-Plus-Storage Regulatory Design: Approaches and Case Studies to Inform International Applications.

Designing Compensation Mechanisms

- The report highlights three basic elements for compensation mechanisms:
  - **Metering and billing:** Defines how consumption and generation-related electricity flows are measured and credited.
  - **Retail tariff design**: Defines the retail tariff structure and purchase rate the system owner must pay for electricity from the grid.
  - **Sell rate design**: Defines the level of compensation a system owner receives for electricity exported from the system to the grid.
- The design of compensation mechanisms has broad implications for the deployment and operational behavior of DPV-plus-storage systems, customer bills, and utility revenues, and is strongly influenced by market context (e.g., solar penetration levels, grid management issues).
- The report notes that, “Tariff design is the primary tool to align the interests of DPV-plus-storage customers with the broader power system.”
- As CRITFC considers the role that DPV-plus-storage can have in meeting the recommendations of the 2022 Energy Vision, compensation mechanism design will have an influence on the extent to which the operational behavior of DPV-plus-storage systems complements other recommended actions (e.g., implementing alternative hydropower asset operations).

For more information, see section 4 in Zinamen, Bowen, and Aznar (2020) An Overview of Behind-the-Meter Solar-Plus-Storage Regulatory Design: Approaches and Case Studies to Inform International Applications.

Policy Stacking

“The implementation of a sequencing or stacking framework—where market preparation, market creation, and expansionary policies are adopted either sequentially or in tandem—may enable a more effective and cost-efficient policy framework that better achieves policymakers’ intended deployment goals than if similar policies are adopted either out of sequence or alone.”
(Krasko and Doris 2013)

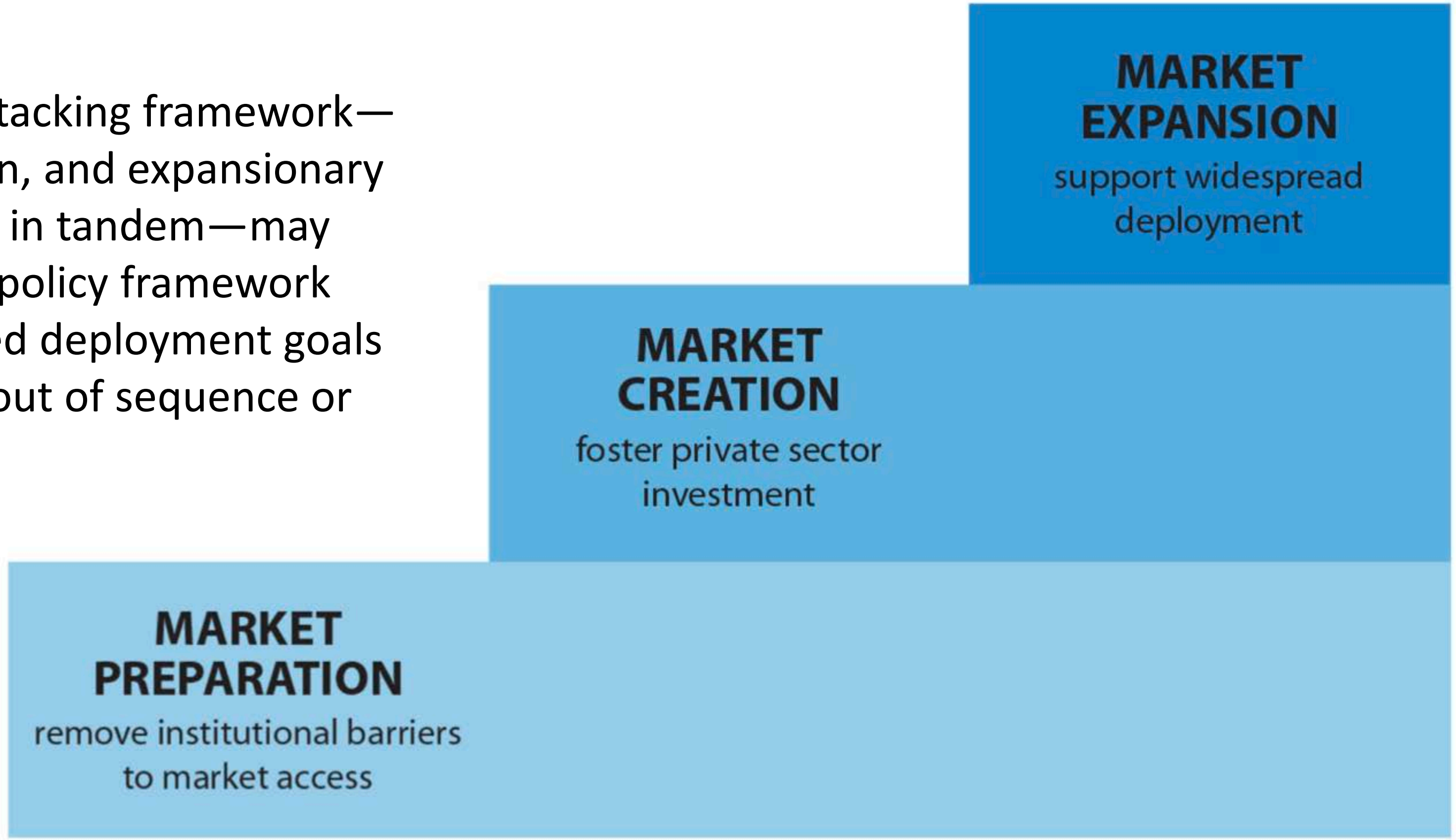


Figure 1. Policy stacking framework

Adapted from Cook, Volpi, *et al.*, 2018

For more information, see section 2 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.

State Behind-the-Meter Energy Storage Policy Descriptions

Cook et al. (2022) developed an energy storage policy stack with 31 policy questions organized under 11 parent policies in three policy categories. The report also assessed the extent to which all 50 states had implemented policies in each category. The table from the report to the right provides brief descriptions of each parent policy.

For more information, see section 5 in Cook et al. (2022) [Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States](#).

Policy Category	Parent Policy	Definition
Market Preparation	Planning and Permitting	The state has planned for BTM energy storage, piloted its use in different situations, developed permitting standards and/or guidance, and has undertaken other related activities.
	Interconnection	The state or utilities in the state have established requirements for connecting BTM energy storage to the grid.
	Compensation	The state or utilities in the state have established clear BTM energy storage compensation mechanisms.
	Rate Making	Time-of-use, demand charge, and/or other rate mechanisms are employed or available in the state.
Market Creation	Wholesale Market	When a state has rules on enabling BTM energy storage participation in wholesale markets, they are clear.
	Mandate	The state has adopted mandates that incentivize or require BTM energy storage.
	Distributed Energy Resource (DER) Aggregation	The state or utilities in the state have approved, developed and/or operate DER aggregation programs.
Market Expansion	Storage Funding and Incentives	The state offers financial incentives for BTM energy storage development.
	Resilience	The state has an energy resilience policy or programs in operation that incorporate BTM energy storage.
	Equity	The state considers BTM energy storage development impacts on disadvantage communities.
	Emission and Life Cycle Impact	The state has an emission target and an end-of-life battery storage program.

Market Preparation Policies

- **Planning and permitting**: Thirty-two states and Washington, D.C., have at least one policy in this category, with most of them focused on pilot programs, policy or economic studies, or including storage in integrated resource plans. Other less-implemented policies include non-wires alternatives to transmission and distribution investments and energy storage-specific permitting requirements.
- **Interconnection:** This parent policy includes setting interconnection requirements specific to BTM energy storage and making hosting capacity maps available that identify where DERs may provide the most benefit to the grid or incur lower interconnection costs. Twelve states have addressed at least one of these questions.
- **Compensation:** Forty-four states and Washington, D.C., have implemented demand response programs, which may in some cases provide compensation for BTM energy storage. However, only five states allow BTM storage to be eligible for net metering, and only six states have storage-specific tariffs.
- **Ratemaking:** All states and Washington, D.C., have at least one utility that offers demand charge rates or one utility that offers time-of-use rates, both of which can incentivize battery storage systems.

The above information is current as of August 2022. For more information, see section 6 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.

Market Creation Policies

- **Wholesale market**: This category is focused on two FERC orders that must be implemented in states served by independent system operators (ISOs) or regional transmission organizations (RTOs). Twenty-nine states have partially or fully implemented FERC Order No. 841, which addresses wholesale market participation for energy storage. Thirty-three states have partially or fully implemented FERC Order No. 2222, which allows aggregations of smaller resources to participate in RTO/ISO markets.
- **Mandate:** Eleven states have renewable portfolio standard targets exceeding 80%—having more variable renewable energy could incentivize energy storage deployment. Only eight states have adopted an energy storage mandate.
- **DER aggregation:** Sixteen states have piloted at least one DER aggregation program, which could provide a pathway for energy storage to provide energy, capacity, and grid services at a larger scale.

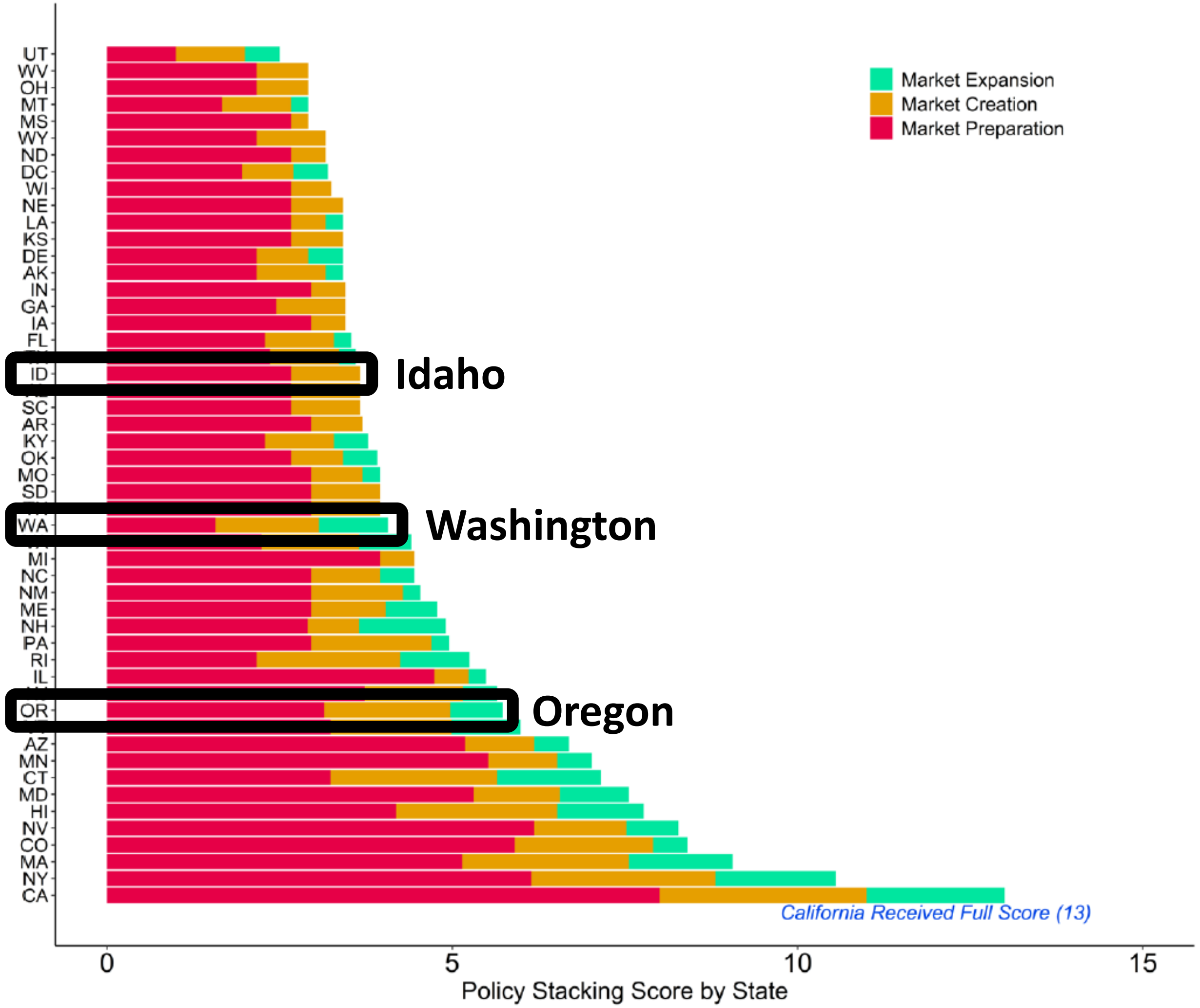
The above information is current as of August 2022. For more information, see section 6 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.

Market Expansion Policies

- **Storage funding and incentives**: At least 18 states have some type of energy storage financial incentive.
- **Resilience:** Eighteen states have adopted some type of resiliency policies or programs to encourage microgrid and resilience development. Only two states (California and Hawaii) have at least one utility that has implemented a resilience or microgrid-related rate structure.
- **Equity:** Five states (California, Connecticut, Massachusetts, New Hampshire, and New York) and Washington, D.C., have adopted policies to expand adoption opportunities for low- and moderate-income customers.
- **Emissions and life cycle impact:** Twenty-three states have developed carbon reduction targets and energy storage end-of-life programs.

The above information is current as of August 2022. For more information, see section 6 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.

Storage Policy Scoring



- Cook et al. (2022) assigned scores for each of the 50 states and Washington, D.C., based on whether those jurisdictions had implemented policies in each category.
- The three states where the four CRITFC member Tribes are located ranked 12th (Oregon), 23rd (Washington), and 32nd (Idaho) based on this scoring method.
- The scores do not reflect the extent to which the implemented policies support BTM energy storage deployment. The authors noted that the report was not a comprehensive assessment of BTM storage policies, but that it could "provide policymakers relevant information to consider their BTM storage policy environment."

The above information is current as of August 2022. For more information, see section 5 in Cook et al. (2022) [Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States](#).

Solar-Plus-Storage Program Examples

Oregon Solar + Storage Rebate Program

Overview

- The Oregon Solar + Storage Rebate Program, established by the Oregon Department of Energy (ODOE), provides rebates for the purchase, construction, or installation of BTM solar PV and solar-plus-storage systems.
- Rebates are provided to contractors, who pass-on savings to residential customers and low-income service providers (nonresidential customers who provide services to lower-income individuals and households).
- At least 25% of the funding must support projects for residential LMI customers* or low-income service providers.**

Photo by Dennis Schroeder, NREL

*LMI customers can demonstrate eligibility if they are already determined eligible for certain other programs for LMI Oregon residents, or if they prove household income less than or equal to 100% of state median income adjusted for household size.

**Low-income service providers include developers/owners of multifamily housing, community organizations offering services to LMI households, and Tribal or local government entities using public buildings to provide services to LMI individuals.

Sources: State of Oregon: Oregon Solar + Storage Rebate Program 2023 Program Report, Oregon Solar + Storage Rebate Program: Homeowners, Oregon Solar + Storage Rebate Program: Low-Income Service Providers, OSSRP Form LMI Eligibility Option 3

Oregon Solar + Storage Rebate Program

Program History/Goal

- The program was established at the direction of Oregon HB 2618, passed in 2019.
- The stated goals of the program were to "support the solar industry and its workers and to increase the use of renewable energy sources, including among low- and moderate-income households and the non-profit organizations that serve them."
- The program launched in 2020 with $2 million in funding and received additional funding through legislation in 2021 ($10 million), 2022 ($5 million), and 2023 ($10 million).
- As of May 2024, funding for the program allocated in 2023 was fully reserved.

Photo by Joe DelNero, NREL

Sources: State of Oregon: Oregon Solar + Storage Rebate Program 2023 Program Report, Oregon Solar + Storage Rebate Program

Oregon Solar + Storage Rebate Program

Incentive Structure

The Oregon Solar + Storage Rebate Program has a tiered incentive rate based on customer type, ability to take advantage of other incentives, and technology:

Customer Type	Solar PV		Energy Storage	
	Rebate	Rebate Cap	Rebate	Rebate Cap
LMI households	$1.80 per watt (DC) of installed capacity	Lesser of 60% of project net cost or $5,000	$300 per kilowatt-hour (kWh) of installed storage capacity	Lesser of 60% of project net cost or $2,500
Low-income service providers	$0.75 per watt (DC) of installed capacity	Lesser of 50% of project net cost or $30,000		Lesser of 60% of project net cost or $15,000
Non-LMI residential customers not eligible for utility incentives	$0.50 per watt (DC) of installed capacity	Lesser of 40% of project net cost or $5,000		Lesser of 40% of project net cost or $2,500
Non-LMI residential customers eligible for utility incentives	$0.20 per watt (DC) of installed capacity			

Source: State of Oregon, Oregon Solar + Storage Rebate Program 2023 Program Report

Oregon Solar + Storage Rebate Program

Challenges

- Few Tribal governments have participated in the program to-date. ODOE conducted outreach to Tribal governments in 2022 and 2023.
- Supply chain issues caused delays in delivery of battery storage.
- Historically, contractors and customers had to wait for rebates for solar-plus-storage projects until after both the solar PV and energy storage were installed.
    - This issue was resolved as of January 2024, and now ODOE can independently process rebates for installed solar PV prior to energy storage being installed.

Photo by Dennis Schroeder, NREL

Source: State of Oregon, Oregon Solar + Storage Rebate Program 2023 Program Report

Oregon Solar + Storage Rebate Program

Impacts

Total budget provided in rebates or reserved as of May 2024 (reservations are converted to rebates at project completion):

- LMI: $10,050,000
- Non-income restricted: $14,180,627

Photo by Dennis Schroeder, NREL

Annual impacts from the last year of the program with detailed statistics (year 2022):

Customer Type	PV Only			Storage (Paired with PV)			Total Committed Funds
	# of Projects	Funds Committed	Capacity (kW)	# of Projects	Funds Committed	Storage Capacity (kWh)	
All customer types	2,542	$7,178,285	28,028	326	$1,719,604	1,574	$8,897,889
LMI or low-income service provider	497	$2,847,202	6,314	39	$292,088	184	$3,139,290
LMI or low-income service provider %	20%	40%	23%	12%	17%	12%	35%

Sources: State of Oregon: [Oregon Solar + Storage Rebate Program](), [Oregon Solar + Storage Rebate Program 2023 Program Report]()

Hawaii Battery Bonus Program

Overview

- The Battery Bonus program, officially called the Scheduled Dispatch program, provides incentives for BTM battery storage for residential and commercial customers.
- Incentives are available for Hawaiian Electric customers on Oahu and Maui with existing solar PV who add battery storage, or customers who install new solar PV and battery storage systems.
- Participation requires enrollment in an existing renewable energy rate program (e.g., NEM).
- Customers must commit to discharging the installed battery for a preset 2-hour period each evening over a period of 10 years.
- The dispatch period is specified by Hawaiian Electric at enrollment and occurs between 6:00 and 8:30 p.m.

Photo by Deb Lastowka, NREL

Source: Hawaiian Electric, Battery Bonus Program

Hawaii Battery Bonus Program

Incentive Structure

- At enrollment, customers specify how much storage capacity they commit to delivering each evening over the course of the program. Customers may choose to commit only a portion of the capacity of their storage system.
- Enrolled customers receive a one-time incentive of $850 per committed kilowatt (kW) of storage capacity.
- Enrolled customers also receive a credit to their bill every month of $5 per committed kW of storage capacity for a 10-year period starting at enrollment.
- Customers not participating in NEM also receive a monthly bill credit for energy exported to the grid.

Photo by Deb Lastowka, NREL

Source: Hawaiian Electric, Battery Bonus Program

Hawaii Battery Bonus Program

Program History and Goals

- The program was created in 2021 to mitigate anticipated shortfalls from the scheduled retirement of the AES coal plant on Oahu in 2022.
- The Hawaii Public Utilities Commission noted in the order approving the program that, “a program that has low implementation barriers, provides a motivating incentive structure, invites optimization of existing programmatic infrastructure, and lays a foundation upon which enhanced programs can be implemented, is the most prudent way forward.”

Photo by Dennis Schroeder, NREL

Sources: State of Hawaii: Hawaii Public Utilities Commission Order No. 37816, Hawaii Public Utilities Commission DER Programs

Hawaii Battery Bonus Program

Impact

- 54.8 megawatts (MW) of BTM storage capacity was enrolled across Oahu and Maui as of April 2024.
    - Based on an upfront incentive payment of $850 per kW, this equates to $46.6 million of upfront incentive payments.*
    - Based on a monthly incentive payment of $5 per kW over 10 years, this equates to $32.9 million of monthly incentive payments.*
- The program was closed as of July 1, 2024.

Photo by Deb Lastowka, NREL

*This calculation does not consider potential terminations of enrollment in the program, which would lead to lower total incentive payments being made.

Source: Hawaiian Electric, Battery Bonus Program

California Self-Generation Incentive Program

Overview

- The Self-Generation Incentive Program (SGIP) provides rebates for qualifying BTM distributed energy systems.
- Qualifying technologies include wind turbines, waste heat to power technologies, pressure reduction turbines, internal combustion engines, microturbines, gas turbines, fuel cells, and advanced energy storage systems.
- In 2024, 88% of the budget is allocated to energy storage technologies and 12% is allocated to renewable generation.
- The energy storage allocation is further broken down into: 63% for equity resilience, 10% for large-scale storage, 7% for small residential storage, 5% for heat pump water heaters (HPWH),* and 3% for residential equity.
- Equity projects include projects in low-income and disadvantaged communities.

Photo by Werner Slocum, NREL

Source: State of California, [SGIP 2024 Handbook]

**"To receive incentives, the HPWH systems must be designed, installed, and operated in a manner that shifts electricity use from peak to off-peak periods and reduces GHG emissions. To achieve these benefits, the incentive program requires using a 'thermostatic mixing valve' that allows pre-heating of water during off peak hours when electricity use is low. This is the 'energy storage' function of HPWHs." Source: State of California, "CPUC Provides Additional Incentives and Framework for Electric Heat Pump Water Heater Program"*

California Self-Generation Incentive Program

Incentive Structure

- SGIP has a declining tiered incentive structure. There are base incentive rates for energy storage that step down over time. Each incentive step is allocated a specific amount of funding—when the funding in a step is depleted, then the next step (with a lower incentive rate) is made available.
- The base rate is further adjusted based on (1) the size and discharge duration of the energy storage (generally, larger systems have lower incentives), (2) the resilience needs of the customer, and (3) the vulnerability of the customer (determined by income or proximity to wildfires).

Photo by Prateek Joshi, NREL

Source: State of California, SGIP 2024 Handbook

California Self-Generation Incentive Program

Program History/Goal

- SGIP was initially created as a peak-load reduction program in 2001, when California was going through an energy crisis and experienced electrical outages throughout the state.
- Over the years, the SGIP has been revised and extended numerous times, including to (1) add energy storage as an eligible technology, (2) expand the focus of the program to include GHG reduction, and (3) allocate a portion of the incentive budget to energy storage projects.

Photo by Dennis Schroeder, NREL

Sources: Center for Sustainable Energy, SGIP Background & History; and Verdant Associates, 2021–2022 SGIP Impact Evaluation report, section 2.1 ("History of the SGIP")

California Self-Generation Incentive Program

Impact

- SGIP is one of the longest-running distributed generation incentive programs in the country.
- Total impacts:
  - $2.2 billion in incentives paid.
  - 1,953 MW capacity installed.
- Energy storage impacts:
  - $987 million in incentives paid.
  - 1,187 MW capacity installed.

Photo by Deb Lastowka, NREL

Source: Center for Sustainable Energy, [SGIP Program Statistics]

Thank you!

www.energy.gov/CommunitiesLEAP

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Appendix

Market Preparation Parent Policies and Child Policy Questions

Parent Policy	Questions
Planning and Permitting	• Has an energy storage policy/economic study been completed in the state? • Is or has a behind-the-meter (BTM) energy storage pilot program been completed in the state? • Has the state modified local government permitting requirements specific to BTM energy storage? • Does the state allow or mandate the inclusion of energy storage in utility integrated resource plans? • Has the state approved or otherwise required consideration of non-wires alternatives or distributed energy resources to defer, mitigate, or obviate the need for certain transmission and distribution investments? • Does the state have a policy on utility ownership of energy storage assets? • Does the state have a policy addressing multiple use applications for energy storage?
Interconnection	• Do the state's interconnection requirements expressly address BTM energy storage export control? • Does a utility in the state publish a hosting capacity map?
Compensation	• Does the state allow BTM energy storage to be eligible for net metering compensation? • Has the state replaced its net energy metering programs with BTM energy storage-specific tariffs? • Does a utility in the state have demand response programs?
Ratemaking	• Does at least one utility in the state offer time-of-use rates? • Does the largest utility in the state offer time-of-use rates? • Does at least one utility in the state offer demand charge rates? • Does the largest utility in the state offer demand charge rates?

For more information, see section 5 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.

Market Creation Parent Policies and Child Policy Questions

Parent Policy	Questions
Wholesale Market Access	• Is FERC 841 being partially implemented in the wholesale market in the state? • Is FERC 841 being fully implemented in the wholesale market in the state? • Has FERC order 2222 been partially implemented in the wholesale market in the state? • Has FERC order 2222 been fully implemented in the wholesale market in state?
Mandates	• Does the state have a renewable portfolio standard (or equivalent) of 80% or more? • Does the state have a mandate or target for any energy storage? • Does the state have a mandate for BTM energy storage?
DER Aggregation	• Has at least one utility in the state implemented a DER aggregation program? • Has the largest utility in the state implemented a DER aggregation program?

For more information, see section 5 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.

Market Expansion Parent Policies and Child Policy Questions

Parent Policy	Questions
Storage Funding and Incentives	• Does the state offer financial incentives for BTM energy storage development?
Resilience	• Has a resilience or microgrid-related rate structure been approved or implemented in at least one utility in the state? • Has the state implemented any policies or programs to encourage microgrid/resilience development?
Equity	• Does the state consider low- and moderate-income incentives for BTM energy storage?
Emission and Life Cycle Impact	• Does the state have at least one energy storage technology end-of-life program? • Does the state have a target to reduce carbon emissions?

For more information, see section 5 in Cook et al. (2022) Check the Storage Stack: Comparing Behind-the-Meter Energy Storage State Policy Stacks in the United States.