MI POWER GRID

Making the Most of Michigan's Energy Future

New Technologies and Business Models

Stakeholder Meeting 4:

Behind the Meter & Community Solar

The meeting will begin promptly at 1:00 pm.

March 10, 2021

1PM – 5 PM

MPSC

Michigan Public Service Commission

MI POWER GRID

Making the Most of Michigan's Energy Future

New Technologies and Business Models: Welcome and Overview

Joy Wang

WangJ3@Michigan.gov

Smart Grid Section

Michigan Public Service Commission

MPSC

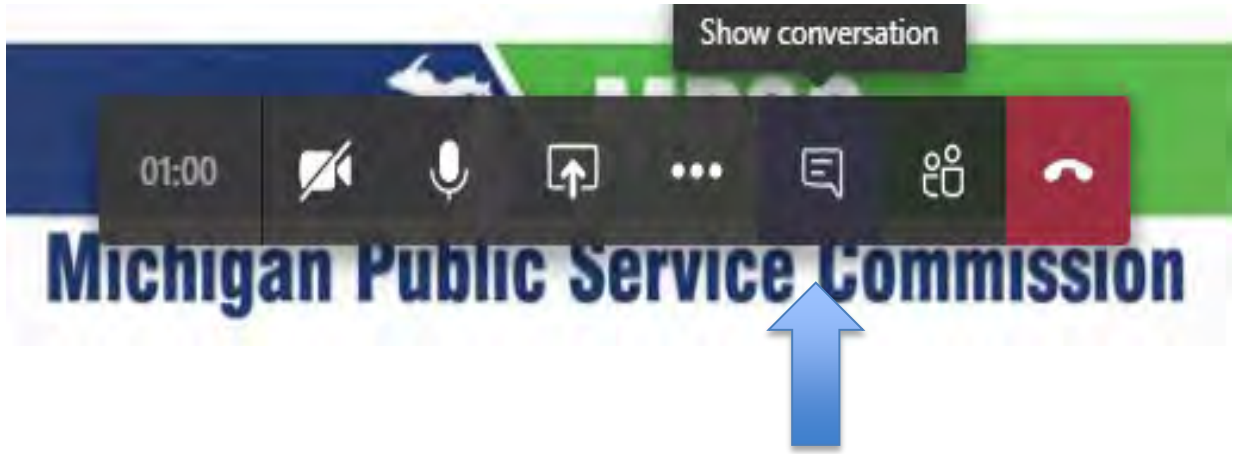
Michigan Public Service Commission

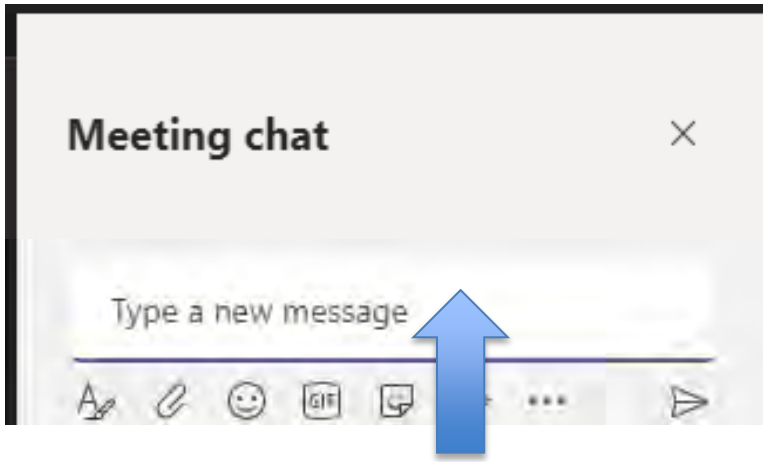
Agenda: Behind the Meter & Community Solar

1:00 pm	Welcome and Opening Remarks	Joy Wang, MPSC Staff, and Julie Baldwin, Renewable Energy Section Manager, MPSC
1:05 pm	Community Solar Markets, Trends, and Regulatory Considerations	Jenny Heeter, National Renewable Energy Laboratory
1:40 pm	Community Solar Market Development	Sarah Wochos, Borrego Solar Systems
2:05 pm	Michigan (MI) Solar Communities – Low to Moderate Income Access	Lisa Thomas, Energy Services, EGLE
2:15 pm	Break	
2:25 pm	*Panel: It Takes a Village… Raising Successful Community Solar* Valerie Brader, Rivenoak Consulting Inc. Debbie Fisher, HOPE Village Revitalization John Kinch, Michigan Energy Options Robert La Fave, Village of L'Anse Matthew McDonnell, Strategen	Moderator: Cody Matthews, MPSC Staff
3:20 pm	Break	
3:25 pm	BTM Solar Trends, Integration Challenges and Ownership Models	Douglas Gagne, National Renewable Energy Laboratory
4:00 pm	*Panel: Looking Ahead at Behind the Meter Solar* John Freeman, Great Lakes Renewable Energy Assoc. Amy Heart, Sunrun Craig Toepfer, Solar Homeowner Leah Wiste, Michigan Interfaith Power and Light Ken Zebarah, Harvest Solar	Moderator: Julie Baldwin, MPSC Staff
4:55 pm	Closing Statements	Joy Wang, MPSC Staff
5:00 pm	Adjourn	

Housekeeping

- This meeting is being recorded
- Recording and slides posted on workgroup website in about a week
- All audience members will be muted
- Please type questions into the chat box
  - To access chat box:





- Staff will ask chat box questions during Q&A
- If comfortable, please share your name, role, and organization in chat
  - May facilitate connections

Housekeeping, cont.

- During the meeting, if clarification of your question is needed, we will ask you to unmute.
  - To unmute:
    - Phone: Press *6
    - Teams: Click mic button
  - Please mute yourself again after your clarification.
- Chat box may note when audience members enter/exit.
  - These notices are automatic:

- If you are not a session speaker, please turn off your video.
- If Teams via web browser is not working, try a different web browser.
  - All work except Safari
- Please share your thoughts on the meeting with us by filling out the survey.

MI POWER GRID

Making the Most of Michigan's Energy Future

Opening Remarks

Julie Baldwin
Manager, Renewable Energy Section
Michigan Public Service Commission

Stakeholder Meeting 4: Behind the Meter & Community Solar
March 10, 2021

MPSC
Michigan Public Service Commission

Community Solar Markets, Trends, & Regulatory Considerations

Jenny Heeter

Senior Energy Analyst, Markets & Policy Group

Strategic Energy Analysis Center

National Renewable Energy Laboratory

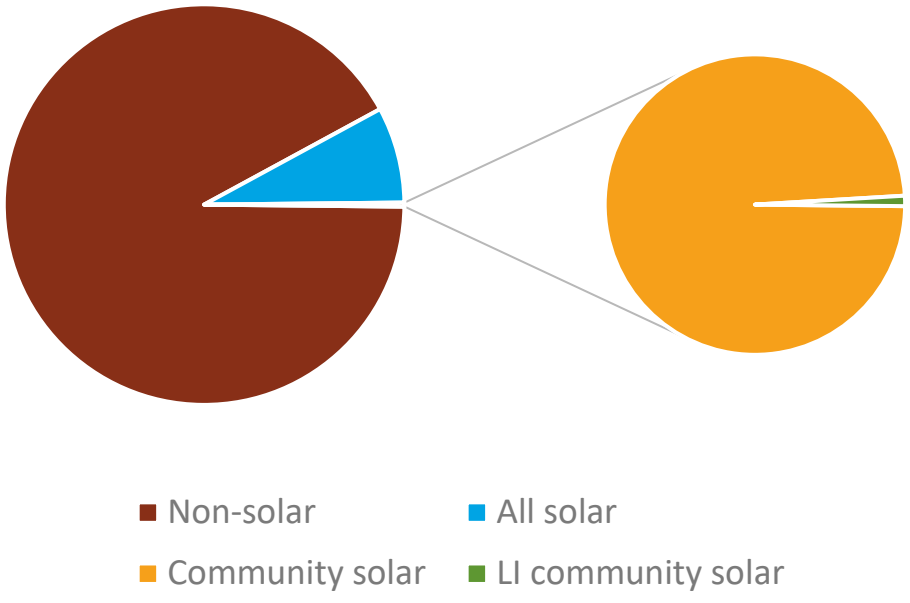
Community Solar Markets, Trends, & Regulatory Considerations

Jenny Heeter, Senior Energy Analyst
National Renewable Energy Laboratory
March 10, 2021

Market Updates

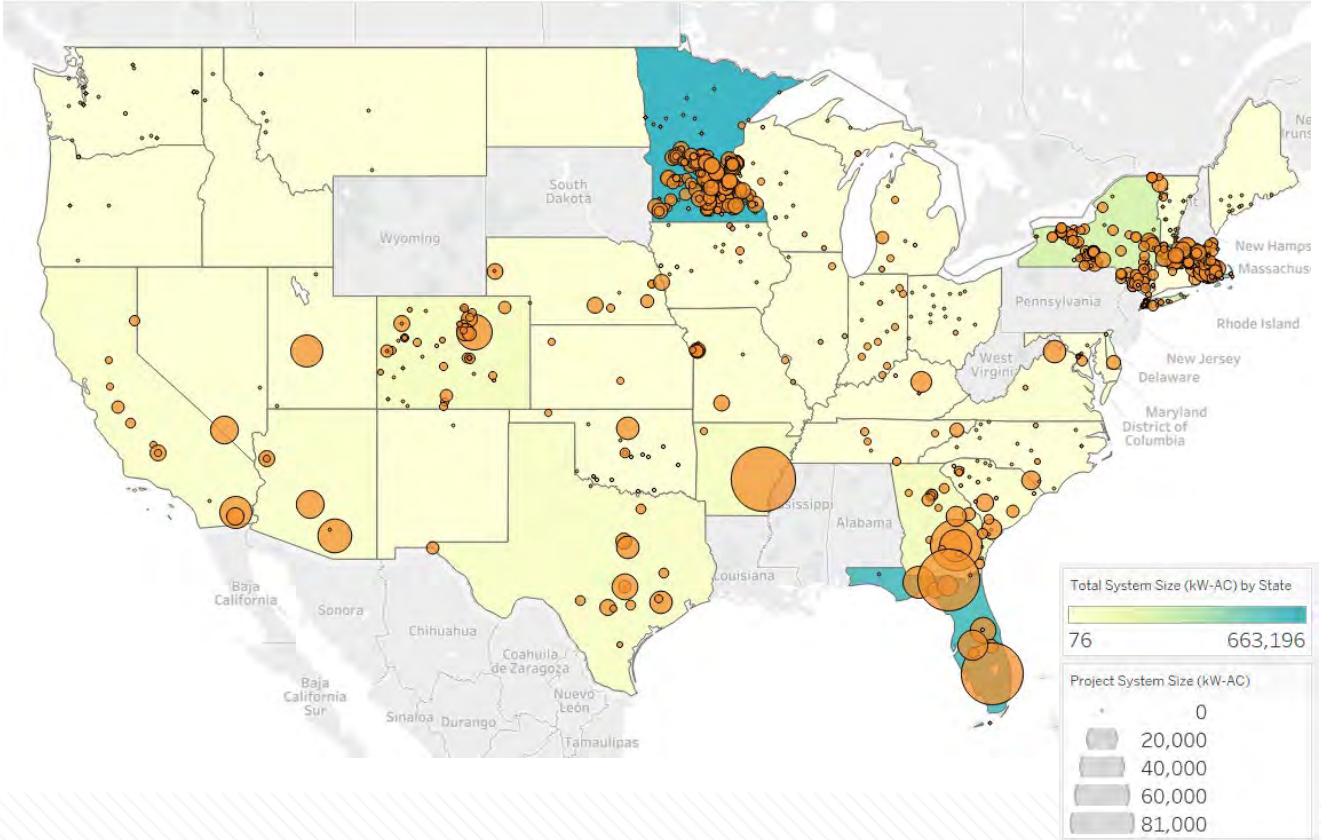
Community Solar Opportunity

- 49% of households and 48% of businesses **cannot** host a PV system of adequate size on their property or virtually net meter an entire system themselves
- Solar represents <10% U.S. electric generation capacity
- Community solar represents <5% of solar
- LI community solar represents <1% of community solar.



Sources: EIA, SEIA, NREL, NREL (unpublished)

The Community Solar Market



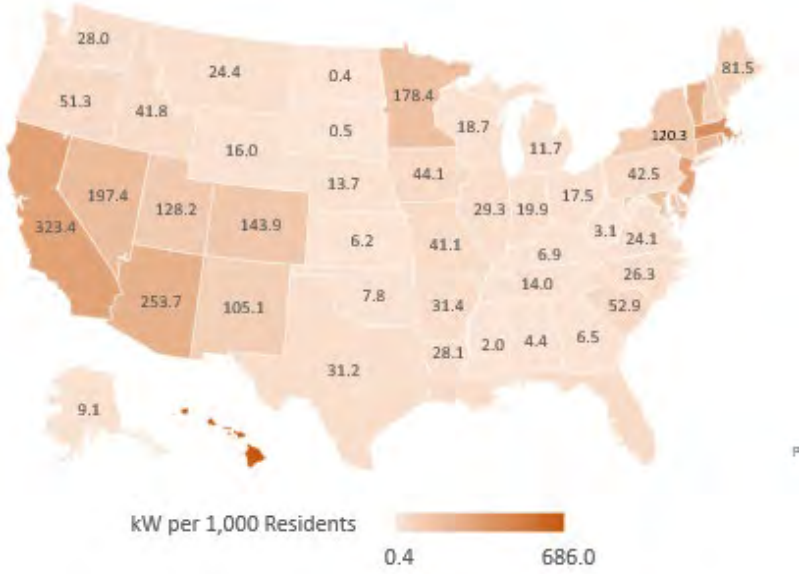
As of July 2020, we estimate that there were >2,600 MW-AC of community solar capacity distributed across >1,200 projects in 39 states and Washington, D.C.

For the cumulative installed capacity, the top 3 states are:

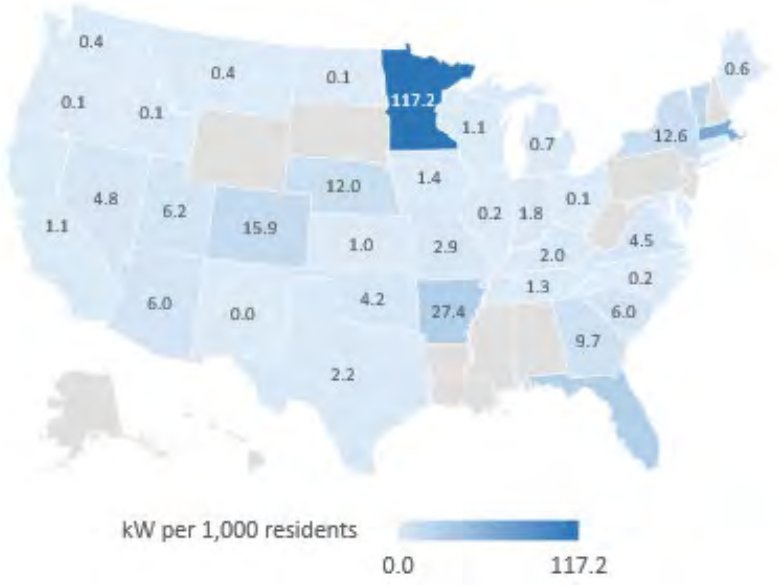
- MN 663 MWac
- FL 593 MWac
- MA 436 Mwac.

Source: Sharing the Sun (2020). National Renewable Energy Laboratory. https://data.nrel.gov/submissions/149

Residential + Non-Residential Solar Capacity per Capita



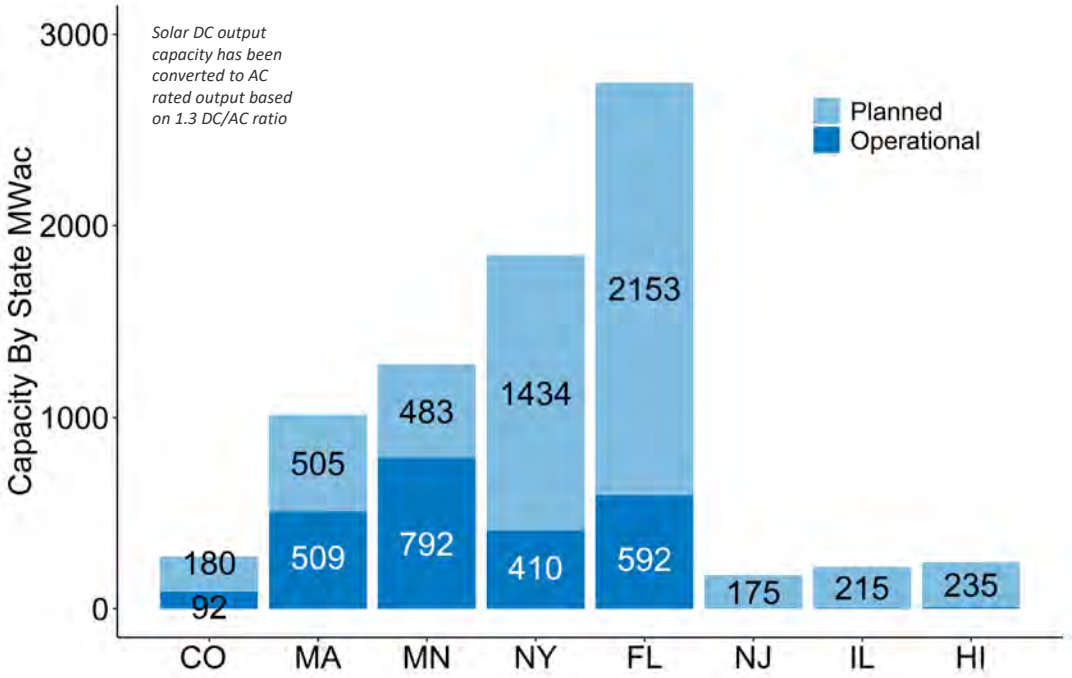
Community Solar Capacity per Capita



Community Solar Capacity Compared to Residential and Non-Residential Solar Capacity (kW/1000 Residents)

Source: Population Data sourced via U.S. Census Bureau as of July 1, 2020
Source: Installed PV Capacity sourced via Wood Mackenzie US Solar Market Insight Q4 2020

Community Solar Capacity in Queue Top States

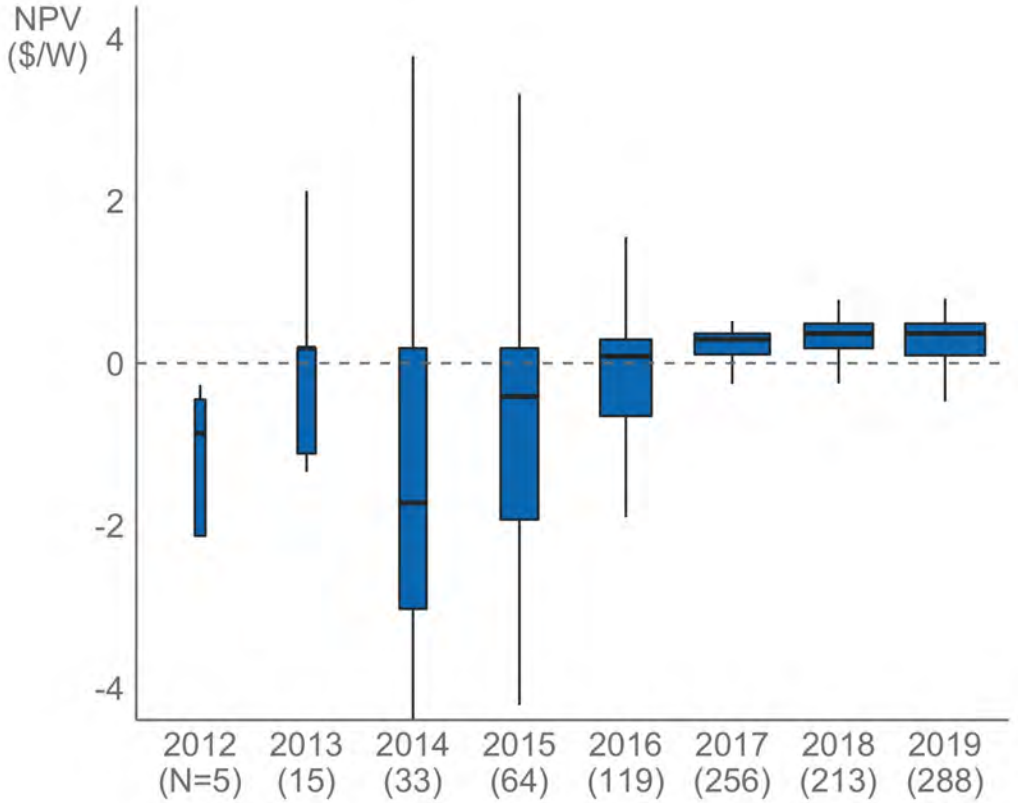


Operational data come from the NREL/UMN Sharing the Sun Data List. CO: Planned solar capacities include projects under Xcel program; FL: Planned capacities include FPL and Duke Energy Program; MA: Planned capacities include SREC II (converted to AC) and SMART program; MN: Planned capacities only include projects under Xcel program; NJ: Planned capacities include Phase 1 and Phase 2 Community Solar Pilot Program; IL: Planned capacities include Adjustable Block Program only; HI: Planned capacities include Hawaiian Electric Community based renewable energy program.

- Five states (CO, IL, MA, MN, and NY) have the most community solar capacity as well as a high number of planned projects.
- NJ, IL, and HI are emerging states with little capacity to date but large planned capacities.
- Over 5,300 MWac in queue.

Subscriber Value

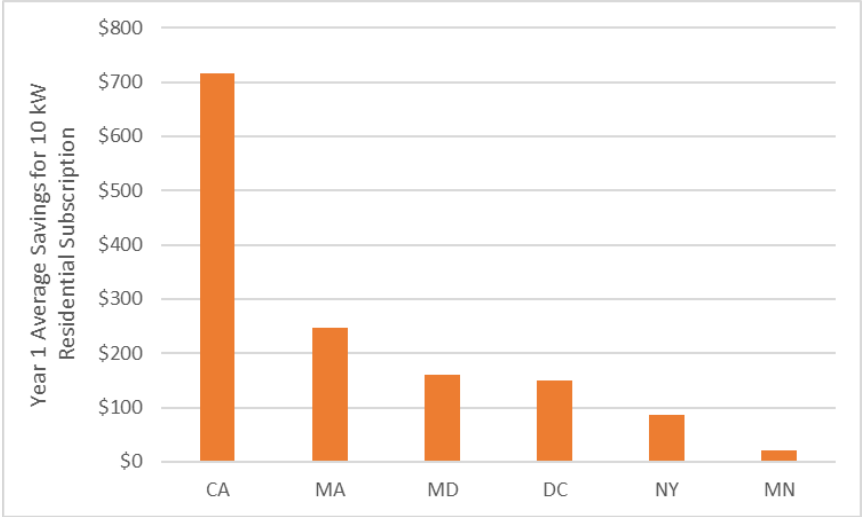
- The average net present value (NPV) of projects developed in 2019 was $0.36/Watt.
- For projects developed in the beginning of 2020, the average NPV was $0.43/W.



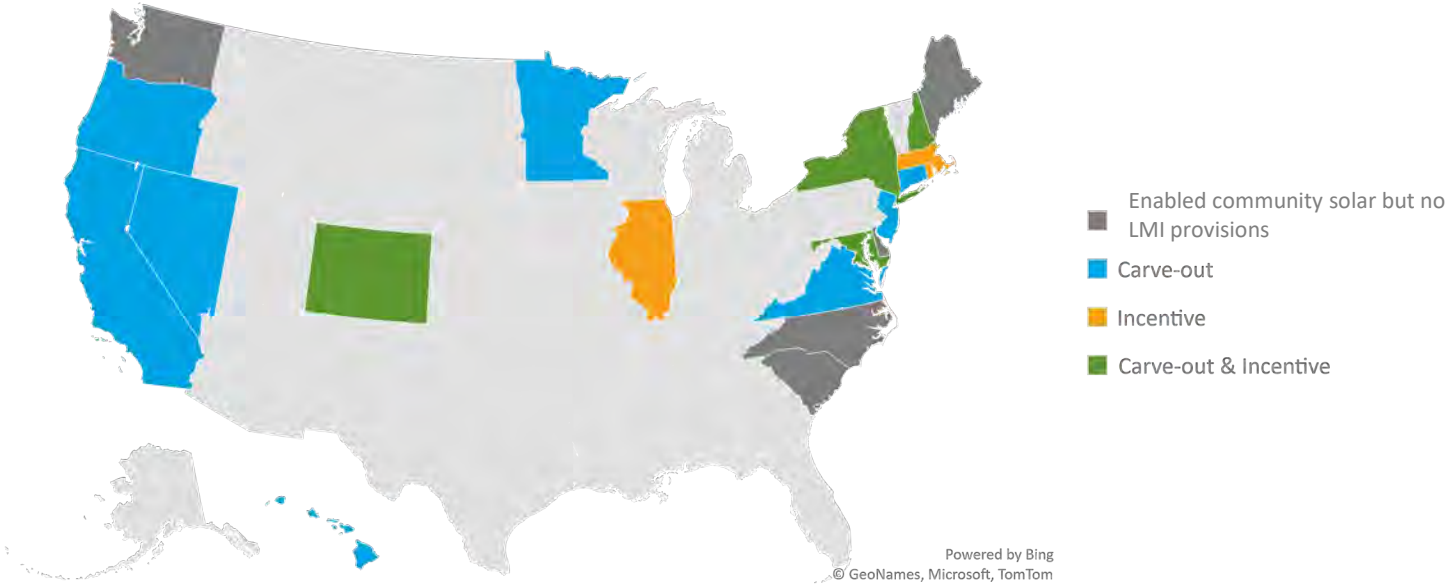
Source: https://www.nrel.gov/docs/fy20osti/76853.pdf

First Year Bill Savings

- First year bill savings is influenced by the payment model; upfront payment models do not have first year bill savings but may have a positive NPV
- We investigate first year bill savings because of their importance in expanding community solar access to all income groups
- On a capacity-weighted average, for all projects developed in the state over time, five states have positive average first-year bill savings:
  - CA, MA, MD, DC, NY, MN
- These data do not take into account low-income community solar projects or programs.



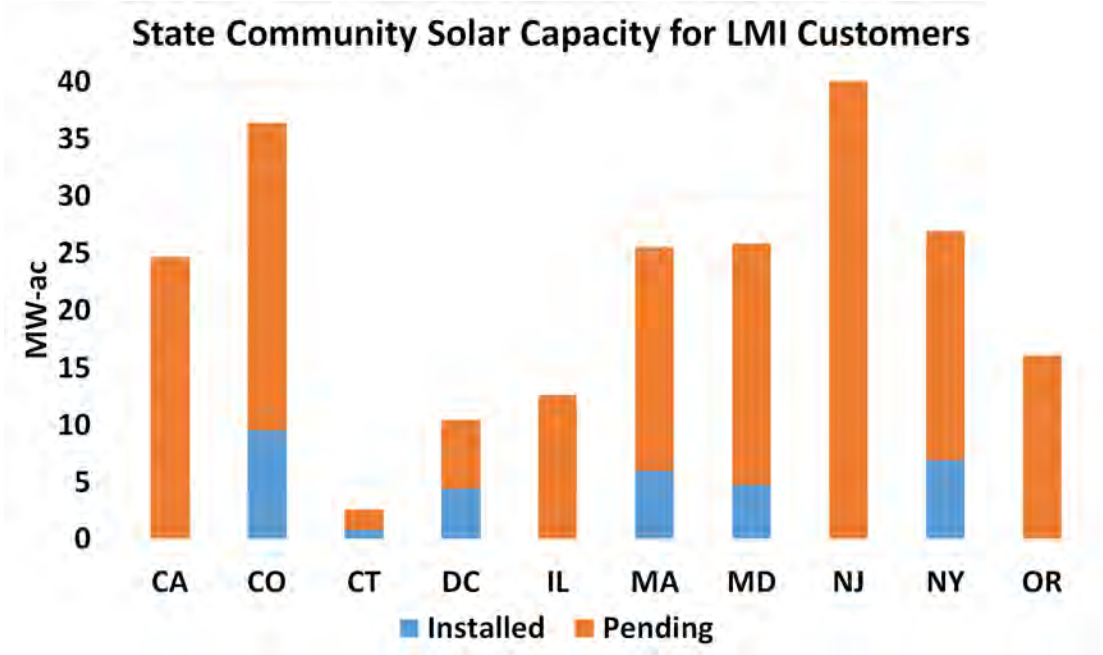
Note: The California data only reflect a highly limited amount of capacity.



State LMI Provision: Carve-out / Incentives

- The carve-out approach has been the most common (12 states)
- But many states use an incentive approach (8 states)
- A few states (4) have used both approaches.

How Much LMI Community Solar is There in the U.S.?

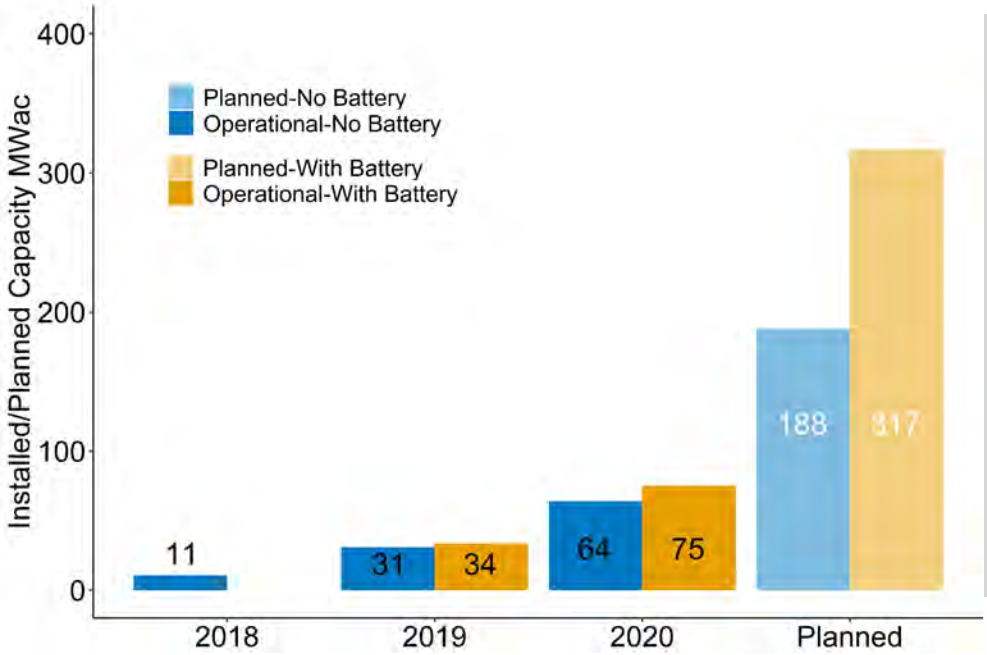


These capacities indicate the community solar project dedicated to LMI customers. 1) Definition for capacity for LMI customers: If a 100MW program requires 30% of capacity to LMI, and 30% of these capacities be set aside for people who meet LMI criteria, the installed/pending capacities are 100*0.3*0.3 = 9 MW, rather than 30 MW. 2) The Pending capacities only include awarded projects. Projects waitlisted/under review/remaining/meet requirements but not awarded are not included. For example, the MD community solar pilot project will have 125 MW community solar focus on LMI customer (at least 125*0.3 = 37.5 for people meet LMI criteria). This figure only shows the current capacity installed/awarded. 3) Some states report capacity on MWdc, assuming DC/AC ratio is 1.3.

- Based on the most recent data, at least 32.3 MW community for LMI customers are in operation, and 225.5 MW are planned. These LMI projects will benefits over 45,000 LMI households.

- LMI projects are developed through:
  - State community solar program with LMI carve-out requirement (CO, CT, MD, NJ, OR)
  - State community solar program with LMI tariff (MA)
  - State LMI community solar program (DC, IL, NY)
  - LMI community solar project investments (CA).

Pairing Community Solar with Storage in Massachusetts

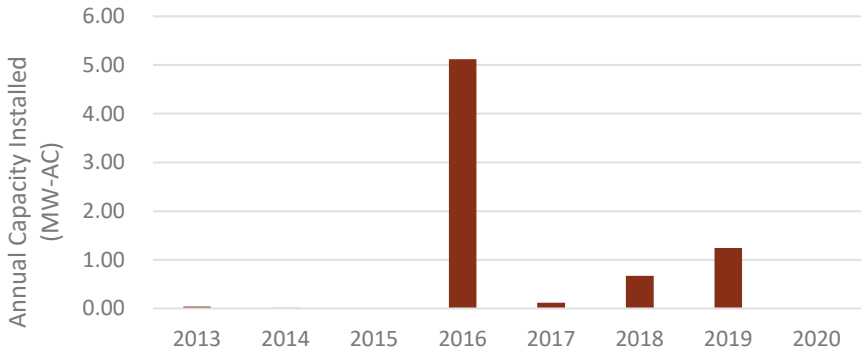


Data Source: Solar Massachusetts Renewable Target (SMART) Application Update

- **SMART program at a glance:**
  - 2 community solar components:
    1. Community shared
    2. Low-income community shared
  - Added incentive for projects paired with battery storage
- **505 MWac community shared projects are planned under SMART**
  - 317 MW with battery storage (94 projects).

Michigan Community Solar Deployment

- ~ 7 MW-AC installed as of mid-2020
- 22nd in terms of community solar deployment



Escanaba Solar Project	Escanaba	MI	City of Escanaba	891.00	2019
Burcham Solar Park	East Lansing	MI	City of Lansing - (MI)	242.31	2019
L'Anse Community Solar Array	L'Anse	MI	Village of L'Anse - (MI)	110.50	2019
SpartanSolar-MEC	Cassopolis	MI	Midwest Energy and Communications	668.77	2018
Marquette Board of Light and Power Solar	Marquette	MI	City of Marquette - (MI)	116.31	2017
Spartan Solar	Cadillac	MI	Wolverine Power Supply Coop	1,121.48	2016
Grand Valley State University Community Solar	Allendale	MI	Consumers Energy Co	3,000.00	2016
Western Michigan University Community Solar	Kalamazoo	MI	Consumers Energy Co	1,000.00	2016
Homeworks Community Solar Garden	Portland	MI	Tri-County Electric Coop	16.08	2014
Solar Up North Alliance	Grawn	MI	Cherryland Electric Cooperative	40.49	2013

Community Solar Design Considerations

A review of key design variables and existing experience with them

Project Ownership

- Common ownership models:
  - Utilities
  - Third-parties
  - Non-profits
  - Building owners

- Project ownership can be related to the subscriber organization, but is not always
  - Example: A utility may own a project but hire a separate subscriber organization
- National subscriber organizations have become popular in states where consumers save money by signing up for community solar

Location and Size of Projects

- The median project size has increased from 218 MW-AC in 2015 to 2,081 MW-AC in the first half of 2020

- However, the average project size increased to 10,507 MW-AC for projects developed in the first half of 2020

Interconnection Year	Average Project Size (MW-AC)	Median Project Size (MW-AC)	Project Count
2015	618	218	86
2016	969	443	147
2017	1,944	1,013	305
2018	2,740	1,000	259
2019	1,704	1,000	309
2020 (June)	10,507	2,081	49

Source: Sharing the Sun (June 2020 release)

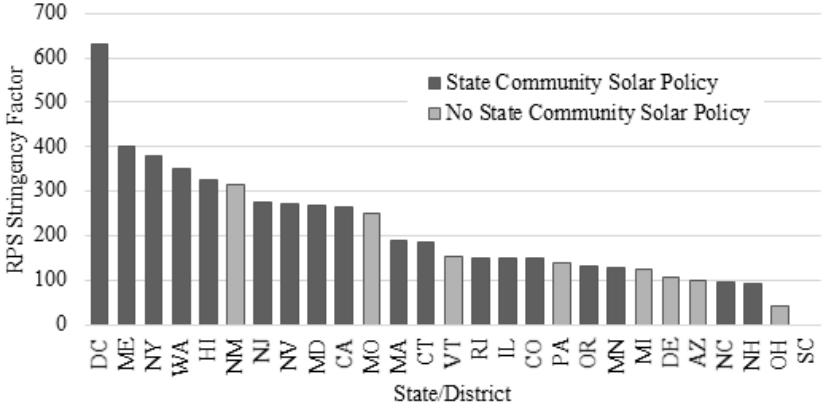
Relationship to Other Goals

Renewable portfolio standard (RPS) or a clean energy standard (CES)

- Most commonly community solar is contributing to those targets, via an exchange of the renewable energy certificates (RECs)

States without RPS or CES

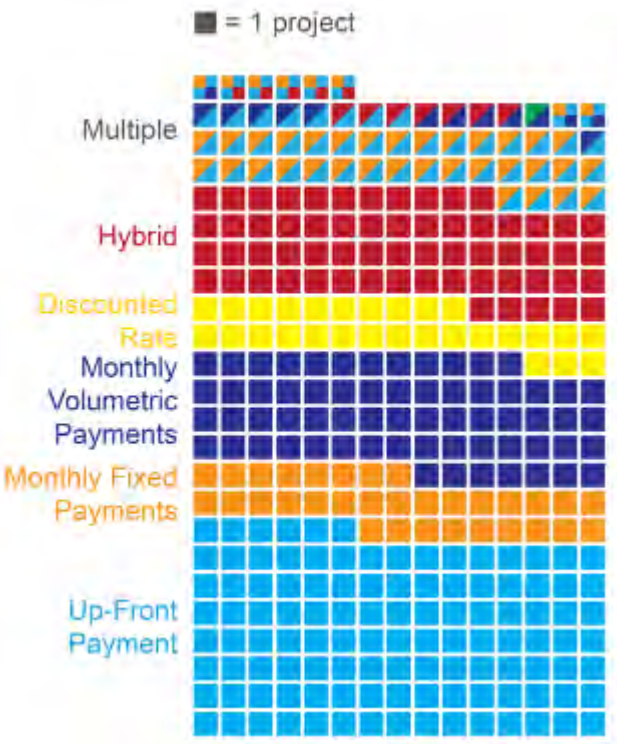
- Community solar projects may still allocate the RECs to the utility, though a few programs do provide the RECs to the community solar subscriber



Subscription Structures

Payment structures:

- Upfront payment: asks the subscriber to give a larger sum of money all at once at the beginning of their subscription period
- Hybrid contract: may ask for an upfront payment followed by multiple payments
- Multiple Payments: typically takes the form of a monthly bill
- Fixed discount: contracts offer a fixed discount on the customer's electricity rate instead of a payment

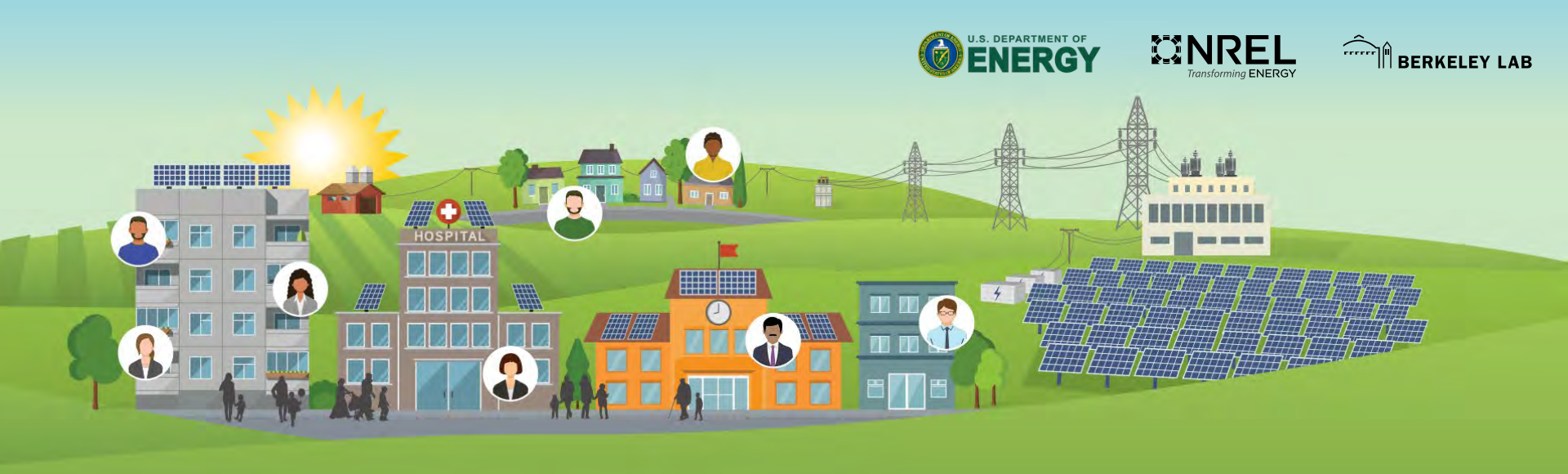


LMI Participation

- Common Approaches:
  - Percentage carveout: require a certain percentage of LMI participation
  - Incentives: Commonly via an RFP process that prioritizes LMI subscription
  - Voluntary: Some examples also exist where a utility will voluntarily create a program that targets LMI customers
- Emerging issue: How to streamline or eliminate qualification barriers and costs

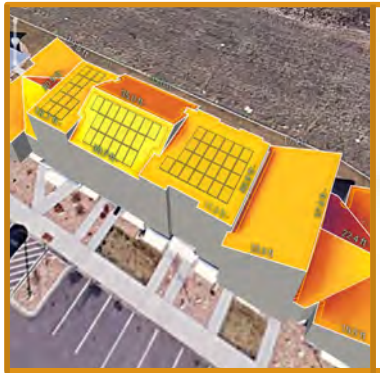
Ancillary Benefits

- Community solar can be designed to meet other needs:
  - Resiliency by pairing with storage
  - Workforce development
  - Community engagement
  - Strategic siting to provide grid services
- Hosting capacity maps:
  - Allows community solar (or any distributed solar project) to be sited in an area with the most available capacity
  - Accuracy is important for these to be useful



Technical Assistance

Technical Assistance: Recent Efforts

			
Analyzing bill savings in different program designs with International Center for Appropriate and Sustainable Technology	Investigating aggregated financing approaches to accelerate adoption of community solar by faith-based organizations with the SEEK project	Exploring options to site and finance community solar on municipal properties with Michigan Energy Options	Developing metrics for a tribal community solar project to ensure community solar benefits can be distributed equitability with X-Utility

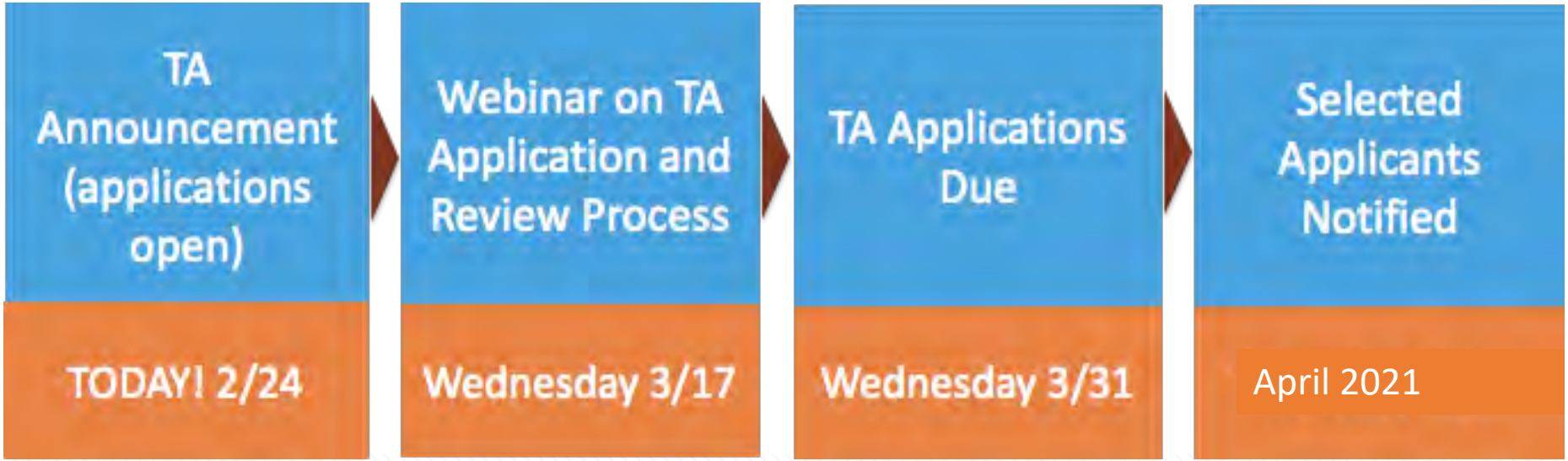
Technical Assistance Round 3: Process

- NCSP partners click here (applications open today!):
  - https://forms.gle/a4LXfcXYkgZspwKo6

- Non-NCSP partners must register first; to register, click here:
  - https://ncsp.mobilize.io/registrations/groups/39758

Technical Assistance Round 3: Timeline

- *Registered NCSP Partners can apply for direct technical assistance to help accelerate their community solar goals*



NCSP Technical Assistance: Types of TA Available

- Consultation
- Presentation(s)
- Support for workshops or other meetings
- Technical review of proposed plans or documents
- General information/education to inform development of community solar initiative rules, guidelines, etc.
- Technical analysis and modeling of potential program costs, benefits and impacts
- Exploratory and foundational research
- Data analysis, evaluation, and model/tool development.

Q&A

NCSP website: www.solarinyourcommunity.org

Join the NCSP: https://ncsp.solarinyourcommunity.org/registrations/groups/39758

Apply for technical assistance (TA): https://forms.gle/a4LXfcXYkgZspwKo6

New NREL presentation: States with Community Solar Policy Updates and Capacity Growth Potential

Community Solar Market Development

Sarah Wochos

Senior Director, Policy & Business Development

Borrego Solar Systems

Community Solar Market Development

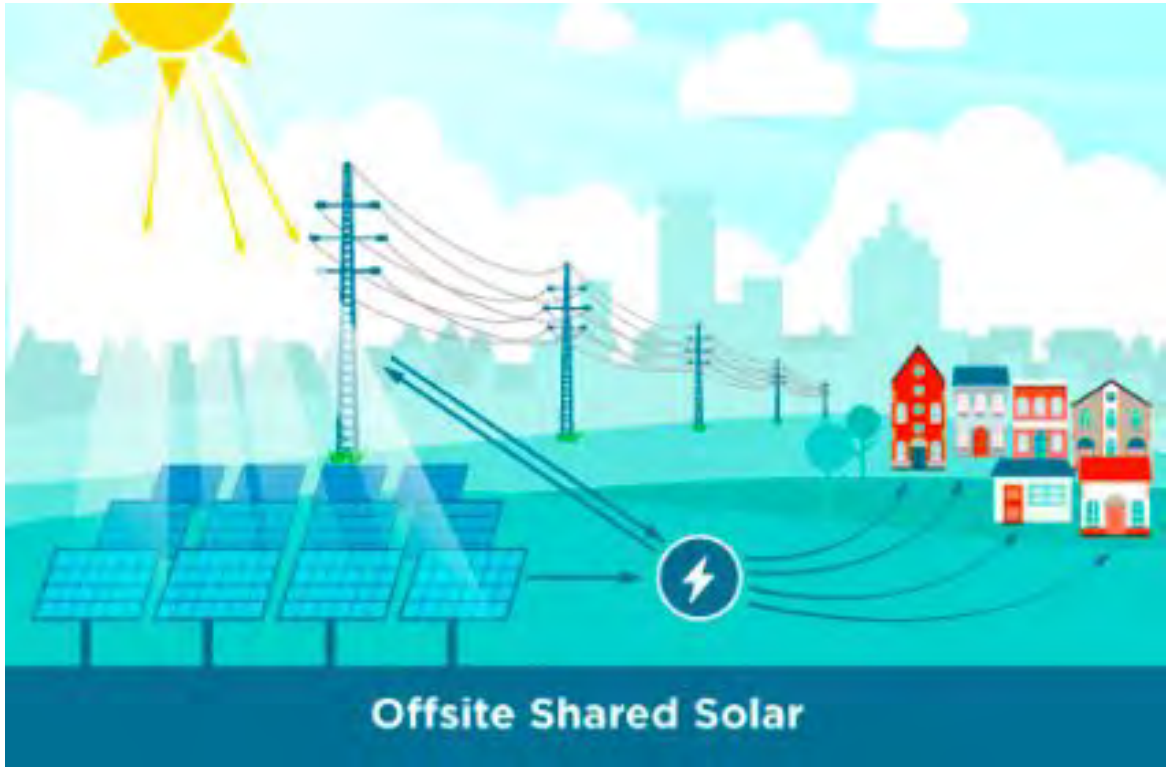
Sarah Wochos - Senior Director of Policy
and Business Development

borrego

Agenda

- Community Solar
- Typical Third Party Market Construct and Benefits
- Barriers to Community Solar
- Typical Project Overview
- Construction and Operation FAQs
- Example Borrego Projects
- Questions

What is Community Solar?



- Projects < 10 MW, but typically 2-5 MW, connected to the distribution system
- Locally sited projects in your community
- Multiple subscribers receive the energy output from a single generating facility
- Participants receive a credit on their electric utility bill for a portion of the power produced

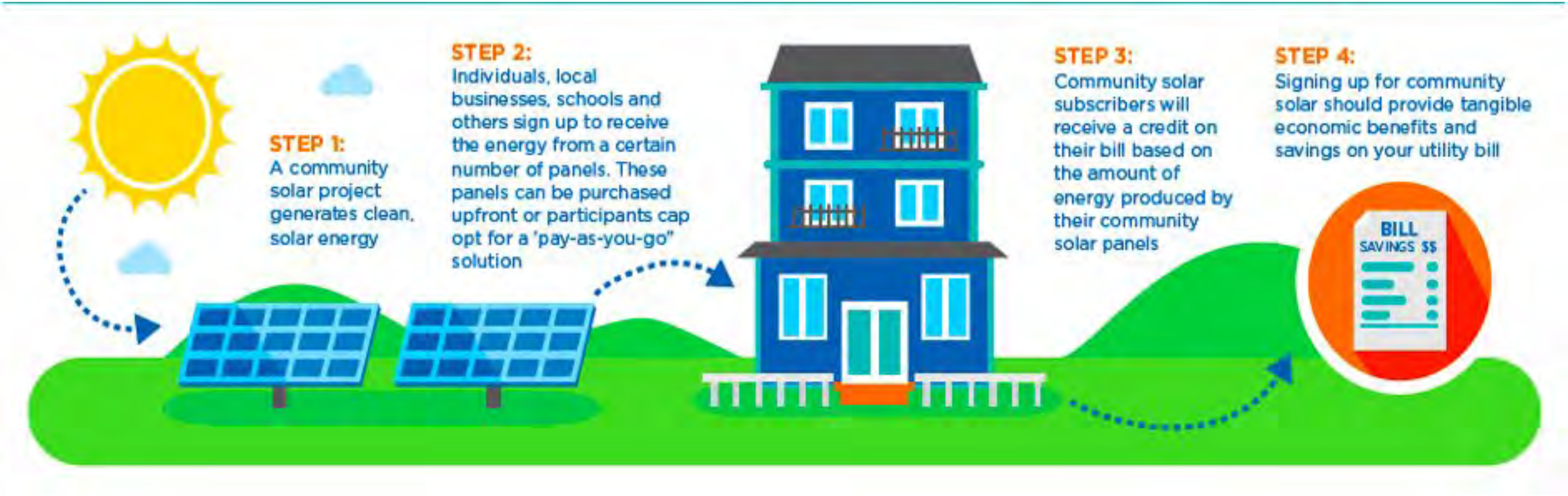
What is not Community Solar?

Community Group Purchasing, sometimes called “Solarize” programs, utilize group purchasing power to provide rooftop solar solutions at lower costs.

Utility-Scale Projects, typically 50+ MW connected to transmission system, help utilities diversify their energy portfolio but do not provide individuals and business direct access to the solar facility.

Green Tariff Programs only provide subscribers the environmental attributes from solar facilities at a premium cost -- they do not share the energy output from the solar facility and do not save subscribers money.

How Community Solar Works



Third Party-led Program

Community Solar Developer

Project Development and Maintenance

Community Solar Project

Electricity

Electric Utility

Community Solar Bill Credits

Community Solar Subscribers

Upfront or Ongoing Participation Payment

Benefits of Third Party-led Community Solar Markets

- **Competition**
  - All customers can participate regardless of their economic status or housing type.
  - Allows for different business models to meet different needs.
  - Should not be confused with retail competition - the community solar subscriber is still charged for their electric usage by the utility.
- **Savings**
  - Successful community solar markets attract participants because of potential savings.
  - Most community solar subscriptions are a $/kWh pay-as-you-go model where the credit on the subscriber's bill is more than the subscription cost.
  - Generally a monetary credit, not a kWh offset, as a separate line item on the bill. Customer is still charged for all of their electrical usage.
- **Flexibility**
  - Subscription is portable within the utility territory and transferable to another customer if they leave the utility territory.
  - Customer can sign up for as little as they want but generally not more than 120% of annual usage.

Issues and Barriers

Program Structure:

- What is a community solar facility? How big? Where can it be located? Where can it not be located?
- What is a subscriber? How many are required for each facility? What types of customers can participate?
- Who administers the program?

Bill credit:

- The authority to provide bill credit to the customer when the system is not behind the customer's meter.
- Governs how and when the credit is applied to the customer's bill, and for how long.
- May include consolidated billing or net crediting.

Bill credit value:

- The actual amount the subscriber receives per kWh on the bill.
- Also covers the value of unsubscribed energy.
- May or may not include value for the renewable energy credit.
- Statutory guidance is either explicit (i.e. applicable retail rate) or requires some investigation (i.e. value of solar, value of distributed energy resources, etc), or some combination of the two.
  - Minnesota
  - New York
  - Illinois

Issues and Barriers, Part 2

Interconnection:

- Clear rules of the road for both systems and the utility for studying the projects and managing the queue.

Participation Rules:

- How community solar entities register and fully participate in the program.
- How community solar entities ensure access to utility bill credit tariffs.
- How the community solar facility interacts with the utility.

Customer Acquisition:

- Any restrictions or mandates on customer acquisition and management.
- Are there requirements for low or moderate income participation.
- Are there requirements for residential or commercial participation.
- Consumer protections including a standard disclosure form.

Typical Site Design

- Solar panel arrays consist of trackers and racking
- Concrete equipment pad for electrical equipment
- Security fence at 7’ height
- Underground trenching/cabling
- Utility poles with overhead electric lines for local distribution grid interconnection
- Gravel access road
- Limited grading across the site to maintain drainage patterns
- Planted with pollinator mix

Source: Borrego Solar, Buckley Solar Project (NY)

Environmental Benefits

- Maintain existing drainage
- Minimal impervious areas
- Native seed mix allows for:
  - deeper root systems
  - increase to groundwater recharge
  - reduced runoff
  - habitat for pollinators
- No pesticides or fertilizers are used, which will contribute to improved public health and general welfare.

Source: Borrego Solar, Lancaster, MA

Project Benefits

- Temporary use of the space - not a permanent installation
  - Allows soil to sit fallow and increases soil productivity
- Diversify the local economy without burdening infrastructure
  - Does not require access to traditional utilities such as natural gas, water or sanitary sewer
- Provides clean energy to the grid
- Interconnection upgrades as part of the project results in reliability improvement for people

Source: Borrego Solar, Whitehall, NY

Construction and Operation FAQs

- **Decommissioning**
  - Minimal impact, removable system
  - Addressed per lease agreement or permit
  - Likely required decommissioning bond at City

- **Operations and Maintenance**
  - Remotely monitored
  - Visits 2-3 times per year for equipment
  - Visits 1-2 times per year for mowing
  - Limited pesticide/insecticide use

- **Construction Timeframe**
  - 4-6 months
  - Average 2-3 trucks per day
  - 20-30 construction jobs

- **Community Impacts**
  - Noise - only during construction
  - Little/no impacts on local utilities or services
  - No adverse effect on property values
  - Property taxes - to engage Assessor for final value

Local economic benefits

- Borrego employs anywhere from 50 to 150 people to work on a project for various levels of time
- The full time equivalent is usually in the 20-30 range for a 3 MW AC project
- Borrego pays local employees per diem during construction for lodging and meals
- This does not include the local spending by in-state consultants and other employees that are employed by Borrego as part of the development and construction team
- Borrego would utilize local building materials, to the maximum extent practicable, for site development and construction.
- Usually, Borrego sources steel, concrete, gravel, seed and electrical materials locally.

Job Category	Job Type
Construction	
	Civil Work
	Module Installation
	Electrical work
	Structural work
	Fencing contractor
	Landscaping contractor
	Tree removal services, if necessary
	Signage
	Traffic Control
	Equipment Storage
	Office Trailer Rental
	Dumpster Rental
	Generator Rental
	Bathroom and Wash station rental
	Insurance
	Performance Bonds company
Long-Term O&M	
	Electrical contractor
	Landscaping (mowing)
	Snow removal

Sample of Borrego's Illinois Community Solar Projects

Source: Borrego Solar, Fulton, IL

Source: Borrego Solar, Clinton, IL

Sample of Borrego's NY Community Solar Projects

Source: Borrego Solar, Knox, NY

Source: Borrego Solar, Whiteside, NY

Thank you!

Sarah Wochos

Michigan (MI) Solar Communities – Low to Moderate Income Access

Lisa Thomas

Engineer, Energy Services

MI Department of Environment, Great Lakes, & Energy

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Michigan (MI) Solar Communities – Low to Moderate Income Access

By:
Lisa Thomas

Energy Services

EGLE

How it Started

- What is CELICA?
  - The Clean Energy for Low Income Communities Accelerator (CELICA) is a voluntary partnership between the U.S. Department of Energy and state/local governments.
- What is the goal?
  - To provide access to renewable energy and demonstrate a wide range of locally designed solutions for low income. Michigan joined the Accelerator in 2018.
- MI Solar Communities – Low to Moderate Income Access
  - Continued the CELICA program after the DOE program ended to continue to provide access to alternative energy
  - Address low-income energy challenges
  - State government and energy service providers partnerships
  - Sustainable Value-Added Programs and Services (VAPS)

EGLE

Phase I – Co-op Utility

- Partners: Energy Services, formerly under the Michigan Energy Office (MEO), Michigan Department of Health and Human Services (DHHS), Local Electric Utility, & Local Community Action Agency (CAA)
- Subscribers: 50 households. Previously weatherized, income-qualified (at or below 200% FPL) households, within electric utility territory
- Each household received the credits for the energy produced by 9 solar panels

Phase II – Municipal Utility

- Partners: Energy Services, Michigan DHHS, Village of L'Anse , & Baraga Houghton Keweenaw Community Action Agency (BHK)
- Subscribers: 25 households. Previously weatherized, income-qualified (at or below 200% FPL) households
- The panels are paid for by contributions from Energy Services and a subscriber on-bill fee of $.90/panel/month

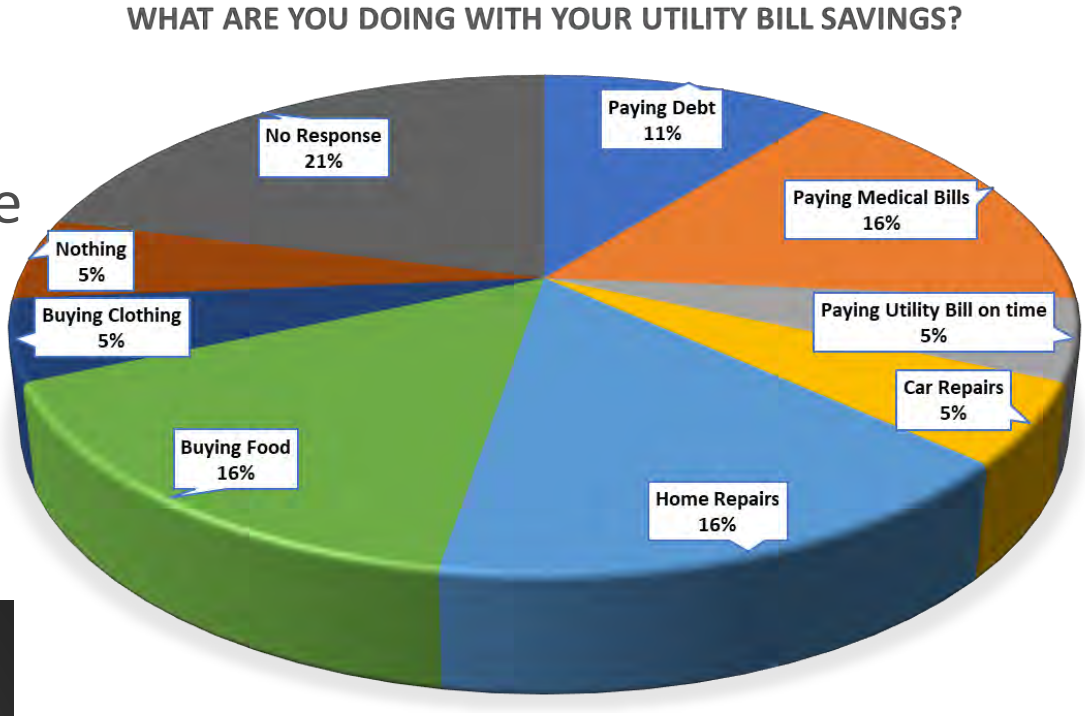
Phase III – Investor-Owned Utility

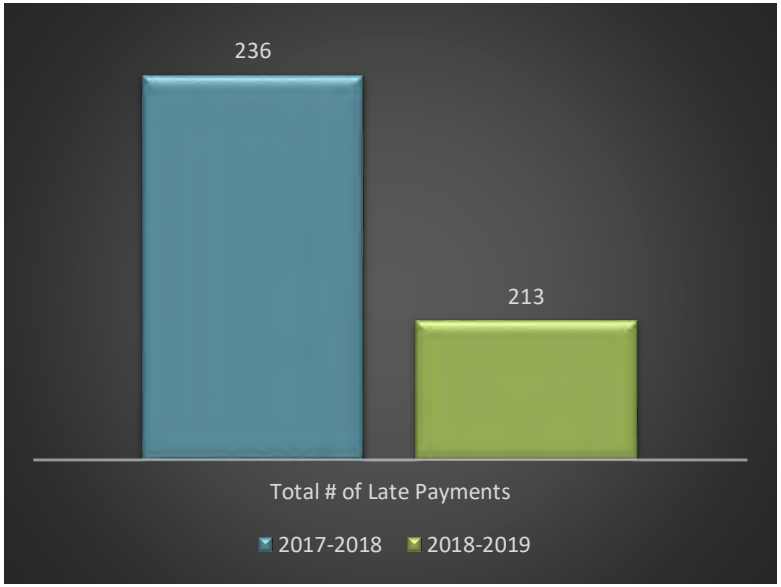
- Partners: Energy Services, Michigan DHHS, Capital Area Community Services, & Consumers Energy Company (CEC)
- Subscribers: 50 households. Newly weatherized, Gas and Electric CEC customers, income-qualified (at or below 200% FPL) households
- Partners signed the agreement in 2021, households will be enrolled in the Solar Gardens program

EGLE

Cherryland Survey Results

- 10% Late Payment Decrease
- Survey Comments:
  - Less Stress
  - Warmer & Healthier Home Temperature





Subscriber Benefits

- Receive weatherization
- Receive solar credits
- Become energy self-sufficient

Program Analysis & Next Steps

Program Successes

- Partnerships Willingness
- Locally designed Project
- Address Energy Burden & Cost

Lessons Learned

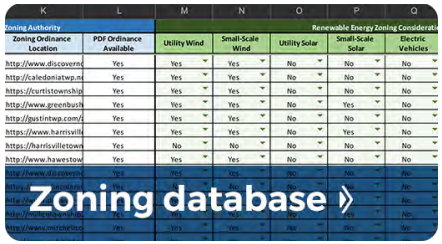
- Data Analysis
- Understanding Our Subscribers
- Income Verification

Next Steps

- Develop guidance & best practices for other communities to replicate
- Identify sustainable funding options outside of EGLE grants

EGLE

Related Programs



- **Michigan Zoning Database**
  - Free database that catalogs the zoning of Michigan's 1,856 jurisdictions and identifies those that reference renewable energy
- **Community Energy Management Program**
  - Communities can apply for renewables after energy efficiency upgrades
- **MI Clean Energy Assets Roadmap**
  - Grants to entities to establish Michigan Clean Energy Assets Roadmaps for renewable energy (i.e. wind, solar and geothermal) and clean energy technology development

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Contact Us

Lisa Thomas
ThomasL17@Michigan.gov
517-282-6646

www.Michigan.gov/Energy

EGLE

MI POWER GRID

Making the Most of Michigan's Energy Future

New Technologies and Business Models

Break: 2:15 – 2:25 PM

Stakeholder Meeting 4: Behind the Meter & Community Solar

March 10, 2021

MPSC

Michigan Public Service Commission

Panel: It Takes a Village…Raising Successful Community Solar

Moderator

Cody Matthews
Engineer, Renewable Energy
Michigan Public Service Commission

Valerie Brader
Chief Executive Officer
Rivenoak Consulting, Inc.

Debbie Fisher
Executive Director
HOPE Village Revitalization

Robert LaFave
Village Manager
Village of L'Anse

John Kinch
Executive Director
Michigan Energy Options

Matthew McDonnell
Managing Director, US Consulting
Strategen

MI POWER GRID

Making the Most of Michigan's Energy Future

New Technologies and Business Models

Break: 3:20 – 3:25 PM

Stakeholder Meeting 4: Behind the Meter & Community Solar

March 10, 2021

MPSC

Michigan Public Service Commission

BTM Solar Trends, Integration Challenges & Ownership Models

Douglas Gagne

Researcher III, Economic/Financial Analysis

National Renewable Energy Laboratory

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

BTM Solar Trends, Integration Challenges and Ownership Models

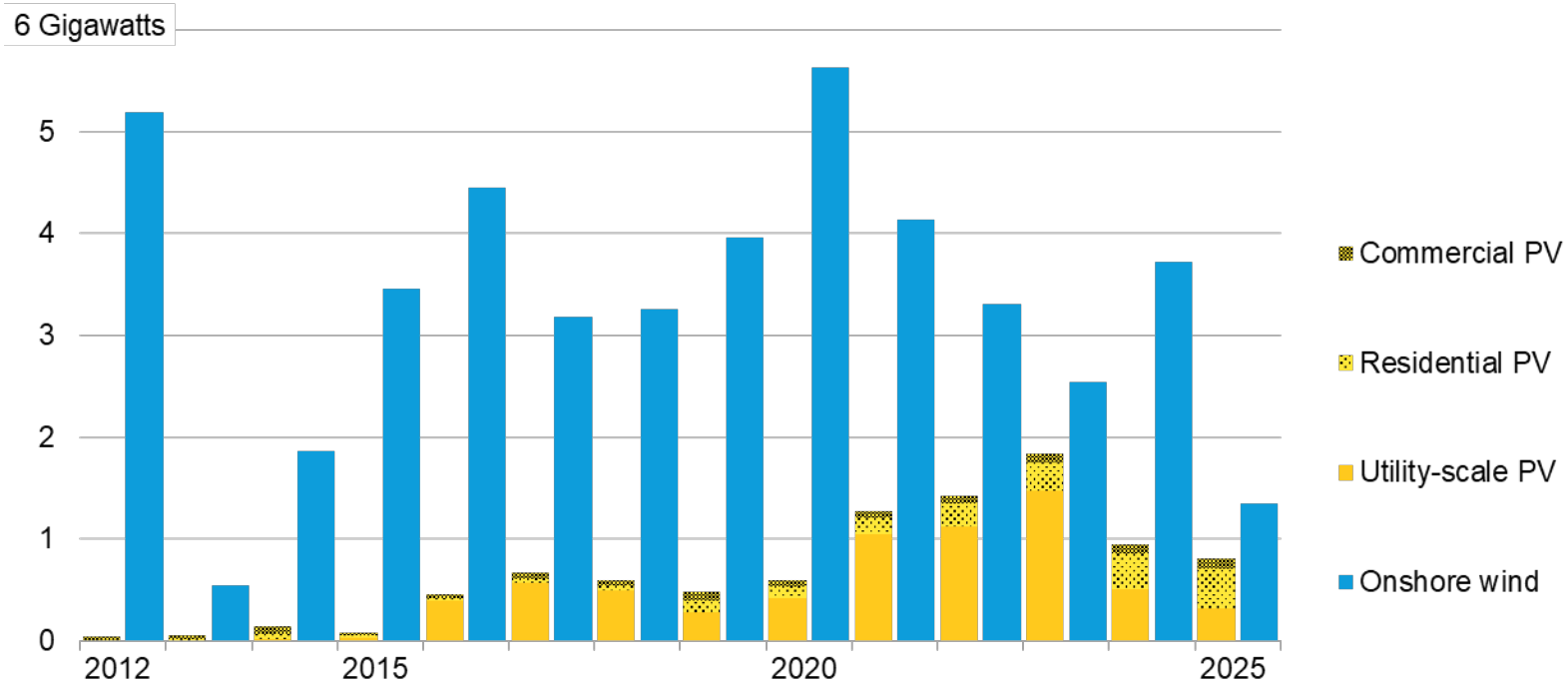
Douglas Gagne, National Renewable Energy Laboratory
March 10, 2021

Presentation Overview

- BTM Solar Deployments and Cost Projections
- Evaluating BTM Projects
- Regulatory Landscape for BTM
- BTM Utility Ownership Models

BTM Solar Deployments and Cost Projections

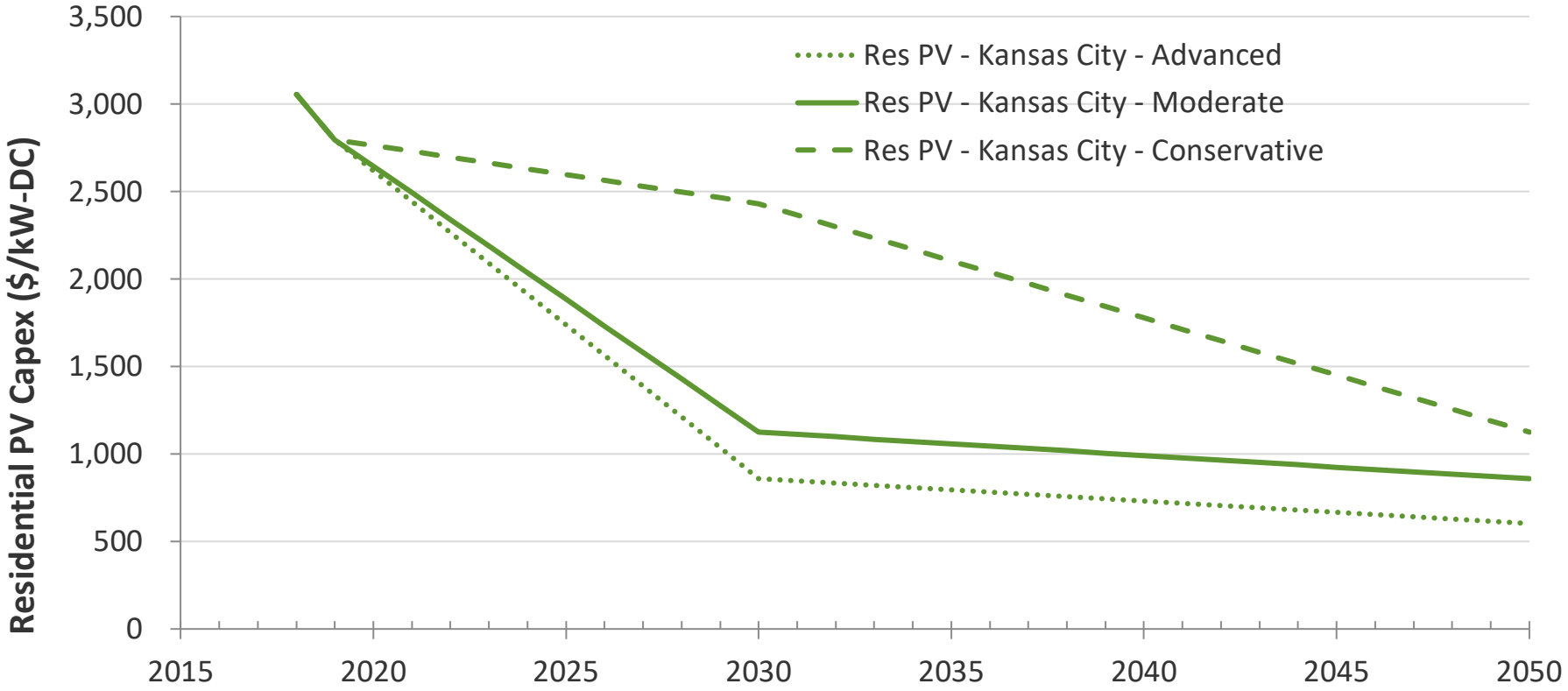
Annual Midwest wind and solar capacity additions



Source: BloombergNEF. 2H 2020 U.S. Renewable Energy Market Outlook

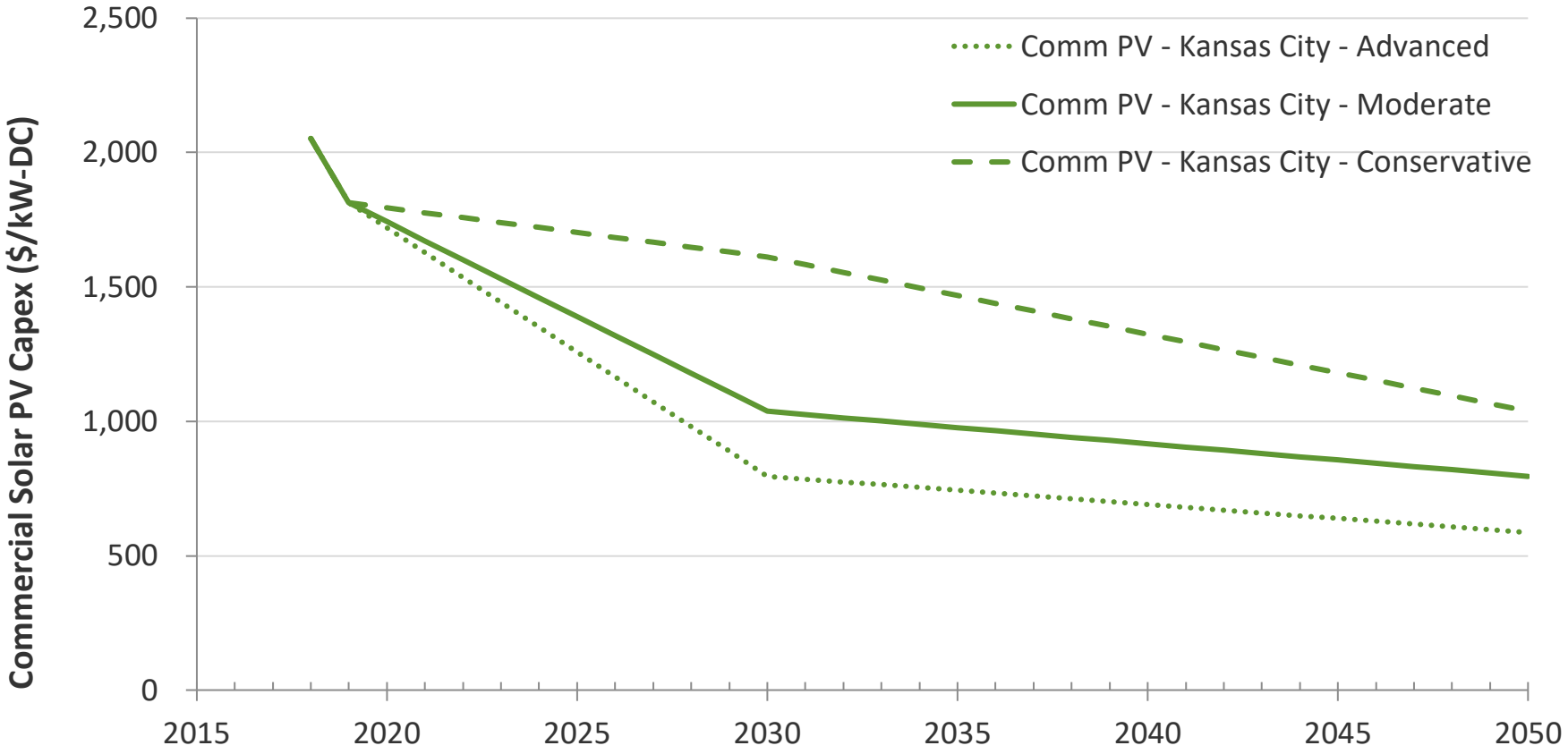
BloombergNEF

BTM Cost Trends- Residential



NREL ATB 2020 https://atb.nrel.gov/

BTM Cost Trends- Commercial



NREL ATB 2020 https://atb.nrel.gov/

Evaluating BTM Technologies

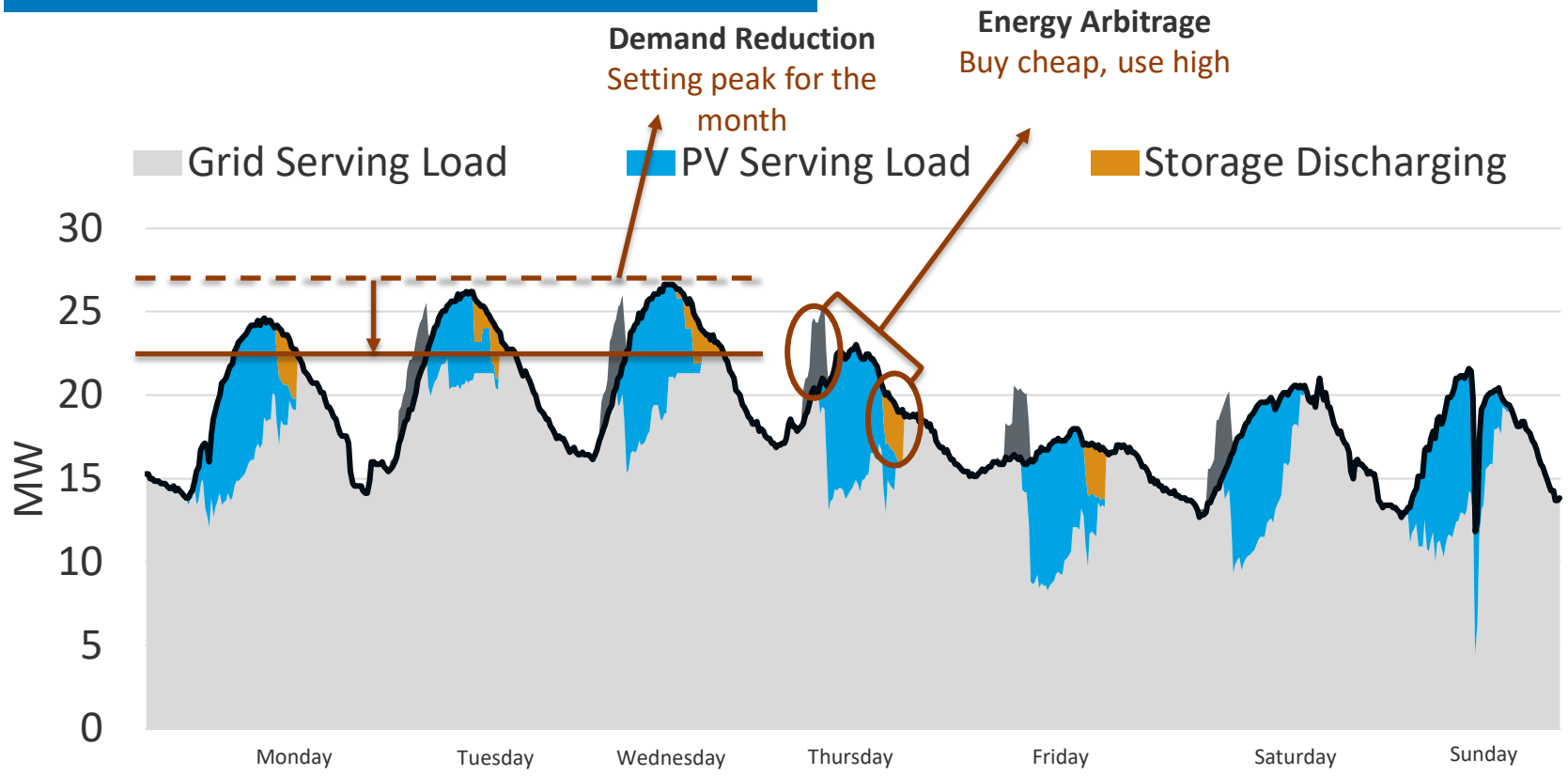
Range of PV + Storage Use Cases

	Off Grid PV + Storage	Grid Connected PV + Storage	Grid Connected PV + Storage with Microgrid	PV + storage for Large-scale Power Generation
Purpose	Providing continuous power in lieu of utility	Lowering cost of utility purchases	Lowering cost of utility purchases Providing power during grid outage	Large-scale generation for off-site sale
Why/Where it works	• Remote sites with high fuel costs • Low grid reliability	• High demand charges • TOU rates • Ancillary service markets	• High demand charges • TOU rates • Ancillary service markets • Resilience requirements	• Deregulated market • Interested offtaker • large land-availability
Primary Power Supply	DERs (typically including generators)	Grid + DERs	Grid + DERs	Grid only
Back-up	None	None	DERs	Typically none but could be possible

Storage Value Streams by Use Case

Value Stream	Description	Off Grid	Grid Connected	Large Scale
Fuel Offset	Offset fuel cost in off-grid remote locations	X		
Demand charge reduction	Use stored energy to reduce demand charges on utility bills		X	
Energy Arbitrage	Energy time-of-use shift (from on-peak to off-peak hours or selling during high cost and charging during low cost)		X	X
Demand response	Utility programs that pay customers to lower demand during system peaks		X	
Frequency regulation and capacity markets	Stabilize frequency on moment-to-moment basis or supply spinning, non-spinning reserves (ISO/RTO)		X	X
Voltage support	Insert or absorb reactive power to maintain voltage ranges on distribution or transmission system			X
T&D Upgrade Deferral	Deferring the need for transmission or distribution system upgrades, e.g. via system peak shaving			X
Resiliency / Back-up power	Using battery to sustain a critical load during grid outages		X	

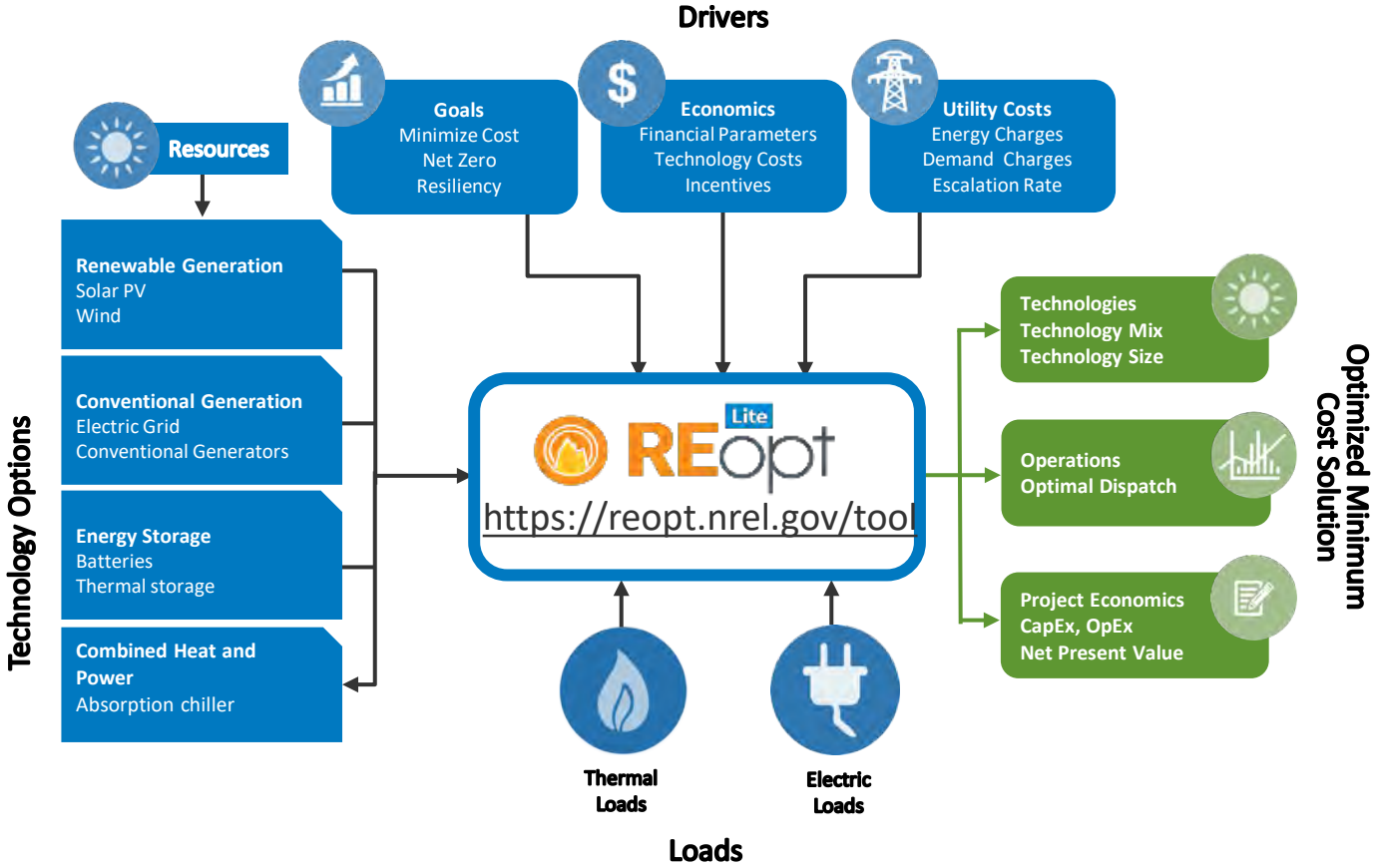
Example of Demand Reduction and Energy Arbitrage



BTM Technology for Resilience

- **BTM technologies include renewable energy (RE) technologies, storage, and combined heat and power (CHP)**
- **They can provide revenue streams and savings while grid connected**
  - Savings may allow for the incorporation of additional microgrid components
- **When integrated into a microgrid, they can increase survival time during a grid outage when fuel supplies are limited**

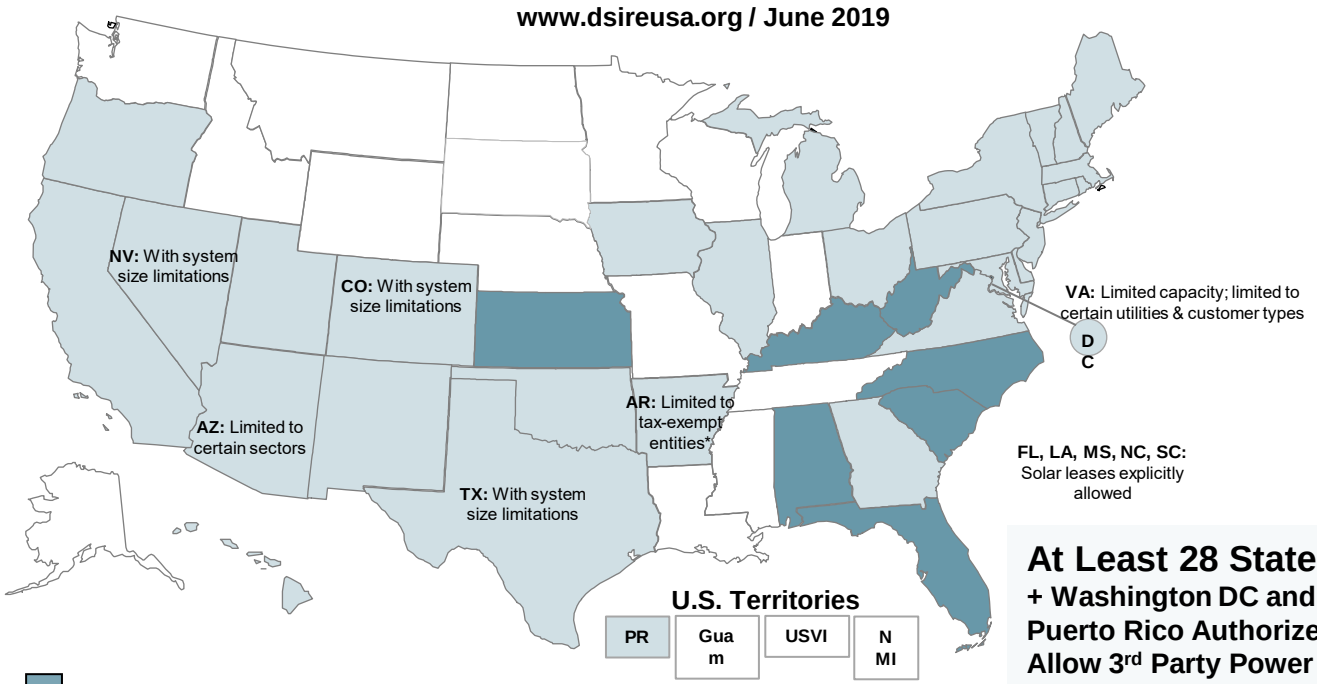
REopt Lite: Free Web Tool to Optimize Economic & Resilience Benefits of DERs



Regulatory Landscape for BTM Technologies

3rd Party Solar PV Power Purchase Agreement (PPA)

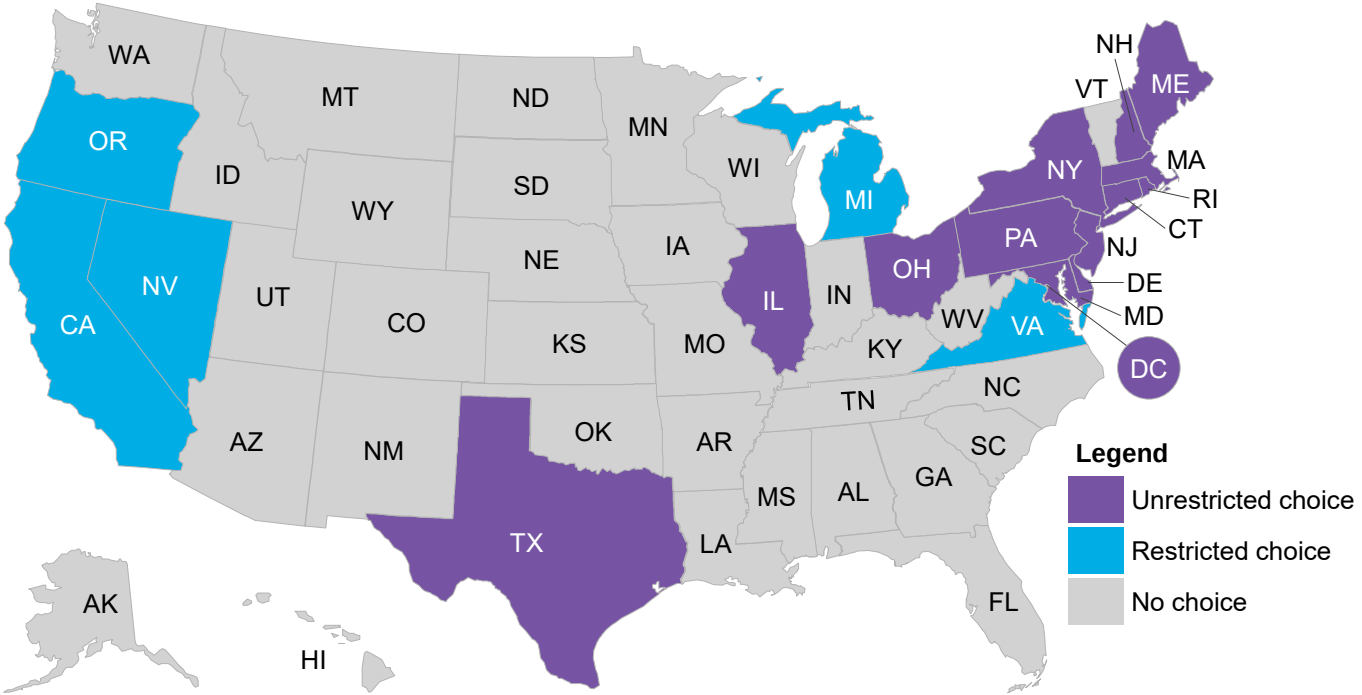
www.dsireusa.org / June 2019



At Least 28 States
+ Washington DC and Puerto Rico Authorize or Allow 3rd Party Power Purchase Agreements for Solar PV

* Commission rules implementing recent statutory changes have not yet been adopted

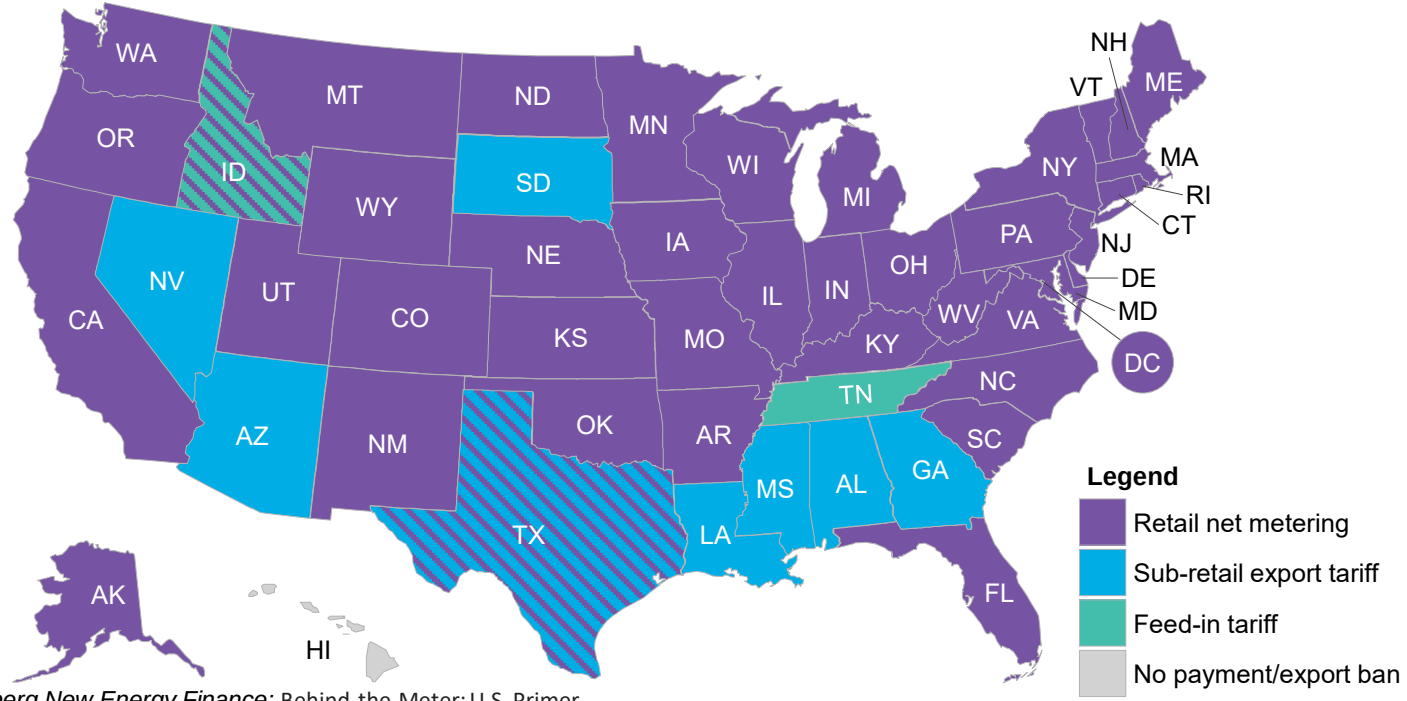
Availability of retail choice



Source: Bloomberg New Energy Finance: Behind-the-Meter: U.S. Primer

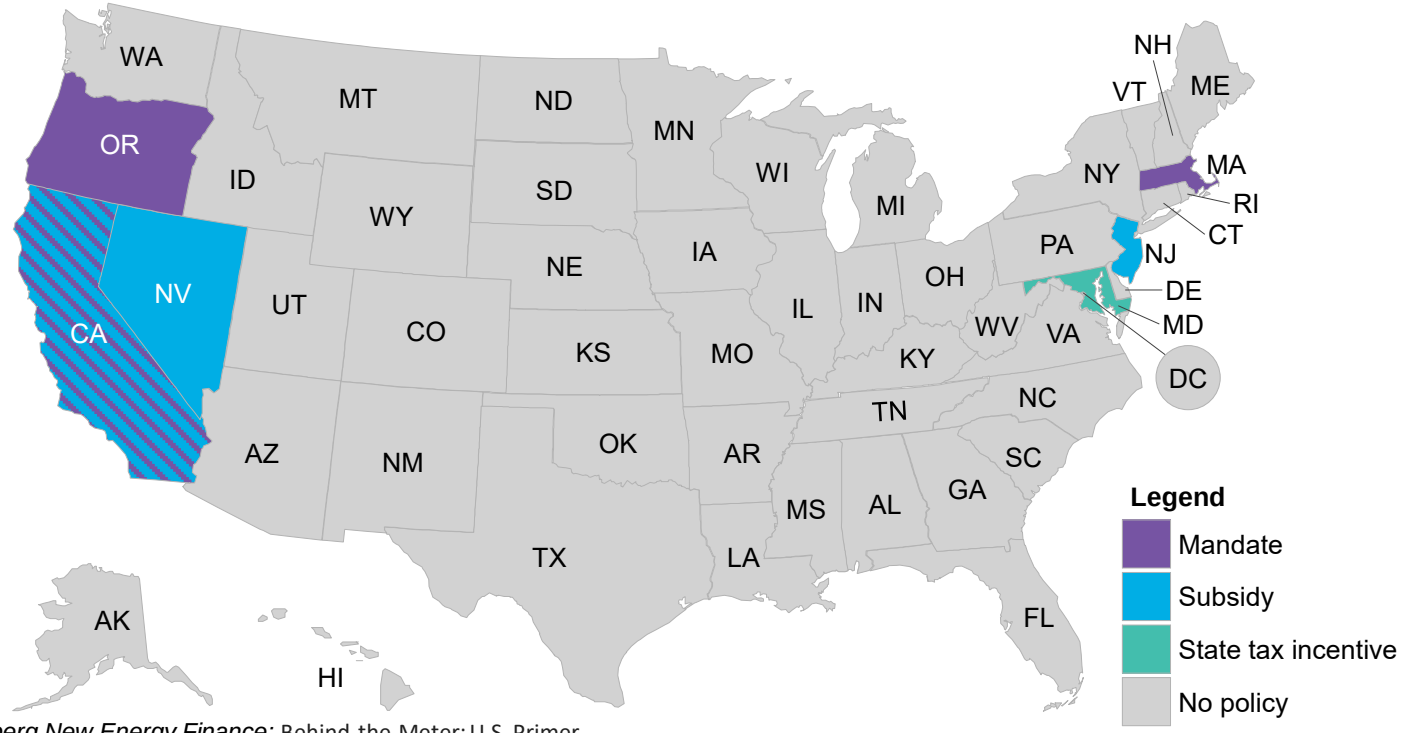
BloombergNEF

State and city solar mandates



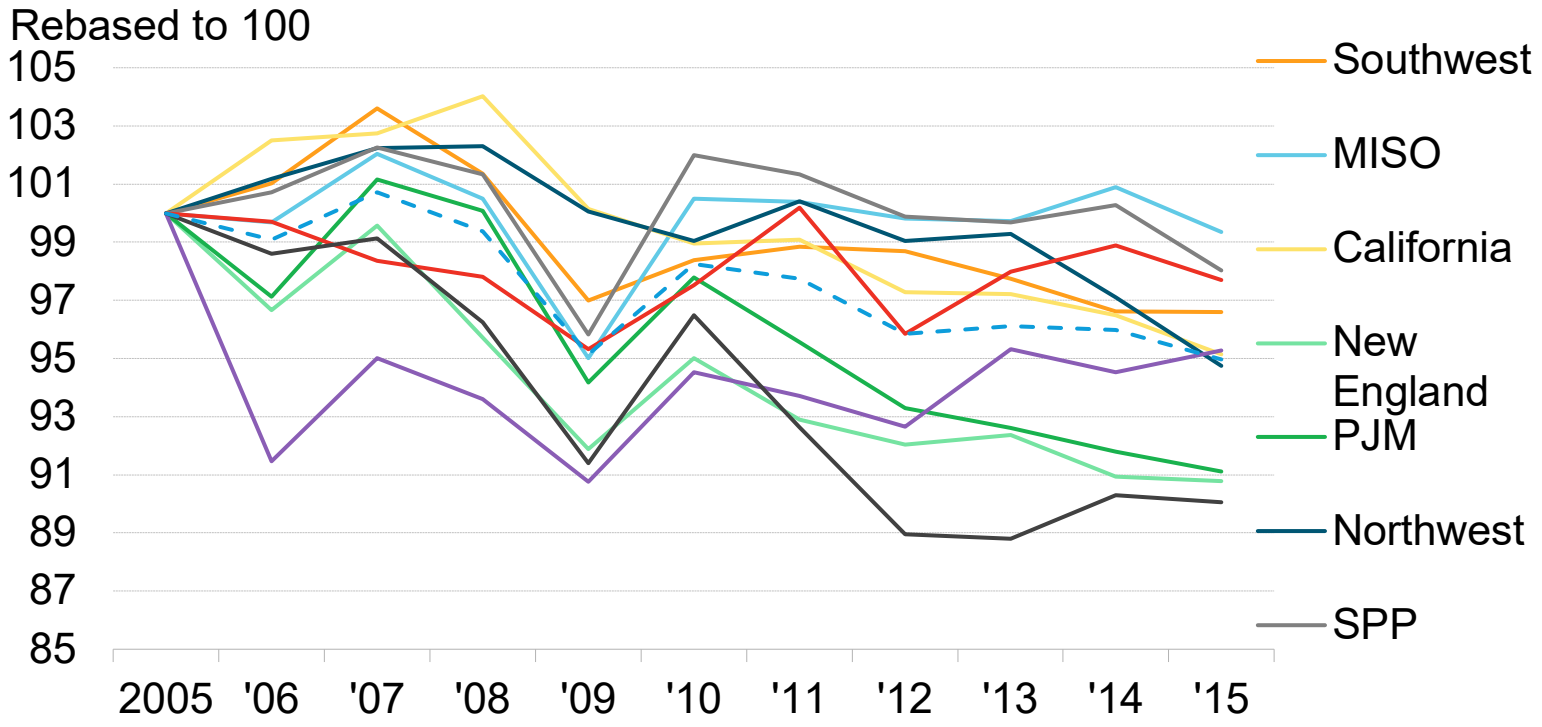
Source: Bloomberg New Energy Finance: Behind-the-Meter: U.S. Primer

BTM energy storage incentives and mandates



Source: Bloomberg New Energy Finance: Behind-the-Meter: U.S. Primer

U.S. electricity demand per capita



Source: Bloomberg New Energy Finance, EIA, U.S. Census Bureau. Note: 2005 values rebased to 100

Utility-Owned BTM Business Models

Rooftop Leasing

Utility-owned rooftop solar PV

Utility-Led Community Solar

Utility-owned system, to offset multiple individual households' consumption

BTM Facilitator Model

Utility-led platform to connect DG market participants

What is Rooftop Leasing?

Rather than simply facilitate interconnections of BTM systems on their grids, some utilities have developed business models where they own and operate BTM systems on customer rooftops.

Benefits:

- Can rate-base the assets
- Can strategically locate PV for T&D deferral, local voltage support
- Increased generation diversity (more distributed)

Costs:

- More expensive than utility-scale solar projects
- Requires upfront capital investment
- Faces competition from third-party solar developers
- Regulatory structure may limit progress

What is Community Solar?

- A *jointly owned* system, or a *third-party*-owned (TPO) system, to offset multiple individual businesses' or households' consumption participating in the program (DOE/NREL 2015)
- Participants ("subscribers") purchase a *share of the total energy produced* by the site and receive the benefits on their electric bill (GTM 2015).
- Upfront payment or pay-as-you go, monthly payments
- Emerging vehicle for including low-income customers in solar projects

NREL photo database

- Facilitated by community solar legislation and/or virtual net metering regulations
- Also known as solar gardens, shared solar or roofless solar

Facilitation Business Model

- Residential customers are at a significant disadvantage during procurement, leading to higher system pricing
  - Potential justification for monopolistic force entering into competitive/private market (customer protection)

- Utility plays role of:
  - Periodic aggregation of customer interest
  - Competitive procurement (and financing) facilitator on behalf of customers
  - Can offer both individual and community PV systems

Utility investments in distributed solar

Utilities have made significant investments both in distributed solar companies as well as in tax equity funds that invest in solar projects.

- According to market research from GTM* since 2010, nearly $3 billion has been invested by utilities in both North America and Europe into distributed energy companies, including distributed solar.

- Utility-affiliated companies have also made investments in investment funds that invest in residential solar projects. Benefits from such investments include tax benefits as well as a better understanding of distributed solar markets and customers.

https://www.greentechmedia.com/articles/read/utilities-have-invested-over-2-9-billion-in-distributed-energy-companies#gs.I5oJHr0

Questions?

www.nrel.gov

Douglas Gagne, NREL
Douglas.gagne@nrel.gov

This work was authored by Alliance for Sustainable Energy, LLC, the Manager and Operator of the National Renewable Energy Laboratory for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office. 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 article 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.

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Disclaimer

- Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

- The analysis results are not intended to be the sole basis of investment, policy, or regulatory decisions.

- The data, results, conclusions, and interpretations presented in this document have not been reviewed by technical experts outside NREL.

Panel: Looking Ahead at Behind the Meter Solar

Moderator

Julie Baldwin
Manager, Renewable Energy
Michigan Public Service Commission

John Freeman
Executive Director
Great Lakes Renewable Energy Association

Amy Heart
Senior Director, Public Policy
Sunrun

Craig Toepfer
Solar Homeowner

Leah Wiste
Executive Director
Michigan Interfaith Power & Light

Ken Zebarah
Director of Sales, Commercial/Ag
Harvest Solar

MI POWER GRID

Making the Most of Michigan's Energy Future

New Technologies and Business Models
Closing Comments

Stakeholder Meeting 4: Behind the Meter and Community Solar

March 10, 2021

MPSC

Michigan Public Service Commission

Thank You and Please Stay Engaged!

- Thank you for your participation
  - Share your thoughts through:
    - Meeting survey
    - Meeting chat
      - Remains open for comments or discussions after meeting.
      - Easier to access with the Teams App
    - Stakeholder comment section of workgroup website
      - Send a document to be posted to the comment section via email to Joy Wang at WangJ3@Michigan.gov
- Please stay engaged
  - Sign up for the listserv if you have not already
    - Go to MI Power Grid New Technologies and Business Models workgroup page
    - Scroll to bottom to add email
  - Attend future meetings
    - Next meeting on March 24 from 1 – 5 PM
    - Topic: Storage
  - Speak at a future meeting
    - Limited slots available for stakeholder input/experiences
    - If interested, email: Joy Wang at WangJ3@Michigan.gov

Thank you!