

The Vision for U.S. Community Solar: A Roadmap to 2030

Prepared For:



VOTE SOLAR

EXECUTIVE SUMMARY

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Acknowledgements

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VOTE SOLAR

With special thanks to our project partners Coalition for Community Solar Access and GRID Alternatives



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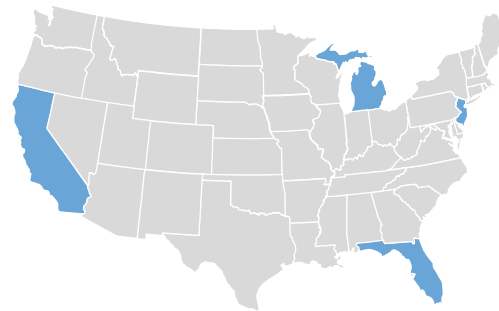
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A Vision for Community Solar: Study Overview

We establish a vision for a market where community solar is a mainstream option for consumers to choose and control their own energy generation — especially for those lacking access to traditional solar options, such as renters and the low- and moderate-income community.

This Vision for Community Solar:

- [Outlines Benefits of Community Solar and Subscriber Preferences](#)
- [Addresses Key Bottlenecks to the Expansion of Community Solar](#)
- [Provides Strategies to Enhance Inclusivity of Low- and Moderate-Income Populations](#)
- Walks through National Market Potential and Forecasts for Community Solar along with Deep Dives in 4 States:
 - [California](#)
 - [Florida](#)
 - [Michigan](#)
 - [New Jersey](#)
- [Presents the National Impacts of Community Solar Market Transformation](#)



Community Solar Makes Solar an Option for Everyone with an Electric Bill

U.S. consumers want solar...

The number of solar energy systems purchased by U.S. homeowners and businesses has grown tenfold since 2010. By the end of 2018, nearly 2 million homeowners and businesses will produce their own solar energy.

...and solar is getting more affordable

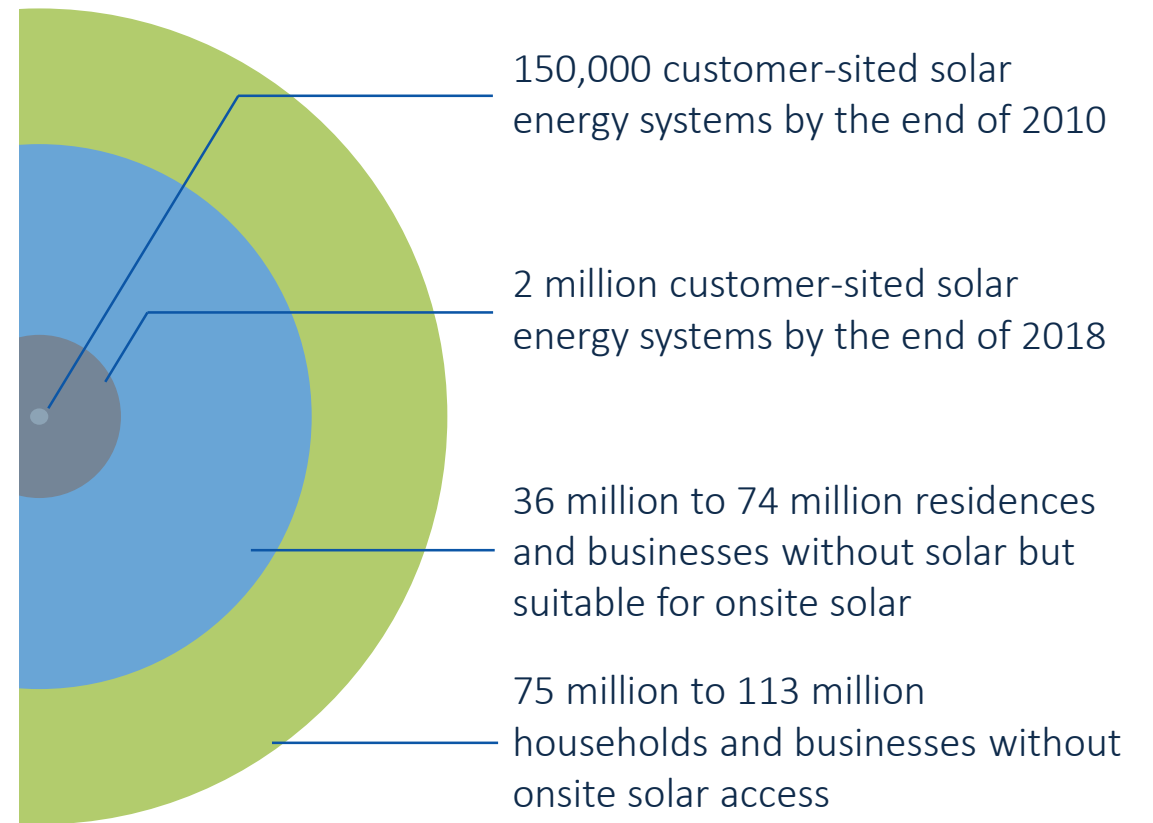
The price of rooftop solar has fallen by 40% in the past five years and currently beats the average retail price of electricity in 27 states and Washington, D.C.

...but access to solar is limited.

Between 50% and 75% of U.S. consumers cannot access traditional rooftop solar, either because they do not own their roof or due to technical restrictions. Community solar gives all 151 million electricity customers in the U.S. an opportunity to directly participate in solar.

Community solar gives all customers the ability to choose local clean electricity that can support local economic development, resiliency and healthier communities.

Community Solar Can Reach All Potential U.S. Customers



Source: GTM Research Wood Mackenzie, GTM Research/SEIA, NREL, EIA, U.S. Census

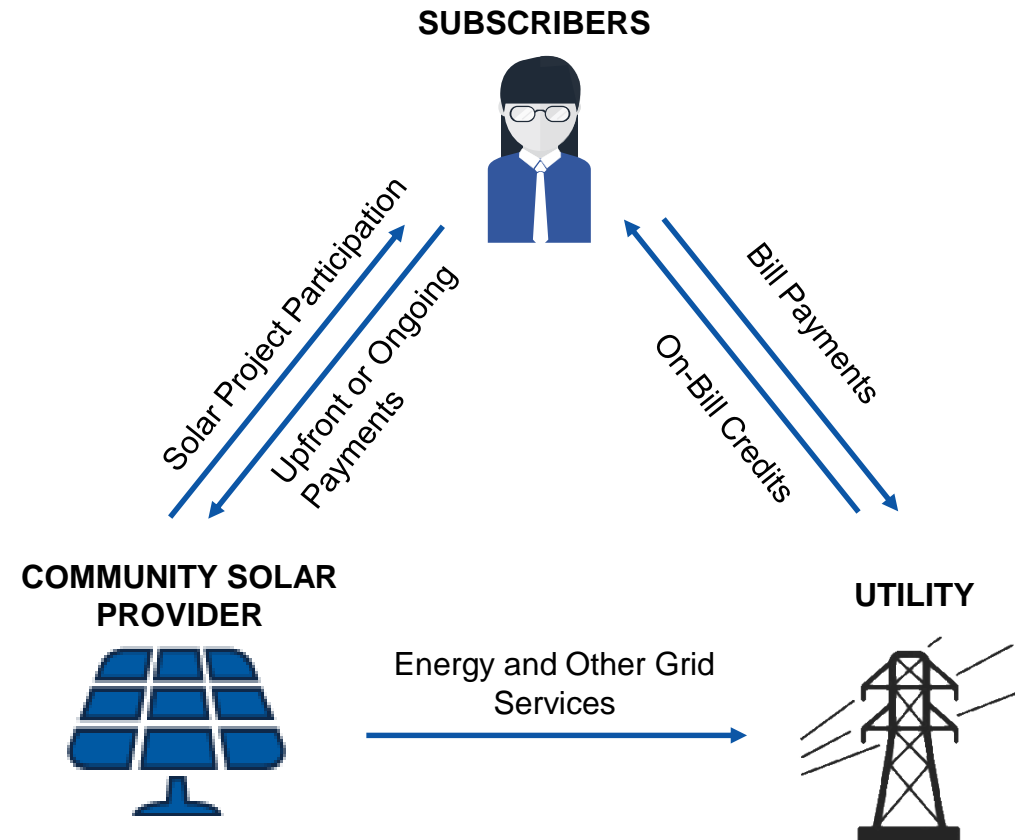
Defining Community Solar

Community solar – also called shared solar or solar gardens – refers to local solar facilities shared by multiple subscribers that receive credit on their electricity bills for their share of power produced.

Over the years, many projects have been labeled community solar, but we define **community solar** as a solar project with **multiple subscribers that receive on bill benefits directly attributable to the community solar project.**

- Subscribers must be credited with the benefits of community solar on their electric utility bills, either in the form of a monetary or energy (kWh) credit
- Subscribers must be tied to a specific solar project of which they are direct subscriber, not generic renewable certificates

The Community Solar Model



Source: GTM Research Wood Mackenzie

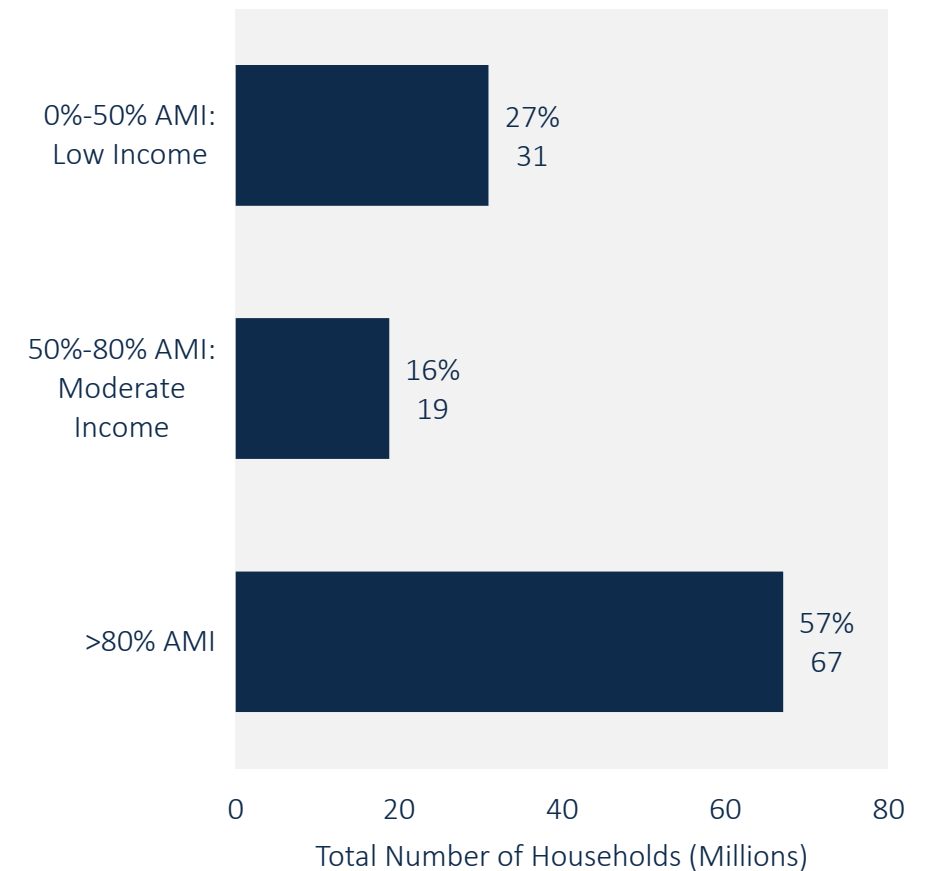
Community Solar Can Empower Communities Most in Need

50 million reasons why community solar needs to tap into the low-to-moderate income customer segment

Why community solar is the key to unlocking 50 million low-to-moderate income (LMI) households' access to clean, affordable energy solutions...

- The LMI subscriber opportunity is massive, accounting for approximately 43% of U.S. households. Of that total, there are 31 million low-income households, 19 million moderate-income households, and 5.78 million affordable housing properties across the U.S. that would benefit from cost-saving community solar solutions.
- Community solar provides the **flexibility to deliver clean energy access to all LMI customers, including renters and multifamily housing** – which LMI households are more likely to occupy.
- **Community solar also offers significant benefits to low-income customers**, including opportunity for bill savings and energy burden reduction, targeted, flexible value propositions tailored to LMI customers' unique needs, and local economic opportunity to drive the clean energy transition.
- At the same time, the LMI subscriber opportunity remains untapped, in large part due to higher costs to acquire LMI subscribers and limited access to capital for community solar projects involving LMI subscribers.
- But with the right combination of **policy solutions, incentives, consumer protections, business model innovations, financing and programmatic support**, there's an opportunity for community solar to play a critical role in creating an equitable clean energy future.
 - Targeted policy, financing and subscriber management solutions can reduce the perceived risk of serving LMI households and deliver significant benefits to LMI customers.

Share of U.S. Households:
Low-to-Moderate Income (LMI) vs. Non-LMI



Source: NREL, 2018

An Equitable Transition to Serve Communities of Color and Environmental Justice Communities

Communities of color and environmental justice communities must also have equitable access to clean energy solutions

- LMI households are not the only customer segment that must proactively be included in solar markets moving forward. This work must also extend to communities of color and environmental justice communities. **Community solar can be used as a tool to target benefits to communities who have historically been at the front lines of environmental pollution and negative impacts from traditional energy generation.**
 - Fossil fuel power has disproportionately impacted the health and well-being of low-income communities, particularly communities of color and indigenous communities. Emissions from power plants sited in these communities contribute to high rates of asthma and cancer, and the presence of heavy industry contributes to a cycle of poverty and public disinvestment in neighborhoods that can least afford it.
 - Approximately 68% of African Americans live within 30 miles of a coal-fired power plant and nearly 40% of communities of color breathe polluted air. Meanwhile, environmental justice communities are disproportionately affected by public health effects of traditional generation.

Policymakers can target the benefits of community solar to communities of color and environmental justice communities through a number of strategies. Support can include program carve outs, job training programs, project ownership, siting preferences and incentives specifically focused on communities who have been disproportionately impacted by the electric system to date.

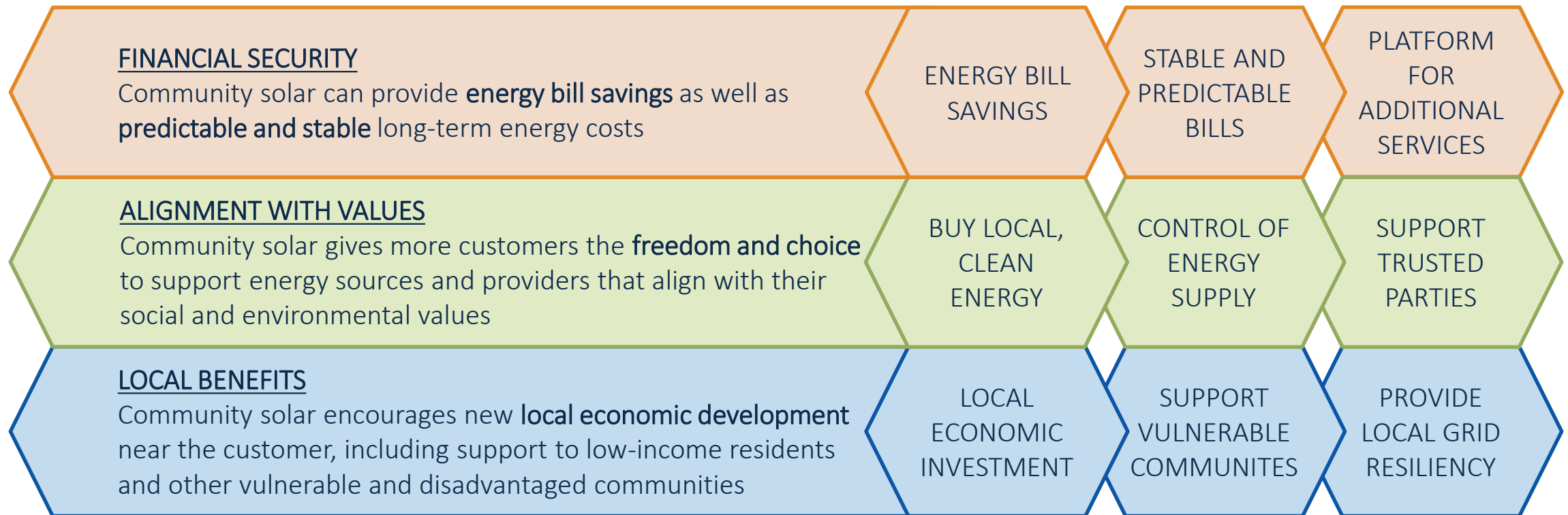
- Such solutions would not only provide **workforce development opportunities**, but also enable legislators and regulators to better quantify and measure **public health benefits** of community solar that displaces the need for fossil fuel generation.
- This report acknowledges that environmental justice communities and communities of color are critical to serve in the nation's transition to a low-carbon electricity system. Analysis of community solar's addressable market focuses on low and moderate income households, affordable housing owners and affordable housing tenants.

Source: Low-Income Solar Policy Guide, 2018

Community Solar Can Be an Attractive Solution for All Electric Customers

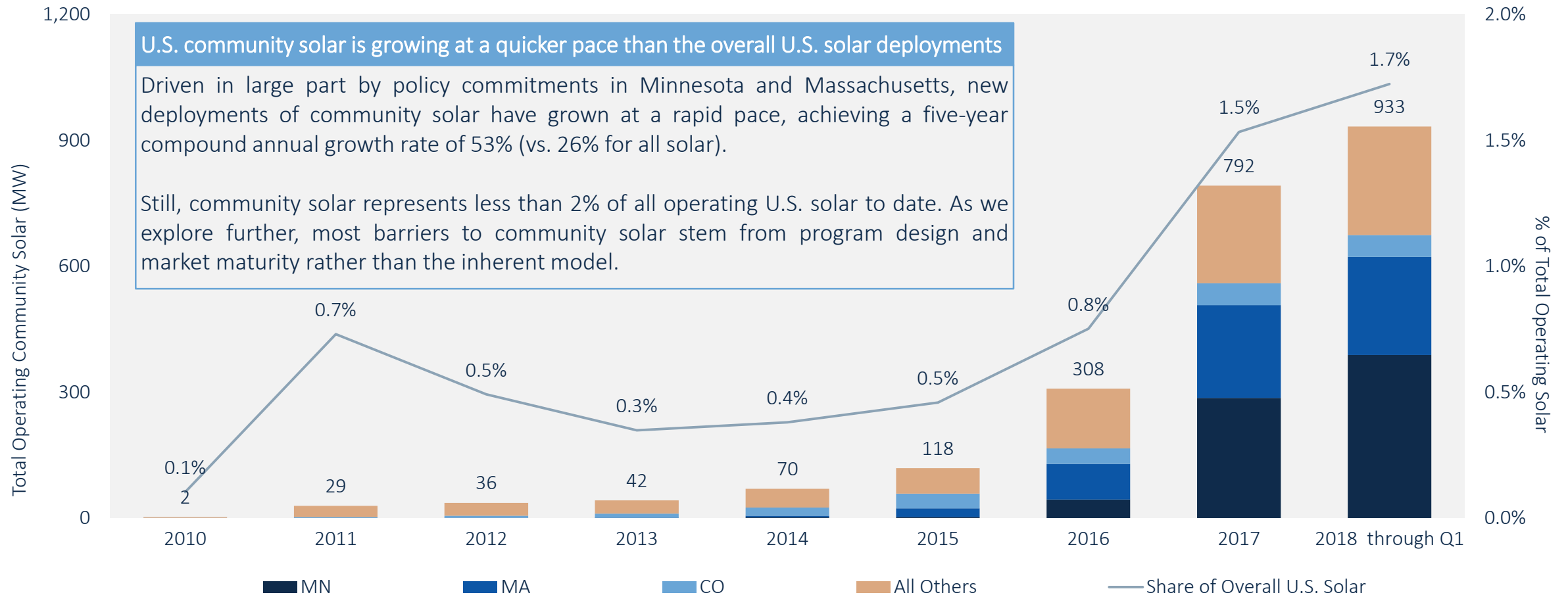
Community solar expands the important benefits of distributed solar to a much broader set of consumers, while also bringing unique solutions to physical, financing and equity challenges of onsite solar and current competitive retail electricity offerings.

Community solar is an energy source that ultimately provides:



U.S. Community Solar Nears 1 GW of Total Capacity Operating Nationwide

Cumulative U.S. Community Solar Installed Capacity by State



Source: GTM Research Wood Mackenzie

Community Solar Is Small Today — but It Can Rapidly Become a Mainstream Energy Source

If all states enabled community solar and adopted market rules that recognize the benefits community solar brings to subscribers and broader stakeholders – it could transform the energy landscape.

New programs can benefit by learning from early pioneers, leveraging solar’s significantly reduced costs and drawing upon best practices—ultimately giving customers of all types, income-levels and geographies access to the rapidly growing clean energy economy.

U.S. Community Solar Market Potential by 2030

Total Community Solar Capacity Operating: **57 GW to 84 GW**

Annual Electricity Generated: **72 TWh to 107 TWh**

- Share of National Electricity Consumption: **1.6%-2.6%**

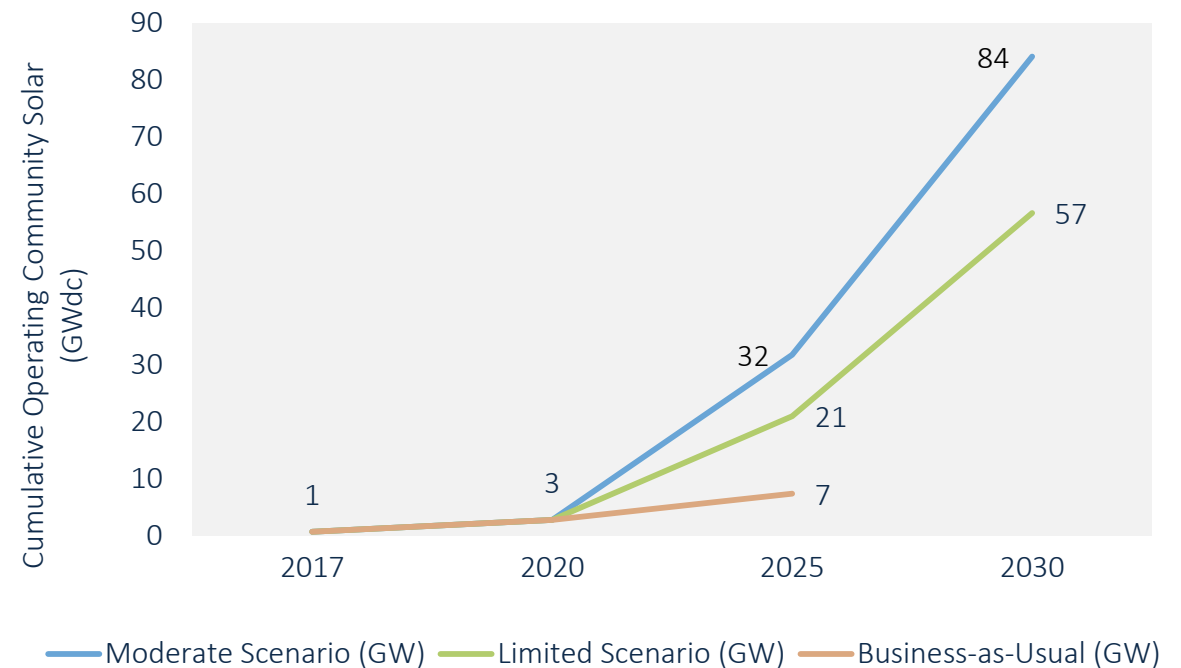
Subscribers Served: **6.4 million to 8.8 million**

- Low- and Moderate-Income Households Supported: **3.5 million to 4.0 million**

Cumulative Capital Invested*: **\$81 billion to \$121 billion**

*Cumulative capital invested represents total initial costs to build community solar plants, including all installation materials, labor, upfront supply chain, development and financing costs. Does not include ongoing operating costs

U.S. Community Solar through 2030: Market Potential



Source: GTM Research Wood Mackenzie

“Limited Scenario” and “Moderate Scenario” refer to the set of grid and environmental benefits included in the compensation for community solar. Neither reflect a full account of all costs and benefits, especially more difficult to calculate economic development and societal health benefits. Adoption forecast also includes assumptions of strong community solar and LMI adoption policy and continued subscription product innovations

Key Solutions to Unlock Community Solar's Potential

- Enabling policy to open viable new markets
 - Bill introduction & passage of *legislation to open the community solar market* in states where it is not yet enabled.
 - Program implementation that provides *stable, fair rates and market participation structures* that recognize and compensate community solar facilities for the full range of their grid, environmental and societal benefits.
- Expanding existing programs to support sustainable and scalable markets
- Improvements in program design to support meaningful participation by underserved communities with *the inclusion of low- and moderate-income (LMI) communities* in mind, recognizing the societal benefits and overall market opportunity that full LMI participation represents
- Product innovation by community solar providers and financiers around costs, technology and the services offered

Resources to guide a sustainable and scalable community solar future:

1. Shared Renewables Guiding Principles (Interstate Renewable Energy Council):

<http://www.irecusa.org/publications/guiding-principles-for-shared-renewable-energy-programs/>

2. Low Income Solar Policy Guide – Community Solar:

<http://www.lowincomesolar.org/best-practices/community-solar/>

3. Policy Decision Matrix and Model Legislation (Coalition for Community Solar Access):

<http://www.communitysolaraccess.org/resources/>

4. Smart Electric Power Alliance Community Solar Program Designs 2018:

<https://sepapower.org/resource/community-solar-program-designs-2018-version/>

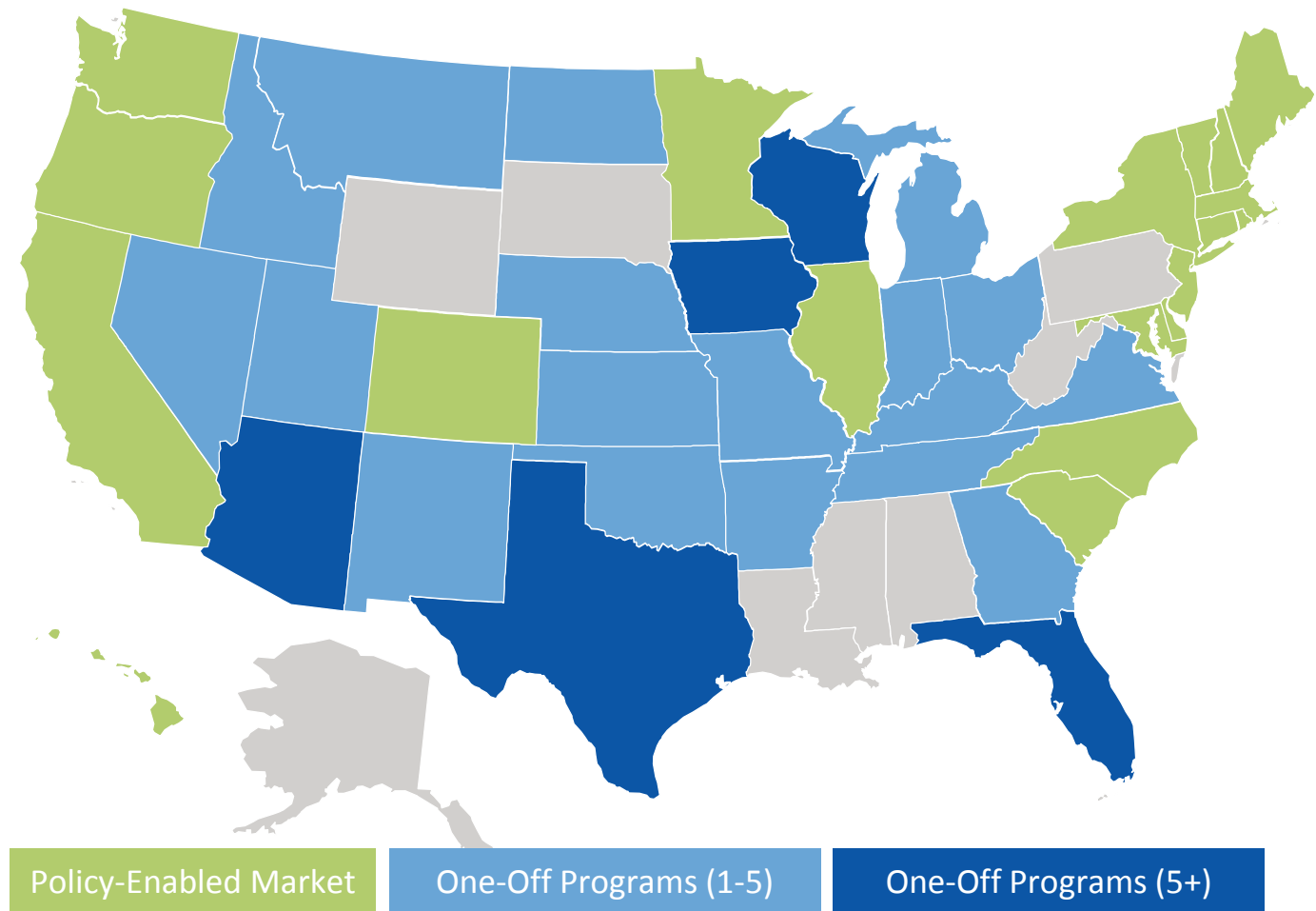
Today: A Patchwork of State-Level Policies and Utility Pilots Drive Community Solar

42 states and Washington, D.C. currently have community solar projects, but only 19 states and D.C. have statewide programs that provide an early opportunity for community solar to scale.

Voluntary utility-led community solar programs—including those initiated by investor-owned utilities, municipal utilities and rural cooperatives—provide limited access in states without state-wide policy.

Community solar is both enabled and encumbered by individual program rules and regulations on who can participate and how community solar projects and subscribers are compensated.

Although nearly every state has a community solar project, policy-enabled markets account for 71% of all currently operating community solar capacity.



Four Early Community Solar Markets in Focus

We examine four state markets in different regions with different makeups: California, Florida, Michigan and New Jersey

Two leading distributed solar states (CA, NJ) and two lagging distributed solar states (FL, MI). Each state differs in its current level of experience with community solar. NJ recently passed legislation and has yet to begin program implementation. CA also passed legislation back in 2013, but only two community solar projects from that program are under development. All operating community solar capacity in CA comes from voluntary utility-led programs administered by municipal utilities. Meanwhile, MI and FL have several voluntary utility-led programs among their investor-owned utilities, rural-electric cooperatives, and municipal utilities but lack statewide enabling legislation.

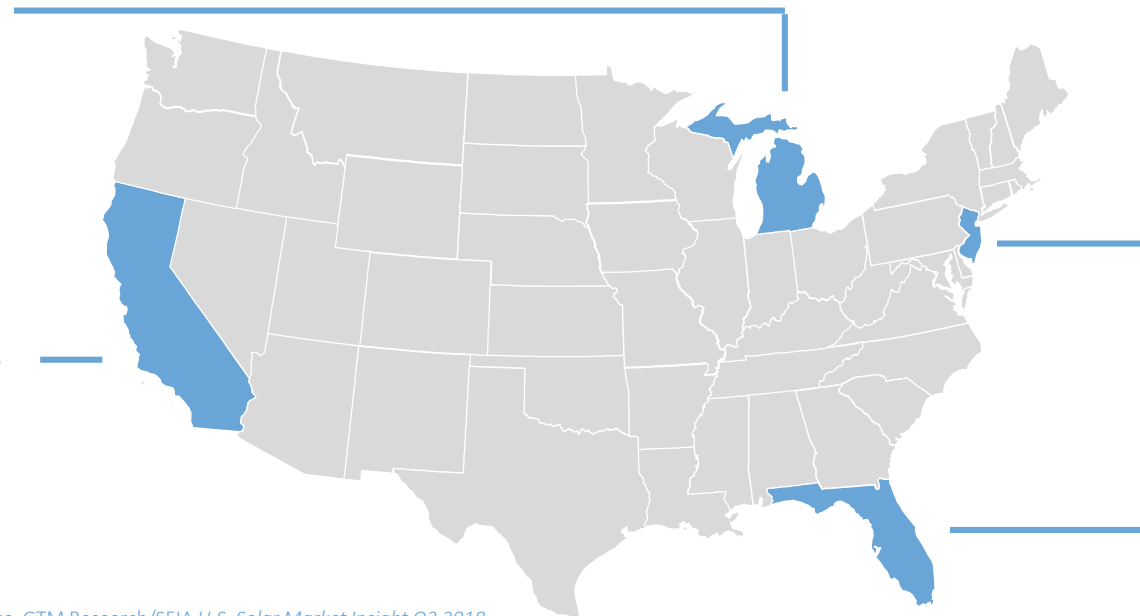
Solar Deployments in States-in-Focus as of 2017 Year End

Michigan

Total solar: **0.1 GW**
Solar as % of total load: **0.2%**
Community solar: **8.3 MW**

California

Total solar: **19.8 GW**
Solar as % of total load: **16.7%**
Community solar: **21.2 MW**



New Jersey

Total solar: **2.4 GW**
Solar as % of total load: **3.9%**
Community solar: **0 MW**

Florida

Total solar: **1.3 GW**
Solar as % of total load: **0.7%**
Community solar: **41.8 MW**

Source: Wood Mackenzie North American Power and Renewables Service, GTM Research/SEIA U.S. Solar Market Insight Q2 2018

Community Solar in California: Market Potential

California is undergoing a significant energy transition, with a 50% renewables target for 2030 and solar already providing nearly 17% of total electricity consumption — over 6% from distributed generation alone. High deployments of solar have already sparked the transition to rates that reflect the temporal value of energy with the consideration of locational benefits. Meanwhile, major load pockets are shifting away from traditional load-serving entities to community-choice aggregators, which could use distributed and community solar as a means to meet clean energy goals.

By 2030, with strong enabling policies, community solar could reach half a million subscribers, supporting hundreds of thousands of renters, LMI individuals, and businesses that have so far been left with few options in the California energy transition.

Community Solar Market Potential in California, 2030 Vision Scenarios

Total Addressable Market: **15.6 million customers**

Total Community Solar Capacity Operating: **6.3 GW to 8.2 GW**

Annual Electricity Generated: **9.4 TWh to 12.4 TWh**

- Share of State Electricity Consumption: **3.4% to 4.4%**

Subscribers Served: **747,000 to 964,000**

- Low- and Moderate-Income Households Supported: **440,000 to 550,000**

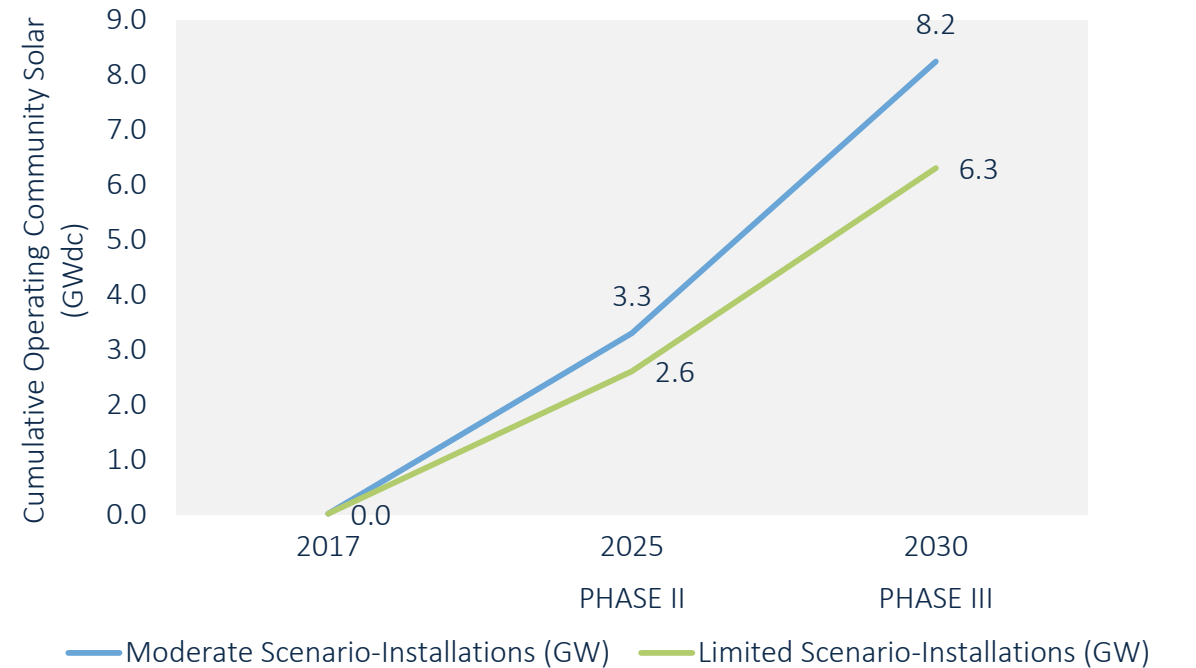
Cumulative Capital Invested*: **\$9.8 billion to \$12.8 billion**

Annual Spend on Operations, Leases and Taxes: **\$125 million to \$165 million**

Further Details on California Market Potential in Full Report

*Cumulative capital invested represents total initial costs to build community solar plants, including all installation materials, labor, upfront supply chain, development and financing costs. Does not include ongoing operating costs

Community Solar in California: Market Potential



“Limited Scenario” and “Moderate Scenario” refer to the set of grid and environmental benefits included in the compensation for community solar. Neither reflect a full account of all costs and benefits, especially more difficult to calculate economic development and societal health benefits. Adoption forecast also includes assumptions of strong community solar and LMI adoption policy and continued subscription product innovations

Community Solar in Florida: Market Potential

Community solar in Florida could provide critical economic relief and local resiliency to vulnerable communities. By 2030, low income, moderate income and affordable housing subscribers could make up nearly half of subscriptions and one-third of electricity generated as, according to our modeling, community solar could eventually provide 25%-30% savings on LMI household bills.

Community solar's ability to be paired with energy storage and microgrids could be a key driver in also assuring that the state and utilities can ensure clean, reliable electricity to communities during hurricanes and other disasters.

Community Solar Market Potential in Florida, 2030 Vision Scenarios

Total Addressable Market: **8.9 million customers**

Total Community Solar Capacity Operating: **2.3 GW to 3.6 GW**

Annual Electricity Generated: **3.2 TWh to 5.1 TWh**

- Share of State Electricity Consumption: **1.1% to 1.8%**

Subscribers Served: **287,000 to 384,000**

- Low- and Moderate-Income Households Supported: **141,000 to 189,000**

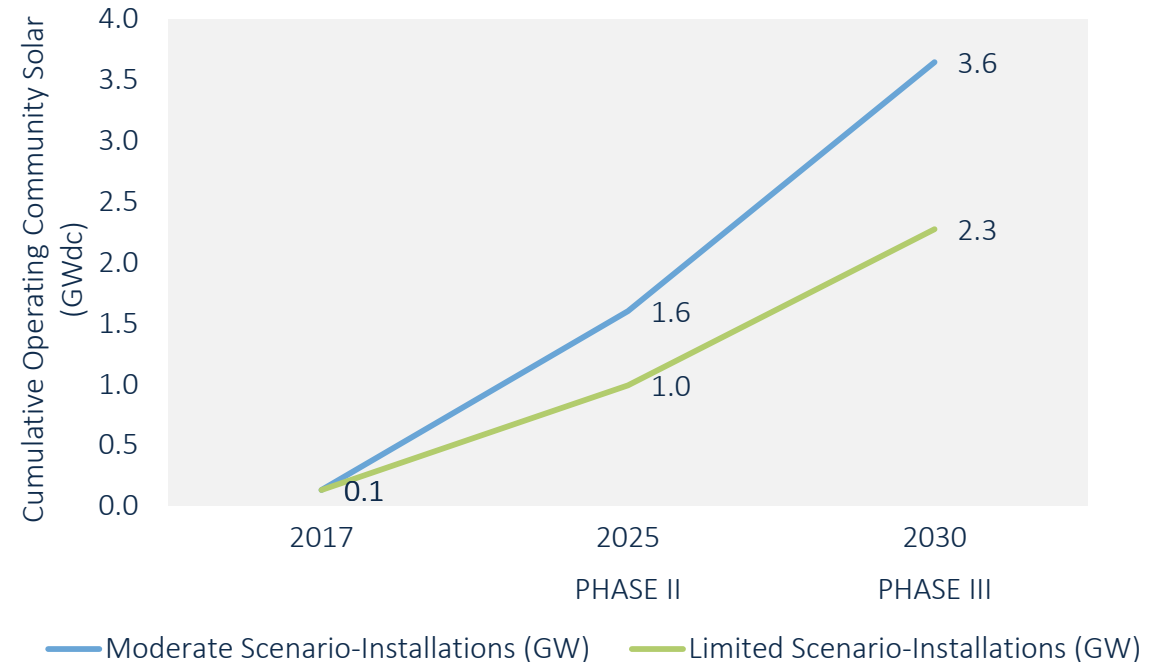
Cumulative Capital Invested*: **\$3.3 billion to \$4.0 billion**

Annual Spend on Operations, Leases and Taxes: **\$34 million to \$55 million**

Further Details on Florida Market Potential in Full Report

*Cumulative capital invested represents total initial costs to build community solar plants, including all installation materials, labor, upfront supply chain, development and financing costs. Does not include ongoing operating costs

Community Solar in Florida: Market Potential



Source: GTM Research Wood Mackenzie

“Limited Scenario” and “Moderate Scenario” refer to the set of grid and environmental benefits included in the compensation for community solar. Neither reflect a full account of all costs and benefits, especially more difficult to calculate economic development and societal health benefits. Adoption forecast also includes assumptions of strong community solar and LMI adoption policy and continued subscription product innovations

Community Solar in Michigan: Market Potential

Community solar in Michigan could be a significant boost for distributed generation in the state. With just over 100 MW of solar installed to date and few supportive statewide policies for solar, Michigan lags nationally in the deployment of distributed generation. In the current regulatory debate around the compensation for the little distributed solar that does exist, policymakers could also look to community solar as a critical resource for ensuring all customer segments can access local clean electricity.

Community Solar Market Potential in Michigan, 2030 Vision Scenarios

Total Addressable Market: **3.9 million customers**

Total Community Solar Capacity Operating: **1.4 GW to 2.3 GW**

Annual Electricity Generated: **1.5 TWh to 2.5 TWh**

- Share of State Electricity Consumption: **1.5% to 2.4%**

Subscribers Served: **177,000 to 288,000**

- Low- and Moderate-Income Households Supported: **92,000 to 176,000**

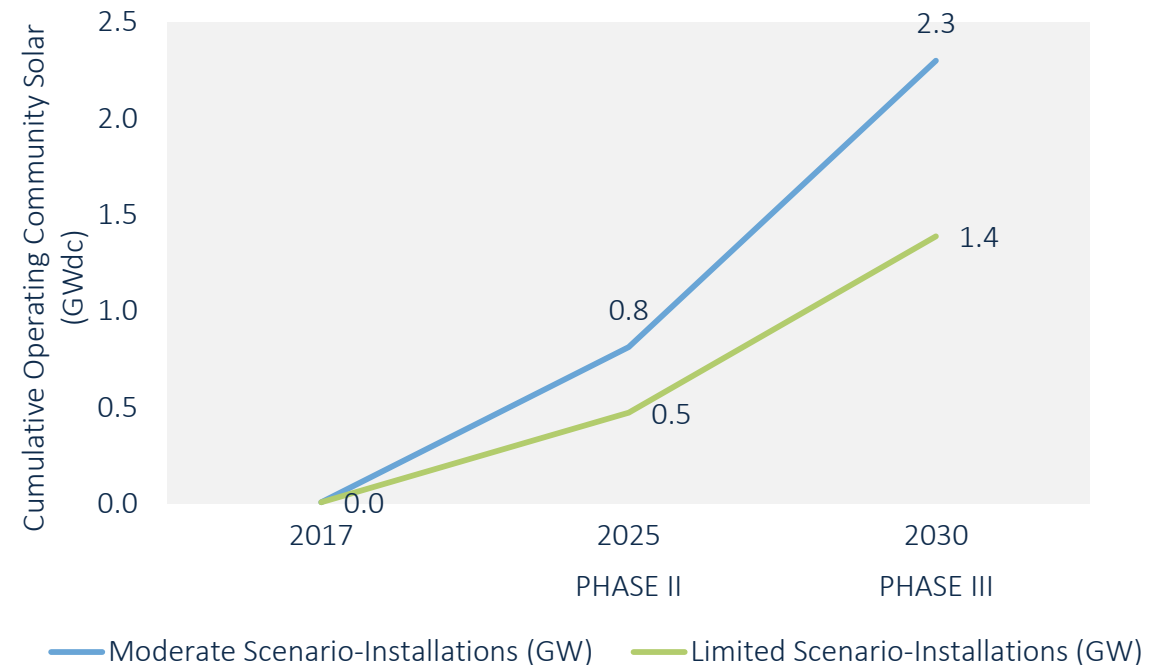
Cumulative Capital Invested*: **\$2.0 billion to \$3.0 billion**

Annual Spend on Operations, Leases and Taxes: **\$21 million to \$35 million**

Further Details on Michigan Market Potential in Full Report

*Cumulative capital invested represents total initial costs to build community solar plants, including all installation materials, labor, upfront supply chain, development and financing costs. Does not include ongoing operating costs

Community Solar in Michigan: Market Potential



Source: GTM Research Wood Mackenzie

“Limited Scenario” and “Moderate Scenario” refer to the set of grid and environmental benefits included in the compensation for community solar. Neither reflect a full account of all costs and benefits, especially more difficult to calculate economic development and societal health benefits. Adoption forecast also includes assumptions of strong community solar and LMI adoption policy and continued subscription product innovations

Community Solar in New Jersey: Market Potential

New Jersey is in the beginning stages of incorporating community solar into its portfolio. A leader in distributed energy deployment, New Jersey recognizes the importance of setting strong solar policy. Robust design of pilots and sustained community solar programs would help residents and businesses thus far locked out of New Jersey's solar success. For example, by 2030, community solar could serve over 250,000 LMI households, including 25%-35% of all affordable housing tenants in the state.

Community Solar Market Potential in New Jersey, 2030 Vision Scenarios

Total Addressable Market: **3.6 million customers**

Total Community Solar Capacity Operating: **2.3 GW to 3.3 GW**

Annual Electricity Generated: **2.6 TWh to 3.6 TWh**

- Share of State Electricity Consumption: **3.3% to 4.5%**

Subscribers Served: **219,000 to 410,000**

- Low- and Moderate-Income Households Supported: **119,000 to 255,000**

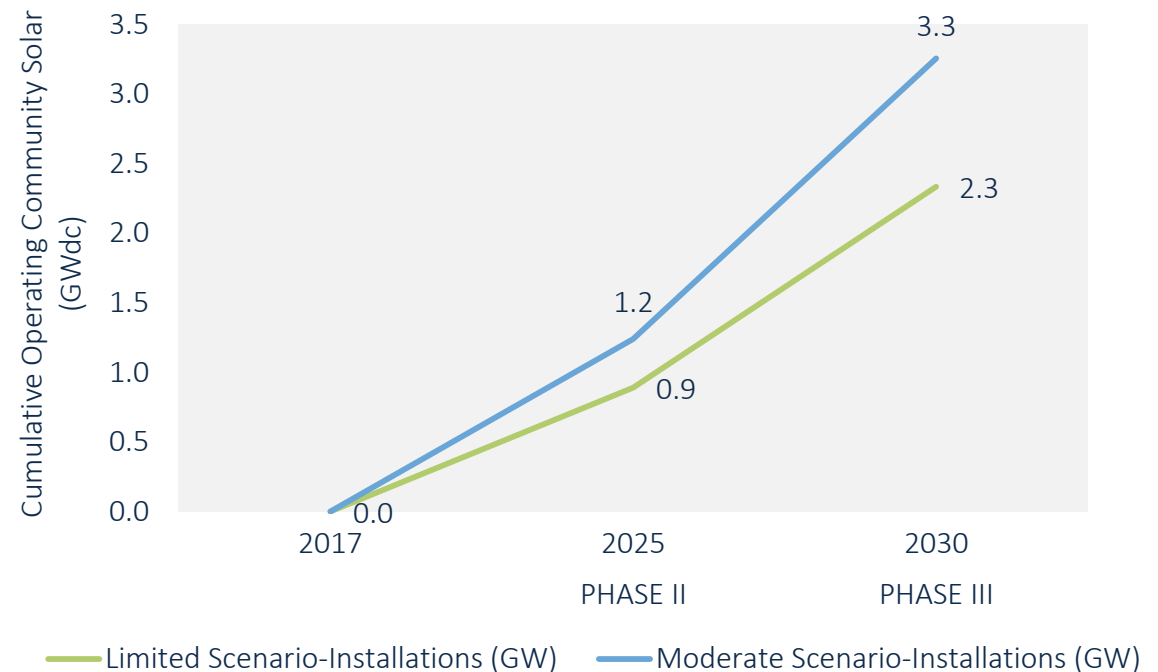
Cumulative Capital Invested*: **\$2.8 billion to \$4.9 billion**

Annual Spend on Operations, Leases and Taxes: **\$47 million to \$65 million**

Further Details on New Jersey Market Potential in Full Report

*Cumulative capital invested represents total initial costs to build community solar plants, including all installation materials, labor, upfront supply chain, development and financing costs. Does not include ongoing operating costs

Community Solar in New Jersey: Market Potential



Source: GTM Research Wood Mackenzie

“Limited Scenario” and “Moderate Scenario” refer to the set of grid and environmental benefits included in the compensation for community solar. Neither reflect a full account of all costs and benefits, especially more difficult to calculate economic development and societal health benefits. Adoption forecast also includes assumptions of strong community solar and LMI adoption policy and continued subscription product innovations

Upfront Community Solar Investment in the Four States Could Top \$24.3 billion by 2030

Community solar could add \$1.5 billion to \$2.0 billion in upfront capital investment per year in the four studied states combined through 2030. This represents private sector investment in the electricity infrastructure of the future.

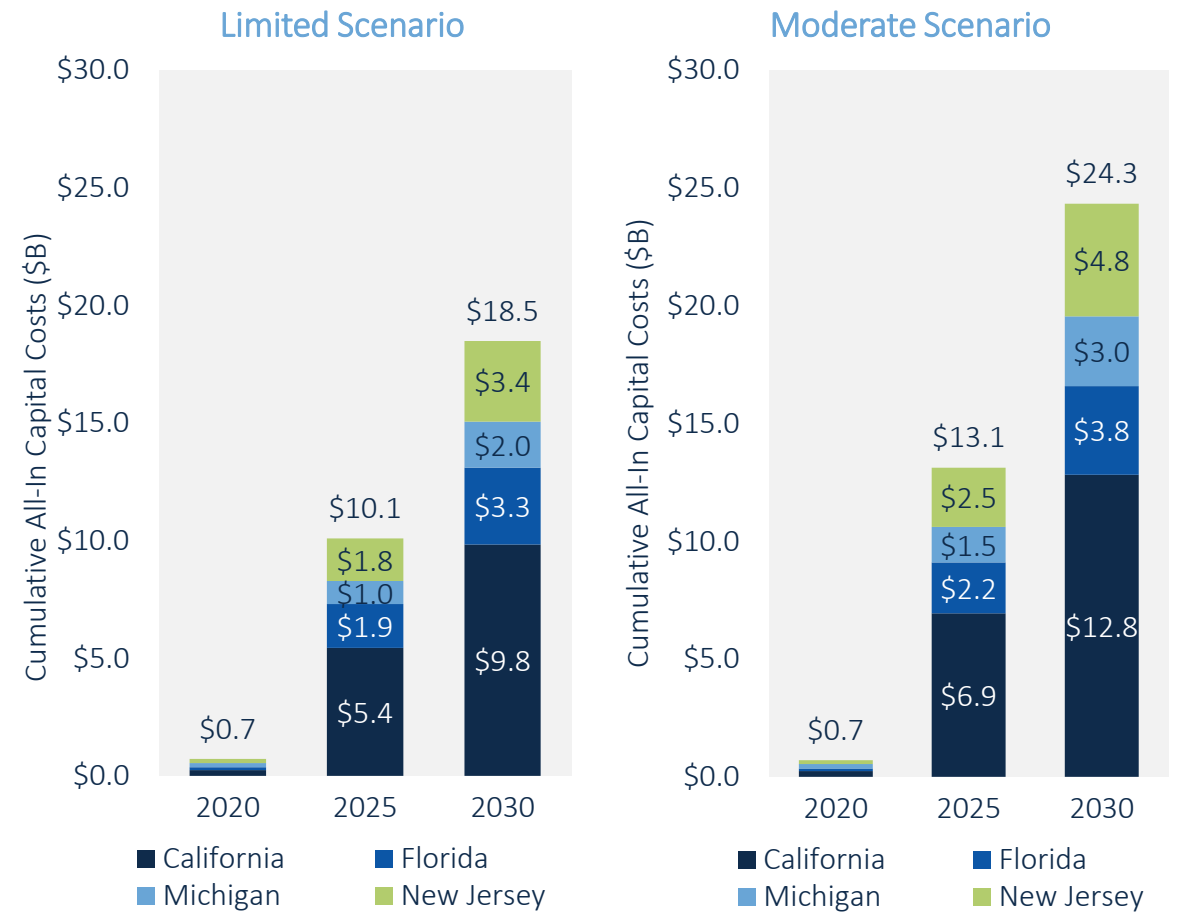
This estimate accounts for only capital expenditures for new solar installations and does not include payments from subscribers, nor ongoing costs such as land lease and property taxes.

Even in our low projection, over \$18.5 billion (\$1.5 billion per year) would be invested into community solar.

California leads the way, with \$9.8 billion to \$12.8 billion invested by 2030, triple the spend of Florida, the next highest ranked state.

Despite falling solar costs, Michigan's investment in community solar accelerates from \$1.3 billion between 2020 and 2025 to \$1.5 billion between 2025 and 2030.

Cumulative Community Solar Upfront Capital Expenditures



Source: GTM Research Wood Mackenzie

What If Every State Opened Its Doors to Community Solar?

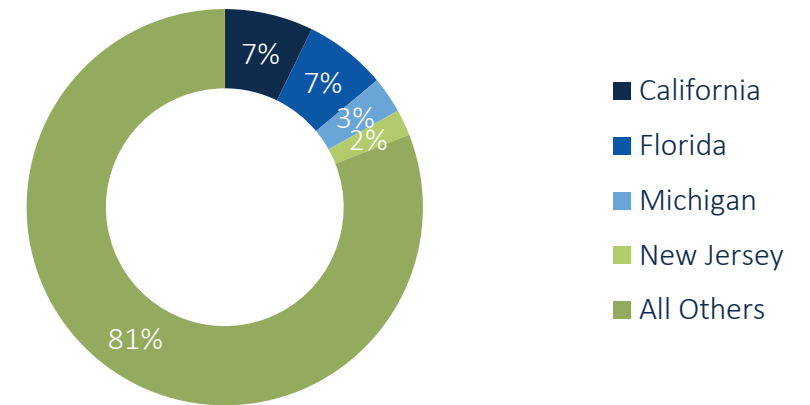
Contribution from community solar rises from a negligible share to as much as 3.1% of total energy consumption in the four states examined in the span of a decade.

The four states in focus represent one-fifth of all electricity sales nationally. Even the 19 states with current statewide community solar programs in place represent only 40% of total energy customers.

If over the next decade, every state were to adopt policies that similarly supported and valued community solar for an expanded array of customer, environmental, grid and social benefits, community solar could exceed 84 GW by the end of the next decade.

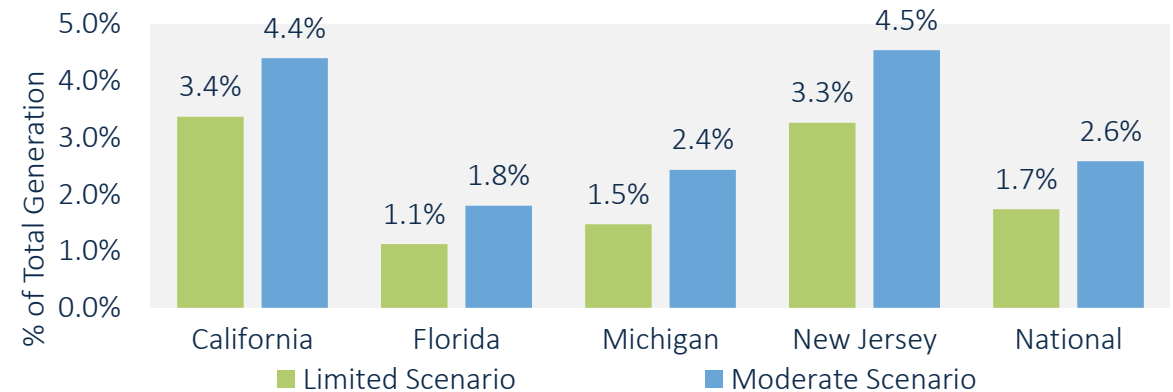
In other words, if all states were to see similar adoption rates as the four states examined (accounting for differences in state load and solar resource), community solar could supply 1.7%-2.6% of all electricity consumed in the U.S. by 2030.

State-Level Electricity Consumption as Share of National Total



Source: EIA

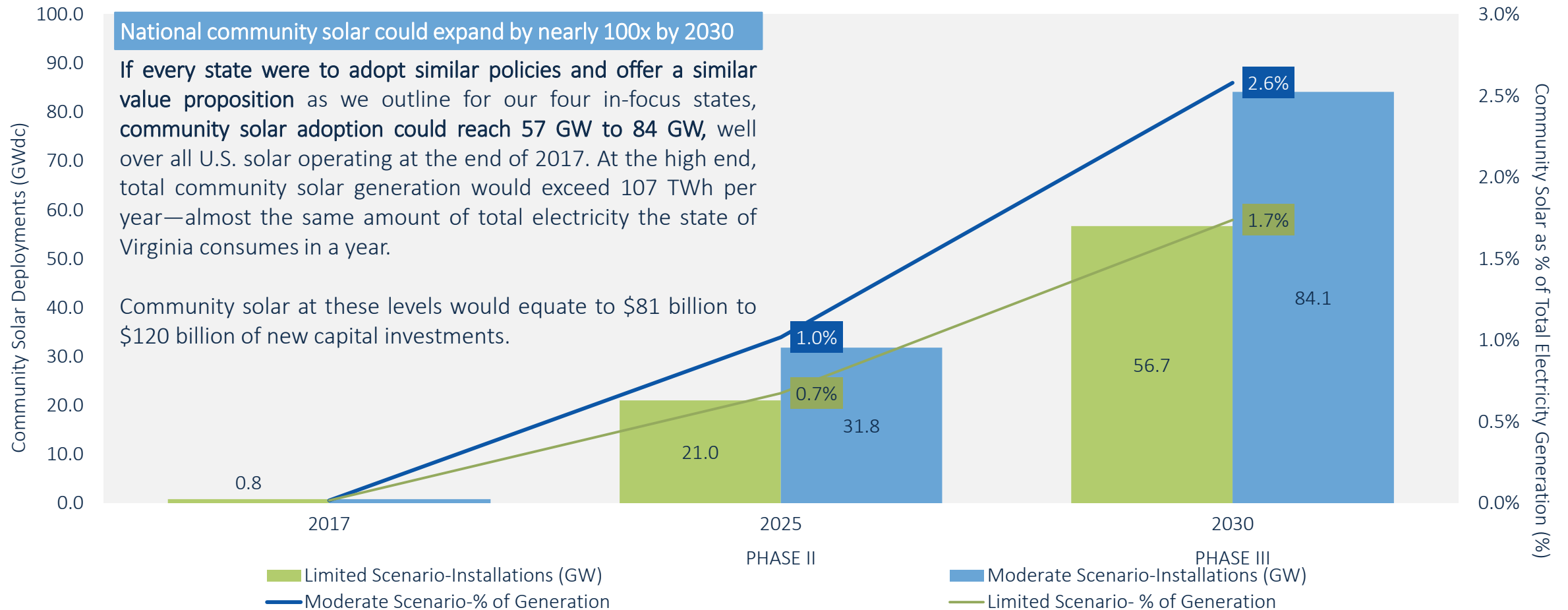
Forecasted Electricity Contribution From Community Solar by Scenario, 2030



Source: GTM Research Wood Mackenzie

Community Solar Could Reach Over 2.6% of U.S. Electricity by 2030 Equaling 57 GW to 84 GW

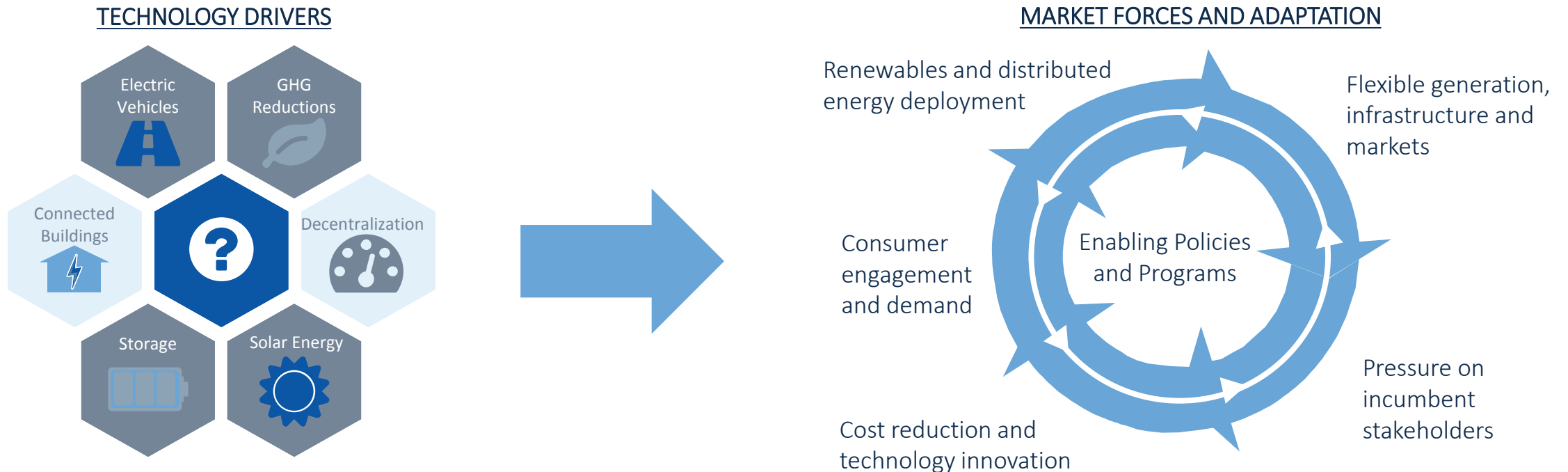
National Community Solar Installations by Scenario (Assuming All States Adopt Forward-Looking Community Solar Policies)



Source: GTM Research Wood Mackenzie

The Next Decade: The Power Sector is Changing – and Invites Community Solar Innovation

Community solar can be a foundational pillar in the ongoing and future power market transformation — one driven by more engaged customers that demand decentralized and decarbonized energy. In this future, distributed solar — including community solar — becomes a platform for a holistic clean, local, reliable and flexible energy service that opens up opportunities for flexible investment and business models in combination with other onsite and co-located distributed energy resources.



Embracing New Distributed Energy Technology Will Increase the Value of Community Solar

Community solar facilities will evolve, both as a virtual interactive energy platform and as a physical energy resource.



Community Solar Subscribers

Community solar operators will need to interact with subscribers beyond a bill, forming a holistic energy service.

Subscribers will receive tailored insights into their energy use, resulting in adoption of new devices and services that further increases the efficiency and lowers the cost of their energy use.



Energy Insights



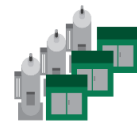
Smart Devices



Flexible Load



Holistic Energy Service and Resource



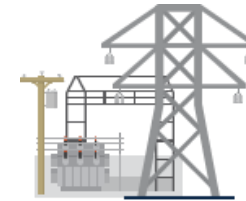
Smart Inverters



Energy Storage



Microgrids



Utilities and the Electricity Grid

Community solar will create value beyond the energy generated — initially from offsetting new generation capacity, transmission and distribution assets, and longer term, in the form of flexibility and resiliency as community solar facilities are co-located with other distributed energy hardware.

A Market Transformation in Three Phases

Transformative growth of community solar will not happen overnight. Improvements in program design and implementation, financing solutions, and customer-focused offerings can expand solar access to all customer types. Proper valuation methodologies are critical to support community solar in a changing market landscape, and inclusive policies are essential to ensure equitable access for underserved communities

We envision a path through three phases: **1) Market Emergence**, **2) Market Transition** and **3) Market Maturity**

PHASE I: Market Emergence

Community solar is still in pilot or early stages, driven primarily by early programs or virtual net metering programs with shifting compensation mechanisms. Community solar is proving itself to regulators, customers and investors.

PHASE II: Market Transition

Lessons from Phase I are incorporated. Community solar benefits from cost reductions through product innovations, streamlined program administration and investor trust. Improved program design and financing solutions encourage and increase LMI participation. Regulators, utilities and community solar stakeholders negotiate the benefits and the compensation for community solar.

PHASE III: Market Maturity

Community solar is an attractive offering to customers that delivers recognized benefits in the forms of cost savings, cost visibility, environmental attributes, grid value, local societal and economic support, and energy resiliency.

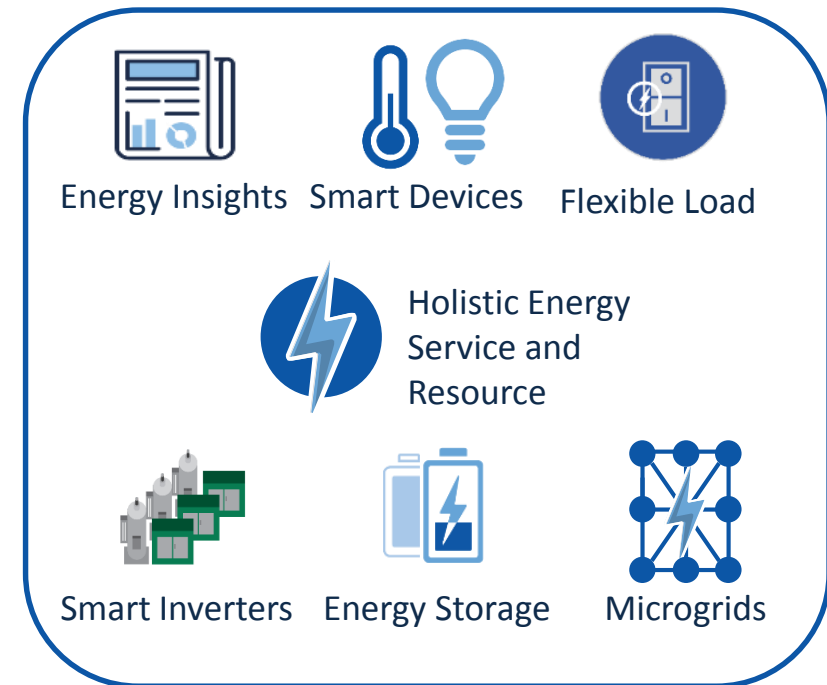
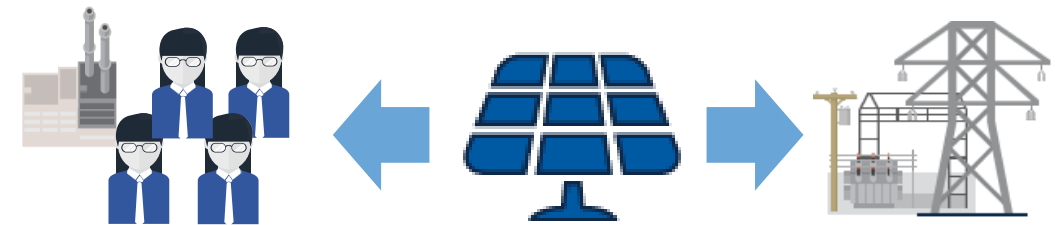
Community Solar at Scale: Looking Beyond 2030

Our 2030 Vision Represents an Early Milestone

Even though it is already supplying millions of new adopters of solar, community solar is just starting its journey as a mainstream energy source. Even under our most ambitious adoption forecast for 2030, community solar serves just 8.8 million out of the 75 million to 113 million households and businesses that lack access to onsite solar.

As community solar operators continue to innovate on the service offering by packaging energy insights and smart energy devices for their subscribers and incorporating physical grid assets like smart inverters and energy storage into their facilities, community solar will transition into a holistic energy service and resource.

As policymakers, utilities and the solar industry continue to deliberate the evolution of electricity rates and energy value, community solar can play a central role in providing benefits for all parties: predictable cost savings for consumers, financial value for operators, grid resilience, local environmental benefits and economic development — as long as policy and innovation evolve to meet these goals.



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