



BRIDGES TO NEW SOLAR BUSINESS MODELS:

OPPORTUNITIES TO INCREASE AND CAPTURE
THE VALUE OF DISTRIBUTED SOLAR
PHOTOVOLTAICS

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Over the past decade, distributed solar photovoltaics (DPV) have experienced unprecedented growth. DPV is now on track to achieve significant scale in many segments of the U.S. market. Yet, nationally, solar produces 0.2% of electricity generation, leaving much room for further growth. Distributed solar's continued growth can and should play an integral role in building the affordable, resilient, low-carbon electric grid of the future. For example, the U.S. Department of Energy's SunShot Initiative is targeting 14% of electricity generation from solar by 2030 and 27% by 2050.

Supportive federal, state, and local policies have to date spurred DPV's development in many U.S. markets. However, many of these policies were designed for early market support of an emerging technology, not as long-term solutions. Thus as the DPV market has grown, so too has conflict around early-market policies. In many states, regulators and policy makers are now reexamining the policy environment as solar adoption reaches net energy metering (NEM) market caps or incentive program funding is exhausted. Further, at the federal level, the business investment tax credit is set to decline from 30% to 10% at the end of 2016, and the residential investment tax credit for homeowners is set to expire. The confluence of these pressures could pose a significant barrier to DPV's market growth.

The need has become clear for additional strategies that support DPV's continued growth into the future in line with SunShot targets. Solar policy frameworks to date have typically focused on customer-centric DPV value accruing primarily to the individual customer and/or third-party solar companies who install DPV systems. Meanwhile, under existing business models, utilities have negatively associated DPV with transaction costs, grid operation challenges, and revenue loss.

Creating a sustainable long-term DPV market will require aligning the interests of utilities, solar companies, technology providers, and customers. Aligning those interests means enhancing legacy solar business models or building new ones by creating an expanded value pool—one that makes DPV affordable and accessible to far more customers, bridges beyond individual customer-centric DPV value to include value delivered to the grid and society, and allows the electricity grid's myriad stakeholders to share in that value.

This needed shift in the DPV market is in many ways similar to a nascent shift currently under way with thermostats. For decades, thermostats' value proposition was customer-centric focused on the building occupant only, and manufacturers responded with business models and products that met that need. The more recent advent of smart, connected thermostats and the new opportunities they create has greatly expanded the potential value pool across the utility meter, such as by enabling customers to shift the timing of their load relative to system peak. But as with DPV today, new solutions, including new business models, require broad stakeholder alignment to deploy and then share value among customers, utilities, technology providers, and other participants.

If done well—necessarily bringing both solar companies and utilities together around the table—new solar business models can successfully accelerate, optimize, and sustain DPV adoption.



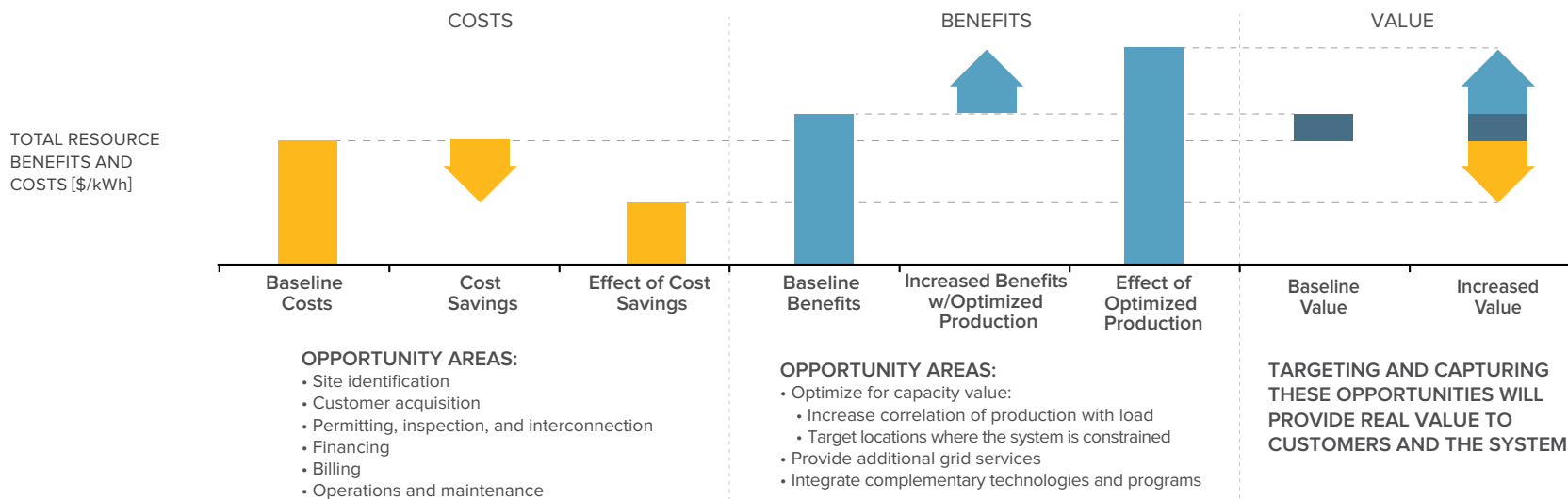
Aligning the interests of these stakeholders will involve two major threads:

- Maximize the delivered value of DPV to customers *and* the electricity system by further decreasing costs and increasing benefits (see Figure ES1), and
- Create new business models that enable and incent solar companies, utilities, and customers to optimize and capture that expanded pool of DPV value through win-win-win opportunities.

To date, reducing solar's upfront capital cost to achieve low-cost deployment *onto* the grid—without accounting for the

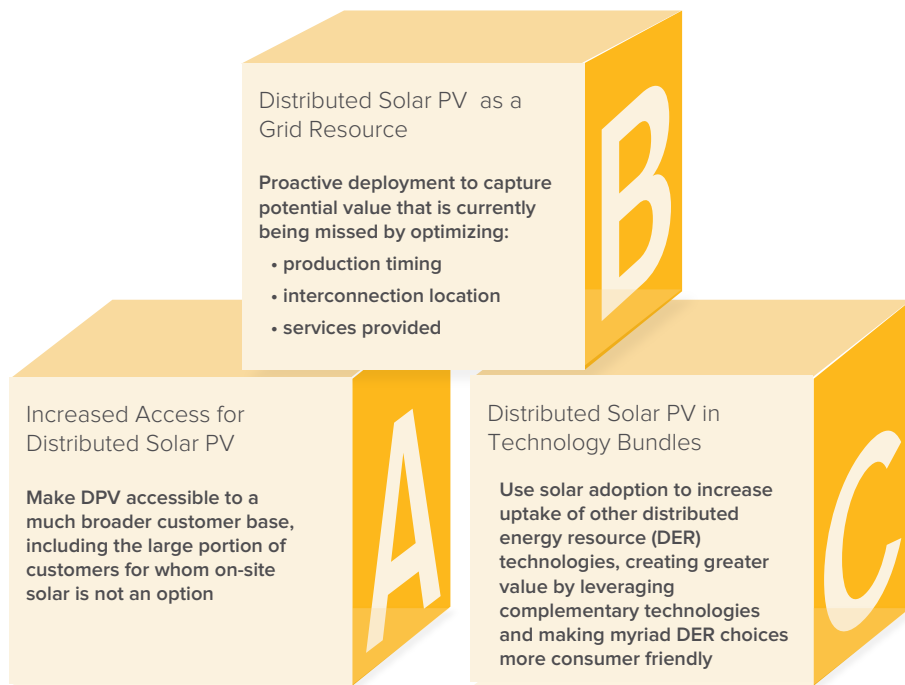
operational benefits and costs of integration *into* the grid—has been a significant solar market development strategy. Further cost reductions are possible, especially related to DPV's soft costs, but the most significant of them will require involvement from both solar companies and utilities together to achieve. Similarly, currently untapped operational benefits that occur post-interconnection can create additional value streams for customers, solar companies, and utilities that evolve from maximizing value for individual customers with DPV to optimizing value more broadly across such customers *and* the system as a whole. However, defining, valuing, verifying, and capturing those value streams will require cooperation among stakeholders.

FIGURE ES1: OPPORTUNITIES FOR INCREASING SOLAR VALUE



While addressing some of these issues will require both pricing realignment and regulatory model reform, reform will take significant time and resources to unfold. Meanwhile, utilities, solar companies, and regulators can design and implement components of solar business model strategies today that provide a bridge to the future. These “bridge” business model strategies can start to create and capture value, while also providing best practices and lessons learned to inform broader reform efforts.

Figure ES2: **BUILDING BLOCKS FOR BRIDGE BUSINESS MODELS**



PROMISING BUILDING BLOCKS FOR BRIDGE BUSINESS MODEL STRATEGIES

In this report, Rocky Mountain Institute (RMI), with support from the U.S. Department of Energy’s SunShot Initiative, investigates opportunities to optimize and demonstrate DPV’s value as it is integrated into the grid to utilities, customers, and solar companies alike. The report highlights three promising “building blocks” for bridge business model strategies that can enable stakeholders to increase, capture, and share DPV value (see Figure ES2). These building blocks are not mutually exclusive, and can be combined to create more-comprehensive solar business models. Regulators, utilities, and solar companies will need to adapt and refine components of these concepts, depending on the specific local market and regulatory environment.

Building Block A: Increased Access to Distributed Solar

Objective: *Make DPV accessible to a much broader customer base*, including the large portion of customers for whom on-site solar is not an option by providing new options for procurement. These options include subscription models where the utility connects solar companies’ off-site DPV projects to customers, such as current community solar programs and utility tariff models for large commercial and industrial customers that provide renewable energy for new load.

Utility Role: The utility’s value proposition expands, better meeting its societal obligations by giving simple and convenient solar access to all its customers. The utility could become an important part of program marketing, leading customer

acquisition efforts, and procuring DPV projects through competitive bidding. The costs and credits on participating customers' bills would reflect the real benefits and costs that the DPV projects create.

Solar Company Role: Solar companies benefit by partnering with a utility to expand customer access to solar, increasing the potential market size. By leveraging the utility's brand and existing customer relationships, the solar company can reduce customer acquisition costs, design and install projects, and perform ongoing operations and maintenance.



Building Block B: Distributed Solar as a Grid Resource

Objective: Optimize deployment to capture potential operational value that is currently being missed. DPV can support the grid and provide energy services to customers, but project design choices largely determine DPV's potential to deliver such operational benefits to the customer and the larger system. Major opportunities to enhance project design include:

- Optimizing for capacity value by designing DPV projects to better correlate production timing with load and targeting locations where the system is constrained (e.g., shifting panel orientation to better align with peak load or locating projects on substations with high forecasted demand).
- Integrating complementary technologies to strengthen capabilities or provide additional grid services while balancing added costs (e.g., incorporating advanced inverters or storage to ensure that the project can reliably provide grid services when most needed).

Utility Role: The utility takes a more proactive role in DPV deployment, using DPV as a resource to reduce cost to serve and improve service for all customers. The utility identifies optimal system locations for DPV integration and facilitates DPV deployment by engaging solar industry partners.

Solar Company Role: Solar companies coordinate site selection with utilities and design and install projects on the distribution system where they can provide high net value. The solar companies would work in a competitive market for projects, either responding to utilities' RFPs or installing projects based on utility pricing mechanisms.

Building Block C: Distributed Solar PV in Technology Bundles

Objective: *Leverage DPV adoption to increase uptake of other distributed energy resource (DER) technologies*, creating greater net value that can be tapped only by leveraging complementary technologies. Technology packages could take different forms, such as a “resilience” package, which bundles solar with storage and advanced controls, keeping the customer’s lights on during a power outage.

Utility Role: The utility enables customers to access energy services through DPV—bundled with additional technologies that increase the net value of the project—and helps customers select the best services for their needs. By advising the customer in this process, the utility can speed adoption by making myriad DER choices more consumer friendly. Utilities would evaluate how the technology packages provide value to the grid as well as the economic implications for customers.

Solar Company Role: Solar companies sell broader energy services to customers via technology packages the utility has screened and approved. Revenues could come from the company’s ability to package DPV with complementary technologies, increasing revenue per customer and expanding the potential market to include customers who see less risk if the technology package has utility approval.



NEXT STEPS FOR SUPPORTING NEW SOLAR BUSINESS MODELS

Refining and implementing innovative solar business model solutions in specific locales will require direct engagement from regulators, utilities, and solar companies, as well as continued support from other federal and state agencies. These stakeholders will need to:

1. Assess current abilities to identify value and customer needs.

Solar companies and utilities should collaborate to address knowledge gaps on DPV adoption, while utilities address gaps in DPV operations data, software tools and processes, and internal data organization and communication. In addition, regulators should look to improve data accessibility and transparency for all stakeholders.

2. Develop a transparent, multi-stakeholder process to create a standardized methodology, evaluate value, and share results.

Solar companies, utilities, and regulators should work together to create a standardized methodology for valuing DPV, including shared data and tools, and then use that methodology to evaluate DPV value and share results.

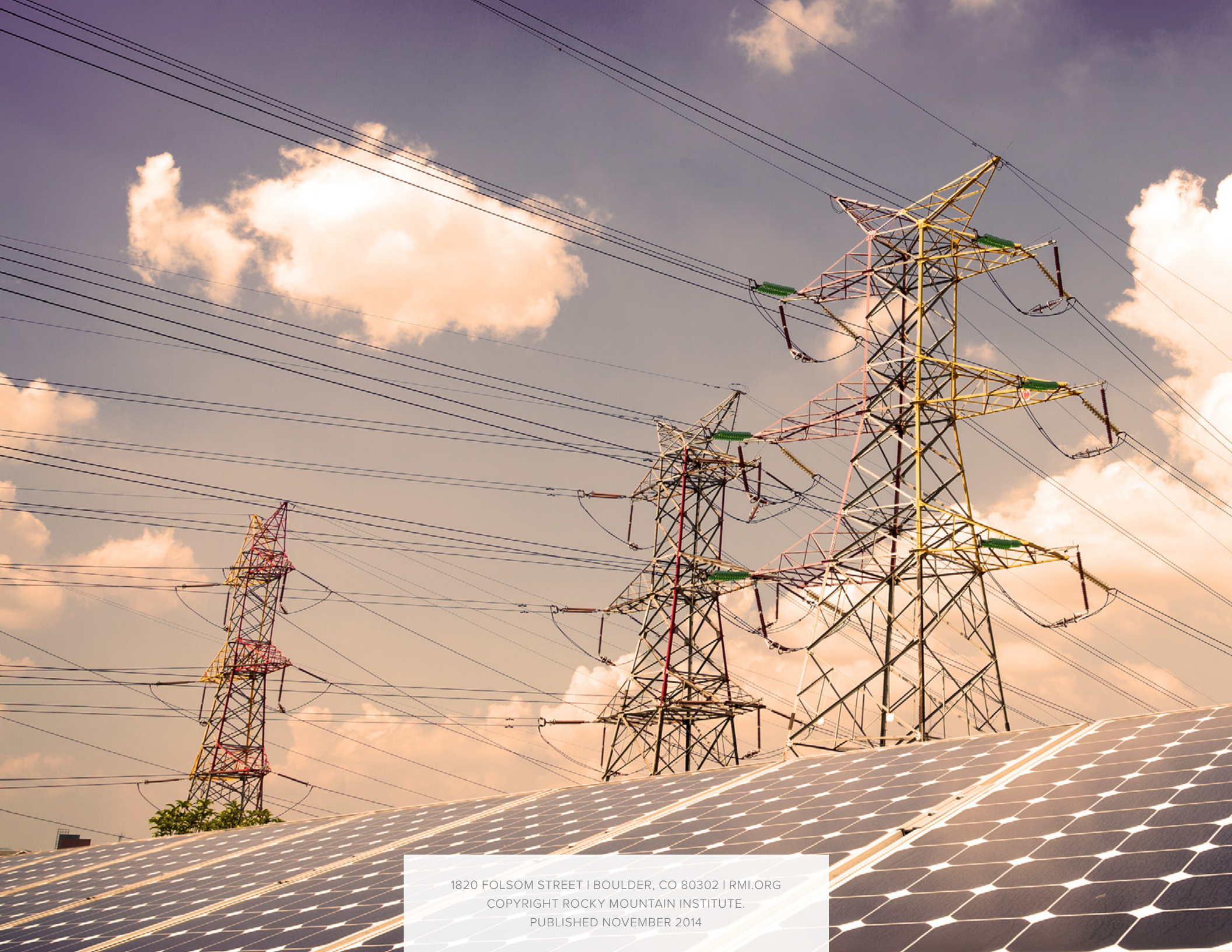
3. Determine approaches for optimizing and capturing value.

Where policymakers provide the driving force behind development of solutions, regulators should proactively clarify existing business and regulatory rules affecting business model development. In cases where that top-down push for change does not exist, solar companies, utilities, and other stakeholders should explore opportunities to collaboratively develop solutions. Regardless of who initiates the process, stakeholders will need to establish desired outcomes and criteria for solutions, identify new business model opportunities, remove implementation barriers, and test solutions.

4. Assess pilots and refine solutions

Federal and state energy and environmental agencies can foster continued innovation by tracking, assessing, and sharing the progress and results of solutions that are proposed and/or implemented.

The rapid improvement of solar's economics offers great opportunity to quickly develop a new resource that can meet growing social and operational needs for clean, reliable, affordable electricity. To fully scale this resource, a multi-party dialogue is required to build new business models that maximize and harness the potential value for all stakeholders.



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