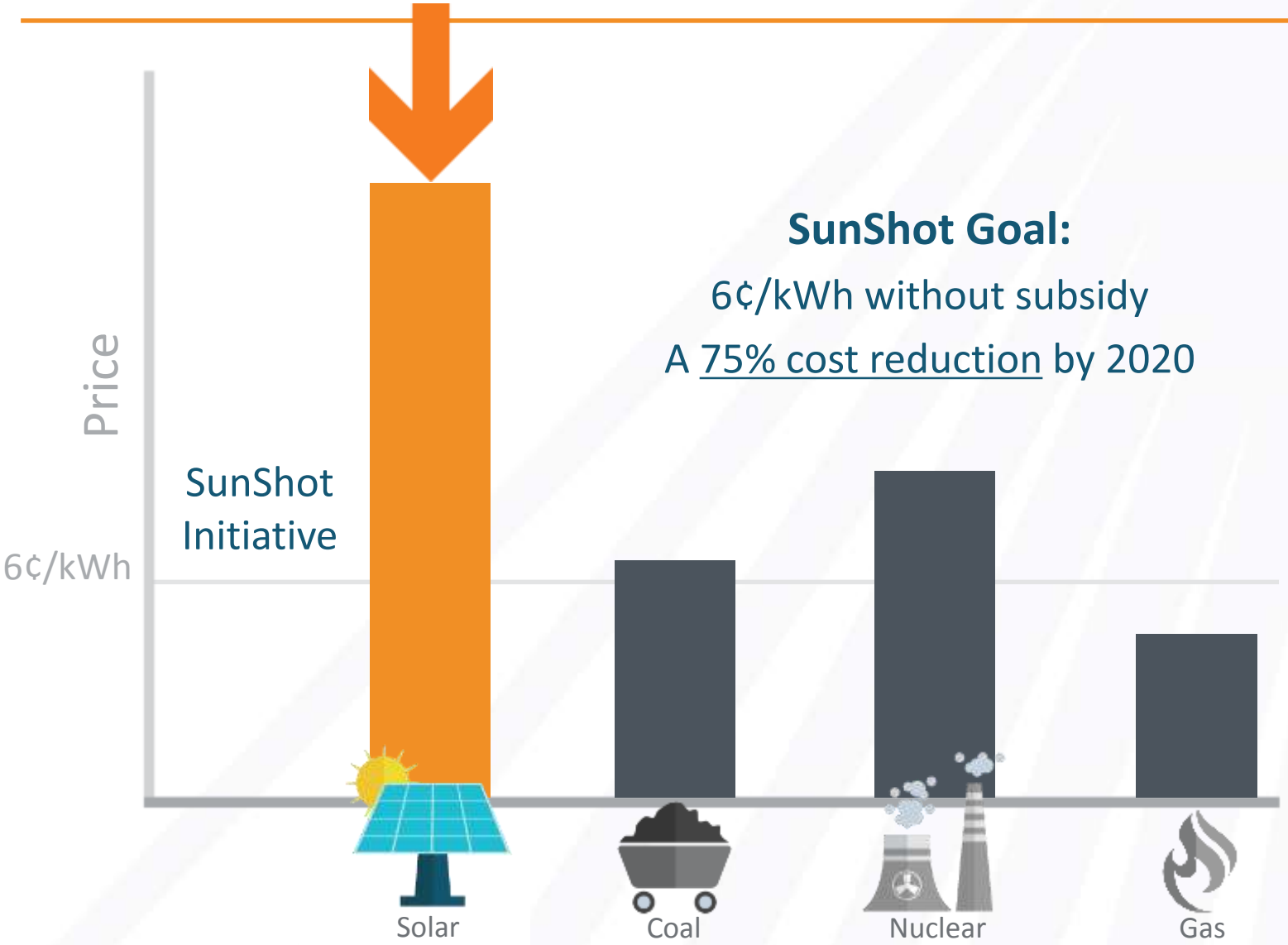
SunShot
U.S. Department of Energy

The SunShot Initiative: Getting to Ubiquitous Solar

Dr. Lidija Sekaric, Director
Solar Energy Technologies Office

energy.gov/sunshot

SunShot Initiative

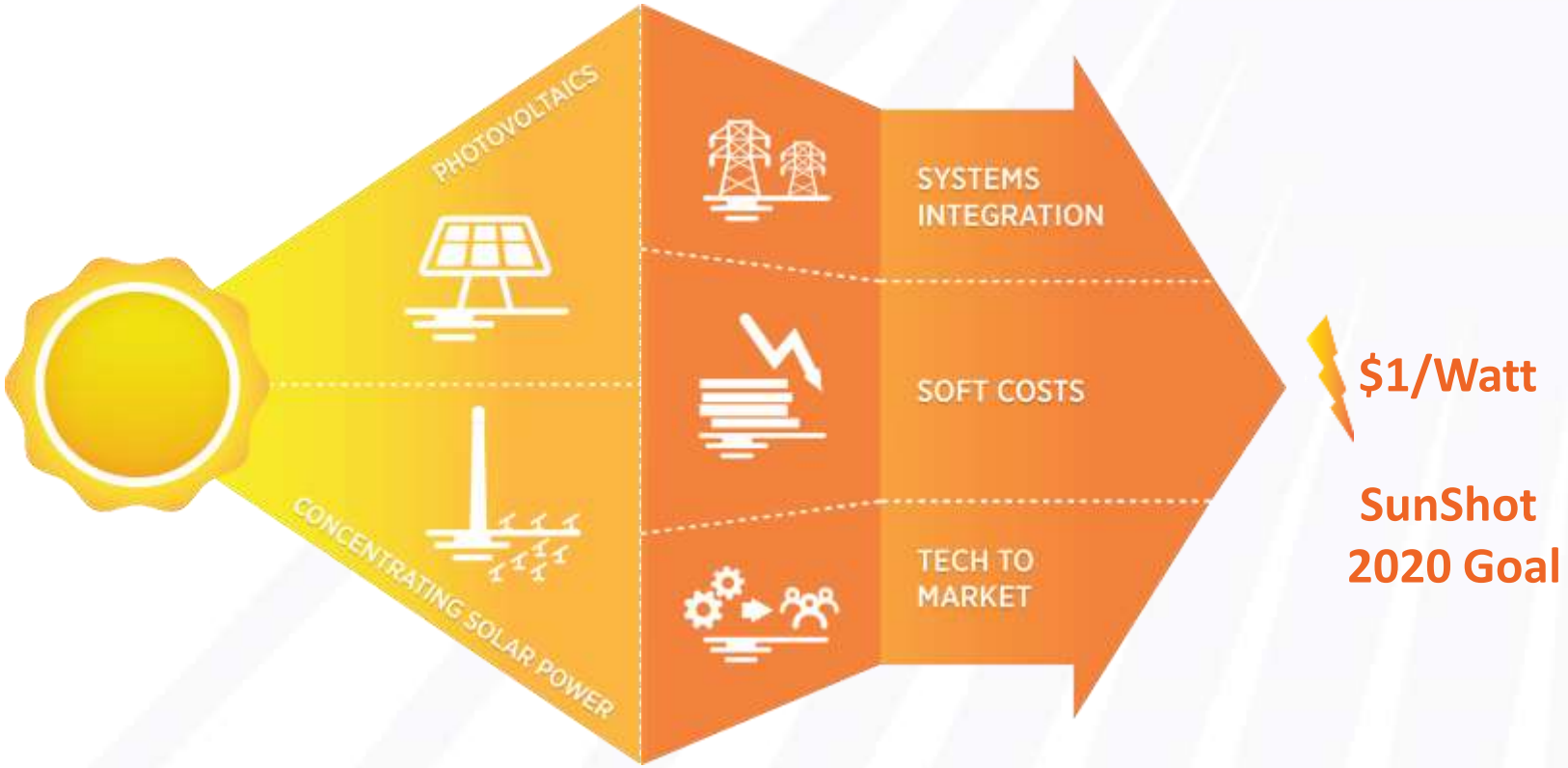


SunShot Goal:

6¢/kWh without subsidy

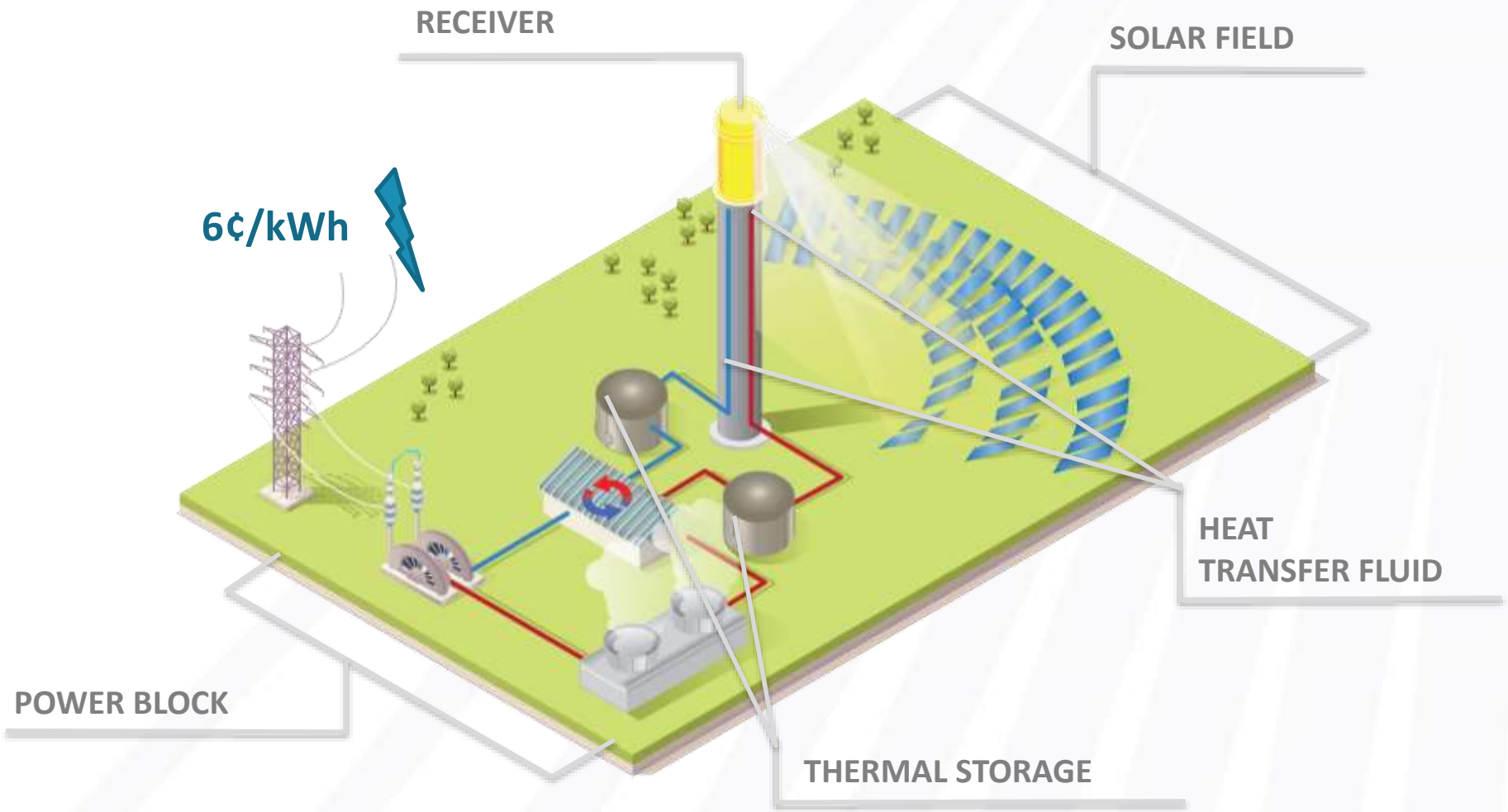
A 75% cost reduction by 2020

SunShot Program Structure



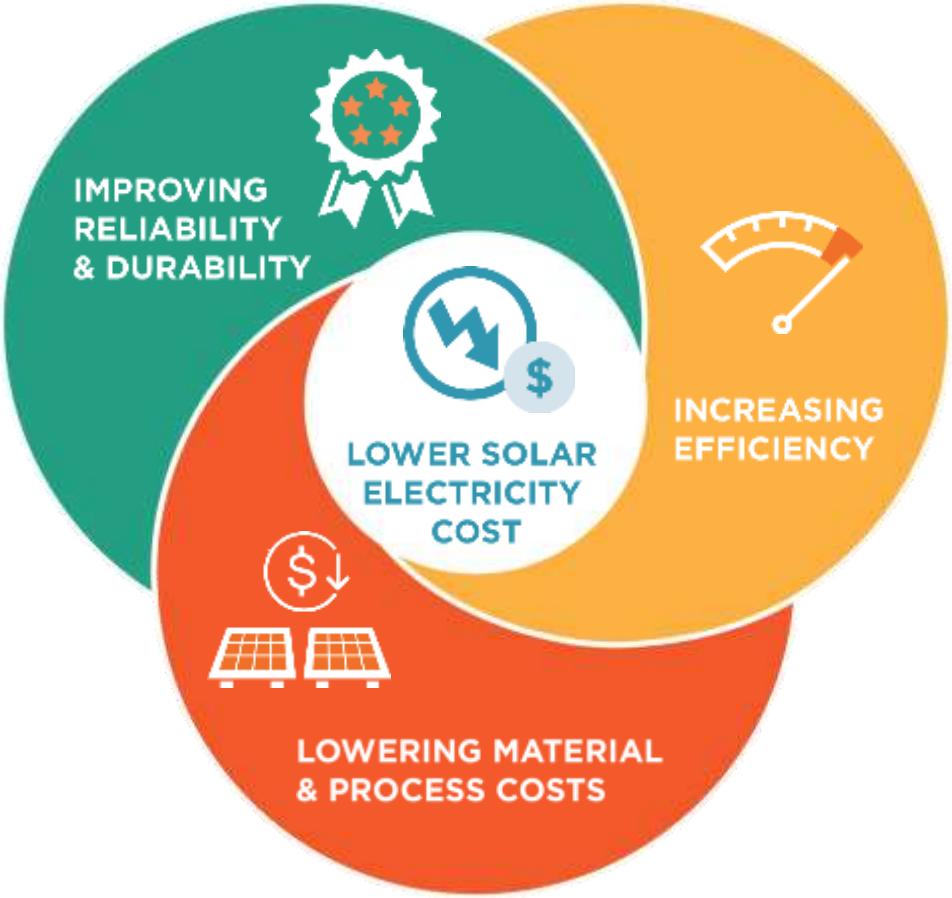
Concentrating Solar Power

Joe Stekli, Program Manager



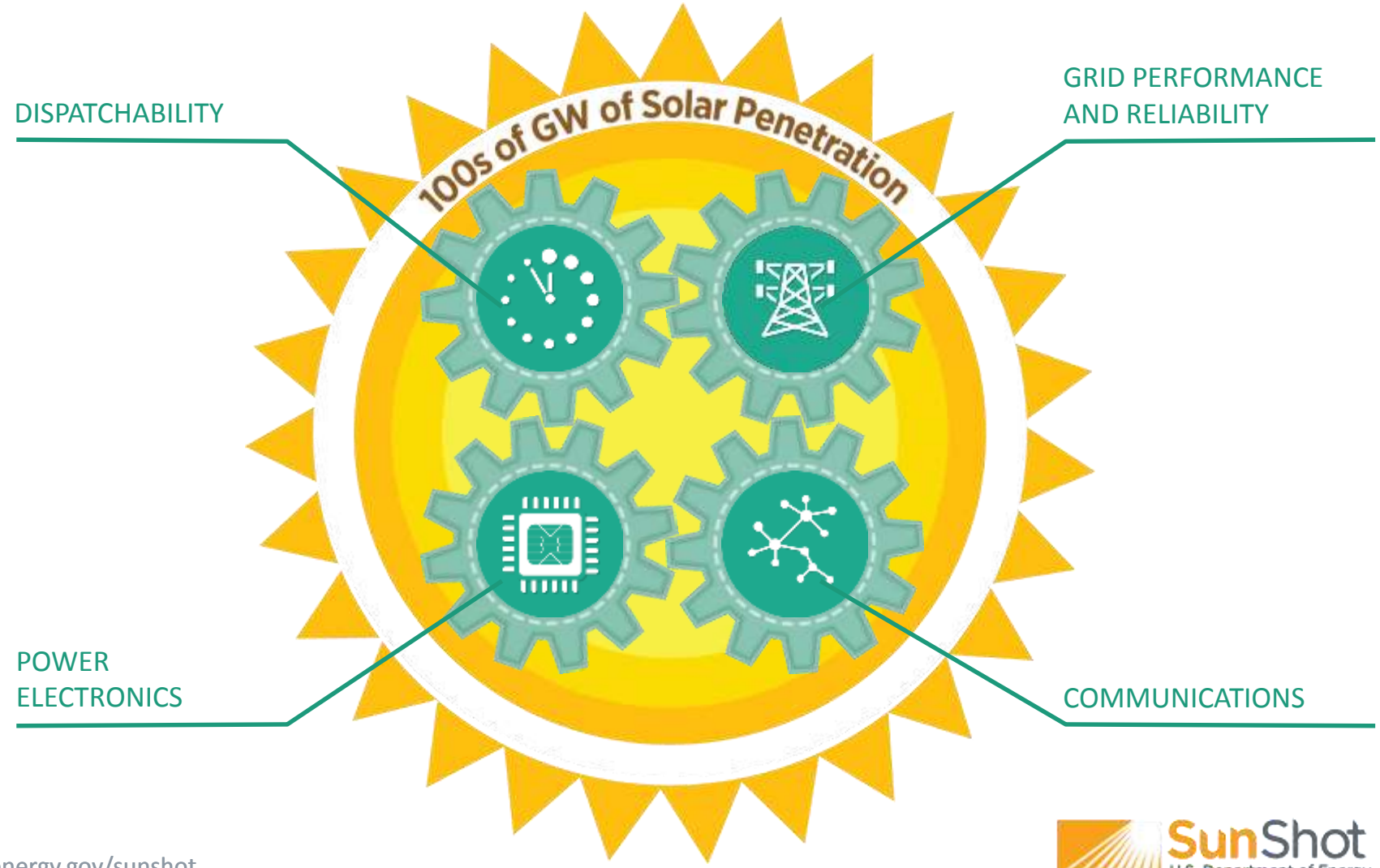
Photovoltaics R&D

Dr. Rebecca Jones-Albertus, Program Manager



Systems Integration

Dr. Guohui Yuan, Program Manager



Balance of Systems (Soft Costs)

Dr. Elaine Ulrich, Program Manager

NETWORKING AND TECHNICAL ASSISTANCE

Empowering state and local decision-makers through timely and actionable resources, peer networks, and technical assistance

BUSINESS INNOVATION

Developing solar finance and business solutions to expand access to capital and accelerate market growth

DATA ANALYSIS

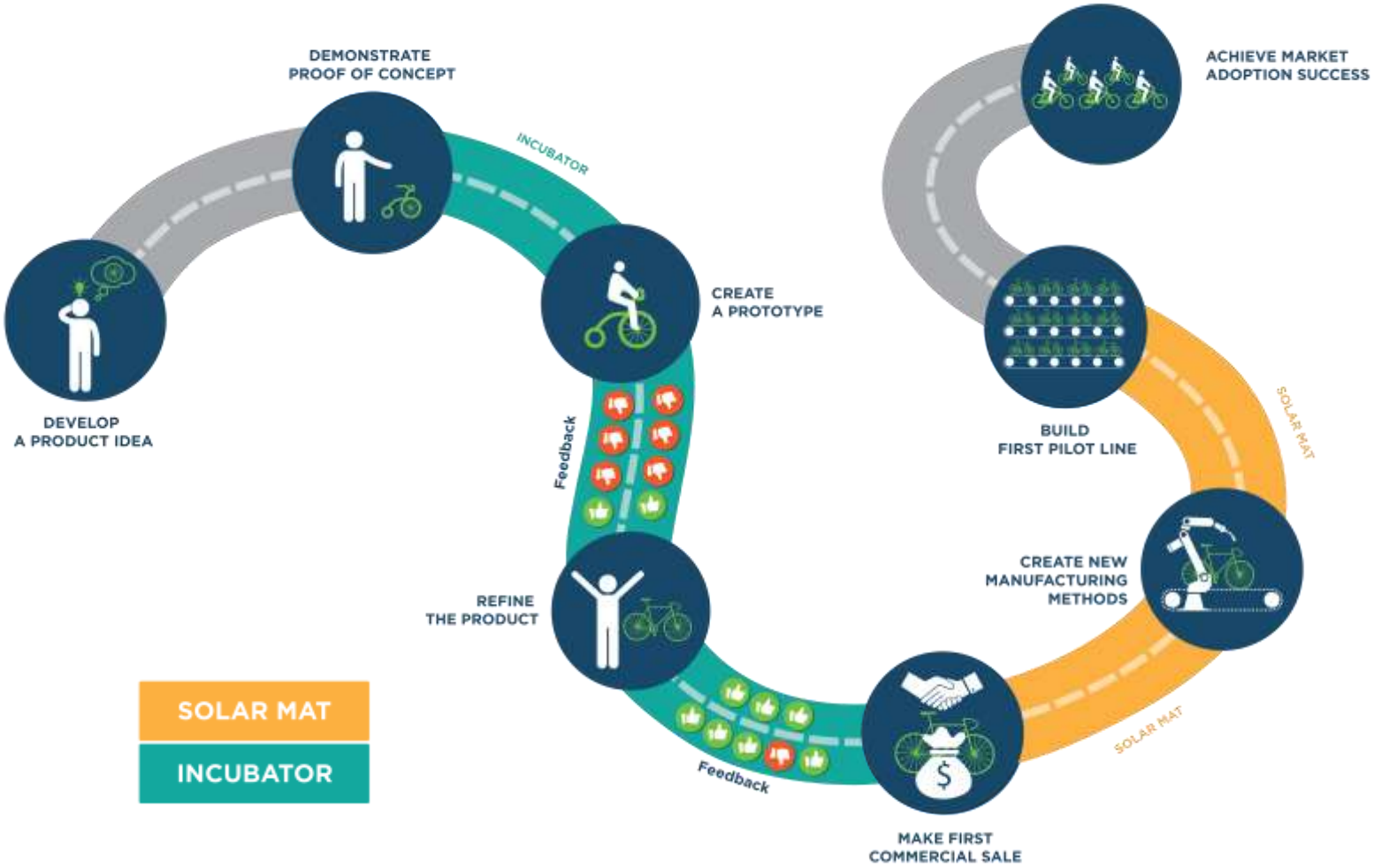
Harnessing big data analysis and technical solutions to support the many stakeholders involved in solar deployment

TRAINING

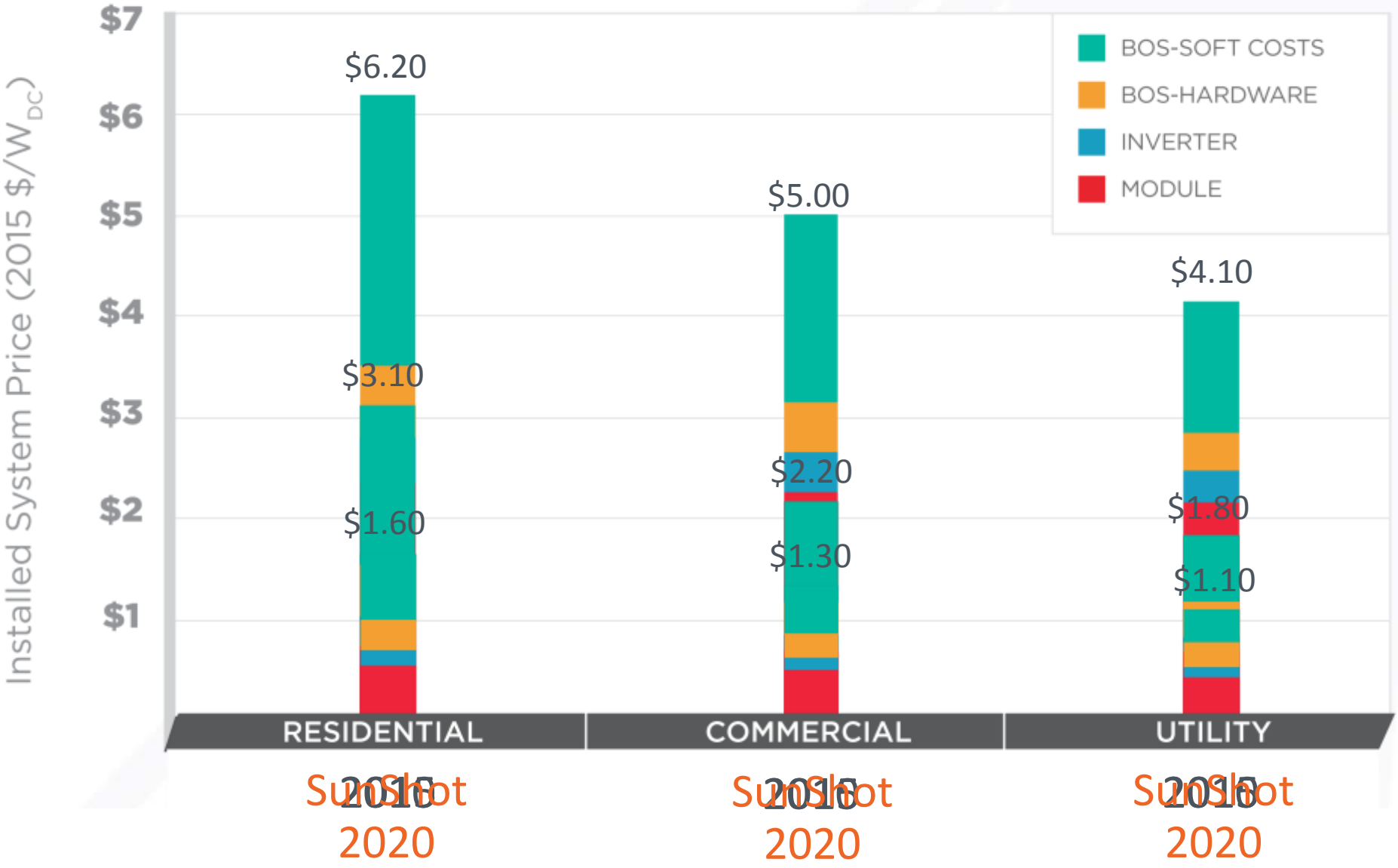
Training an innovative solar workforce to enable the solar industry to meet growing demand

Technology to Market

Joe Stekli, Program Manager



Installed PV System Prices



Capacity & Economic Impact

At the end of **2015…**

Enough to power

4,000,000

average American homes

Solar capacity has grown

23-fold

since 2009.

Solar accounted for

34% of all new electrical generation

capacity installed in 2015.

8,000

solar businesses in the U.S.

$20 billion:

Value of the U.S. solar market in 2015

53% ↓

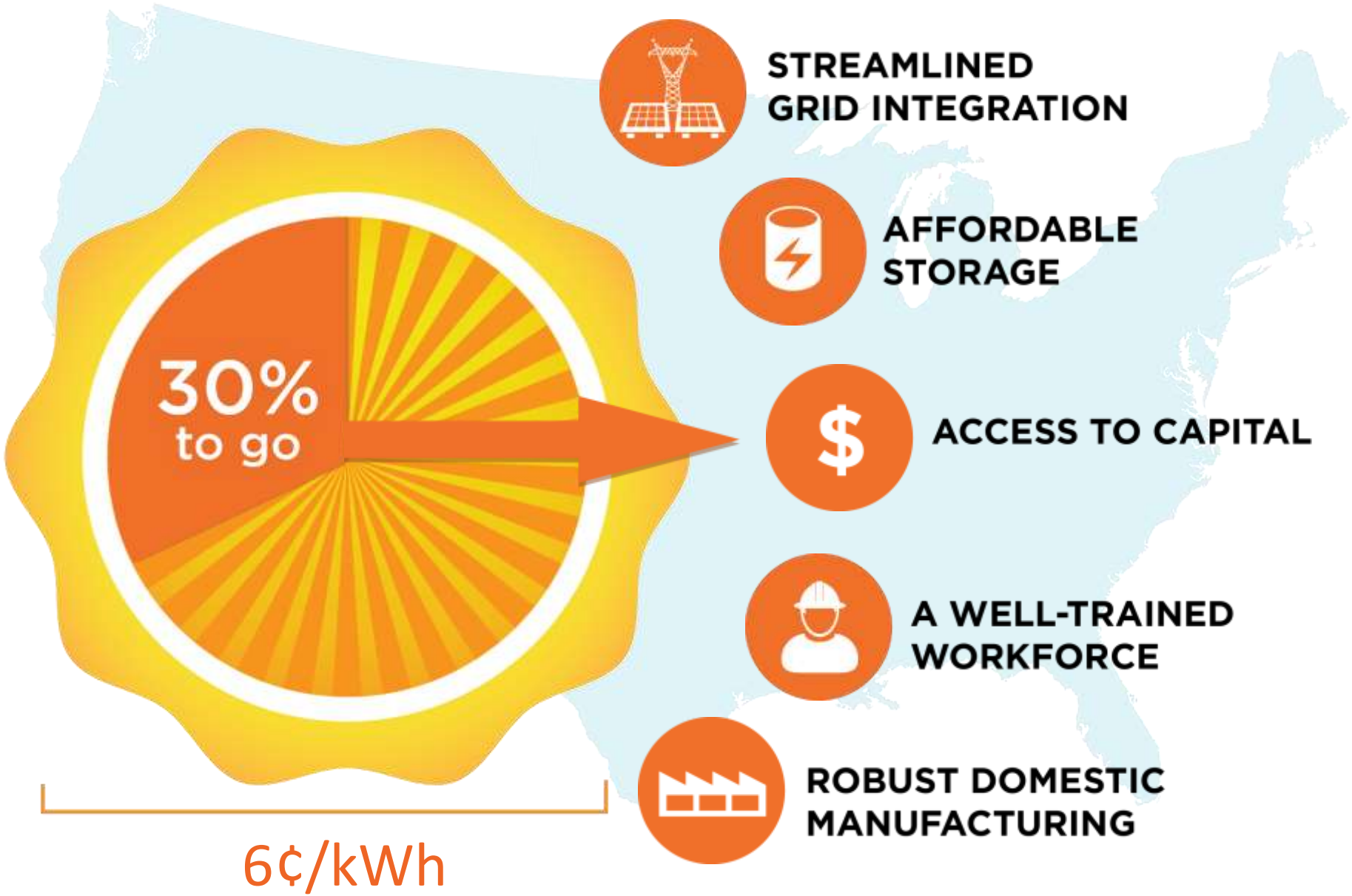
Solar systems costs are down 53% Since 2010

America Will Achieve its SunShot

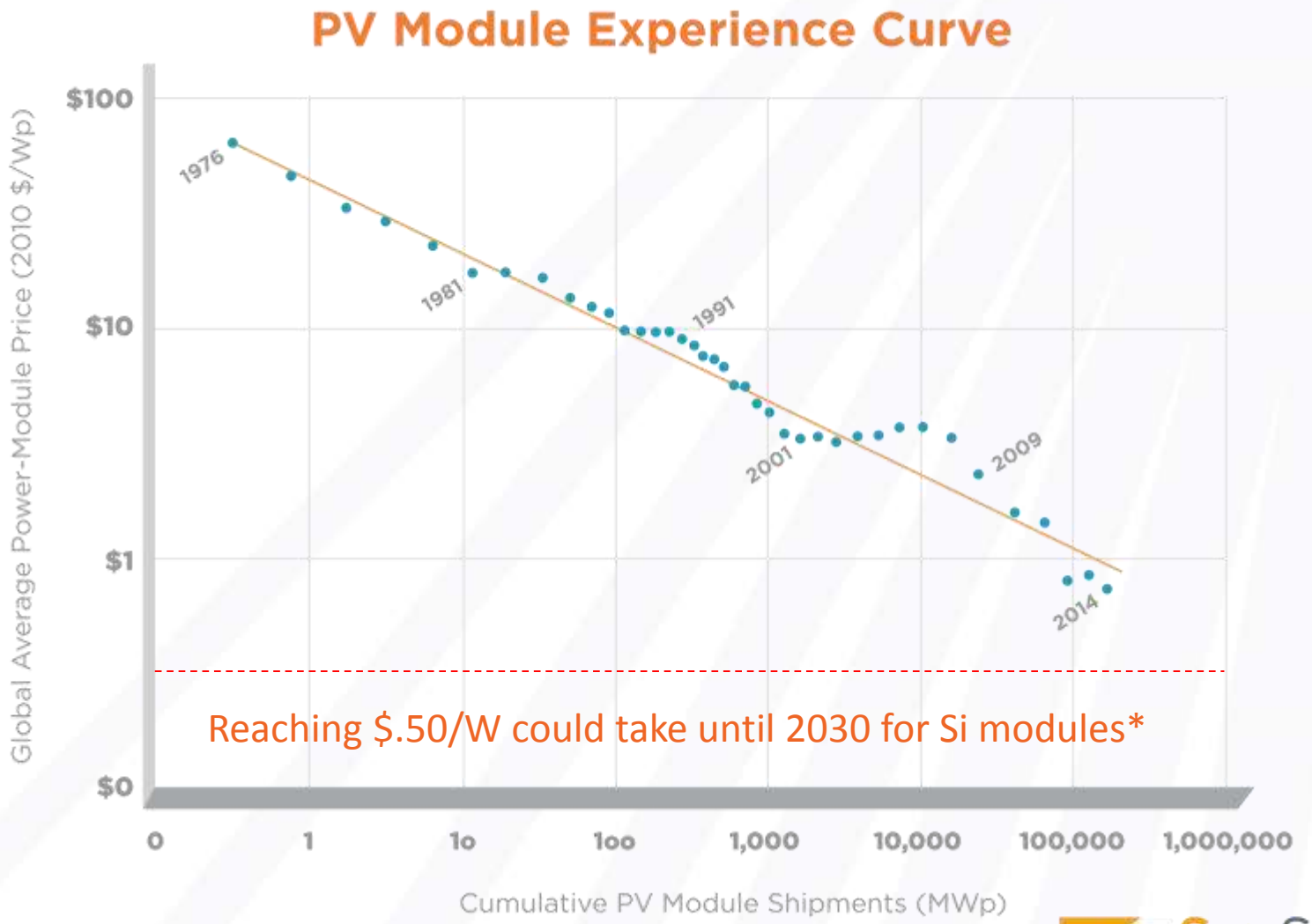
Solar energy will be cost competitive with fossil fuels by 2020, if not before, the director of the Department of Energy's Solar Technologies Office said in New York Thursday.

Forbes

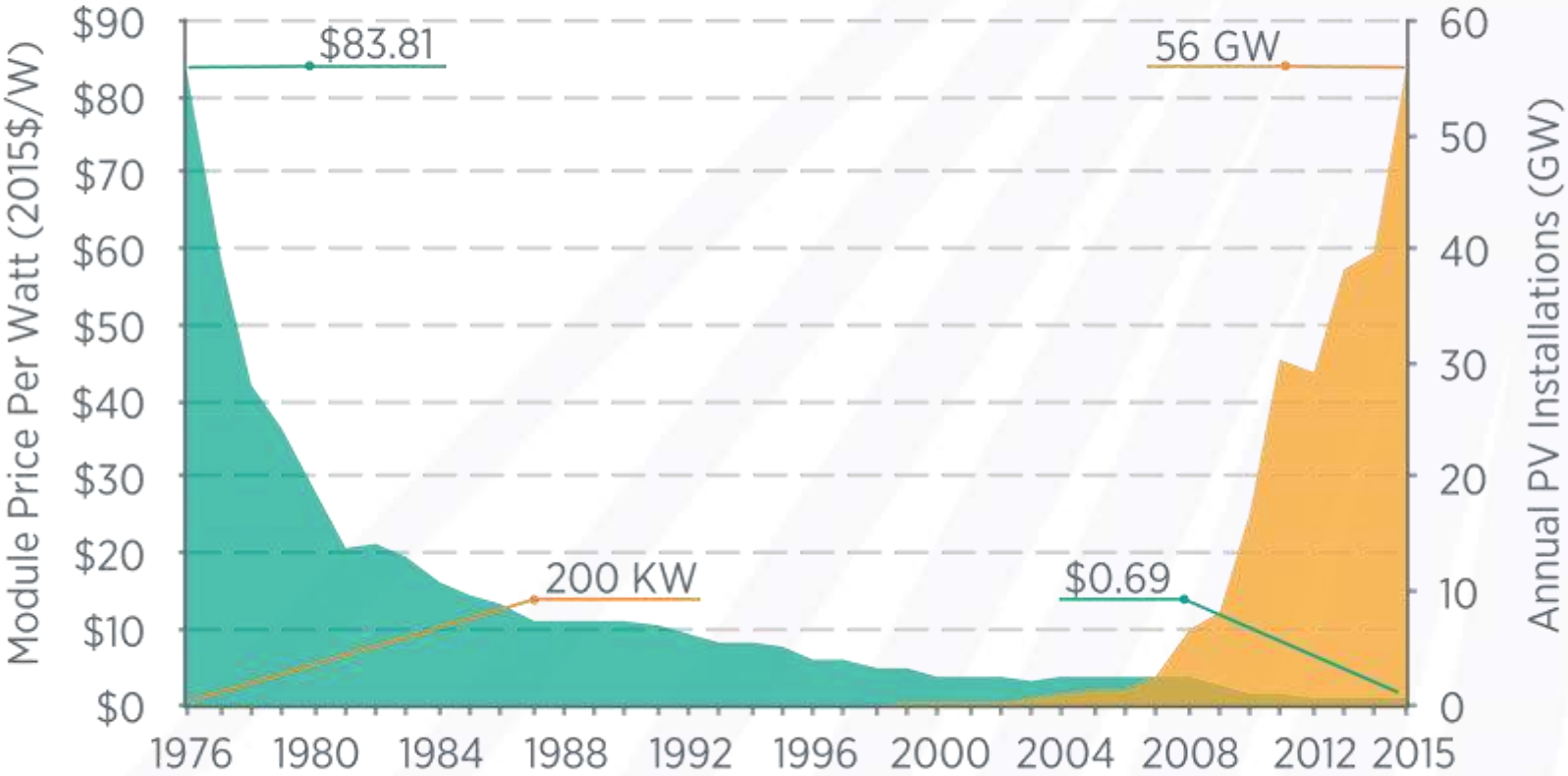
SunShot Goal: WHAT'S LEFT



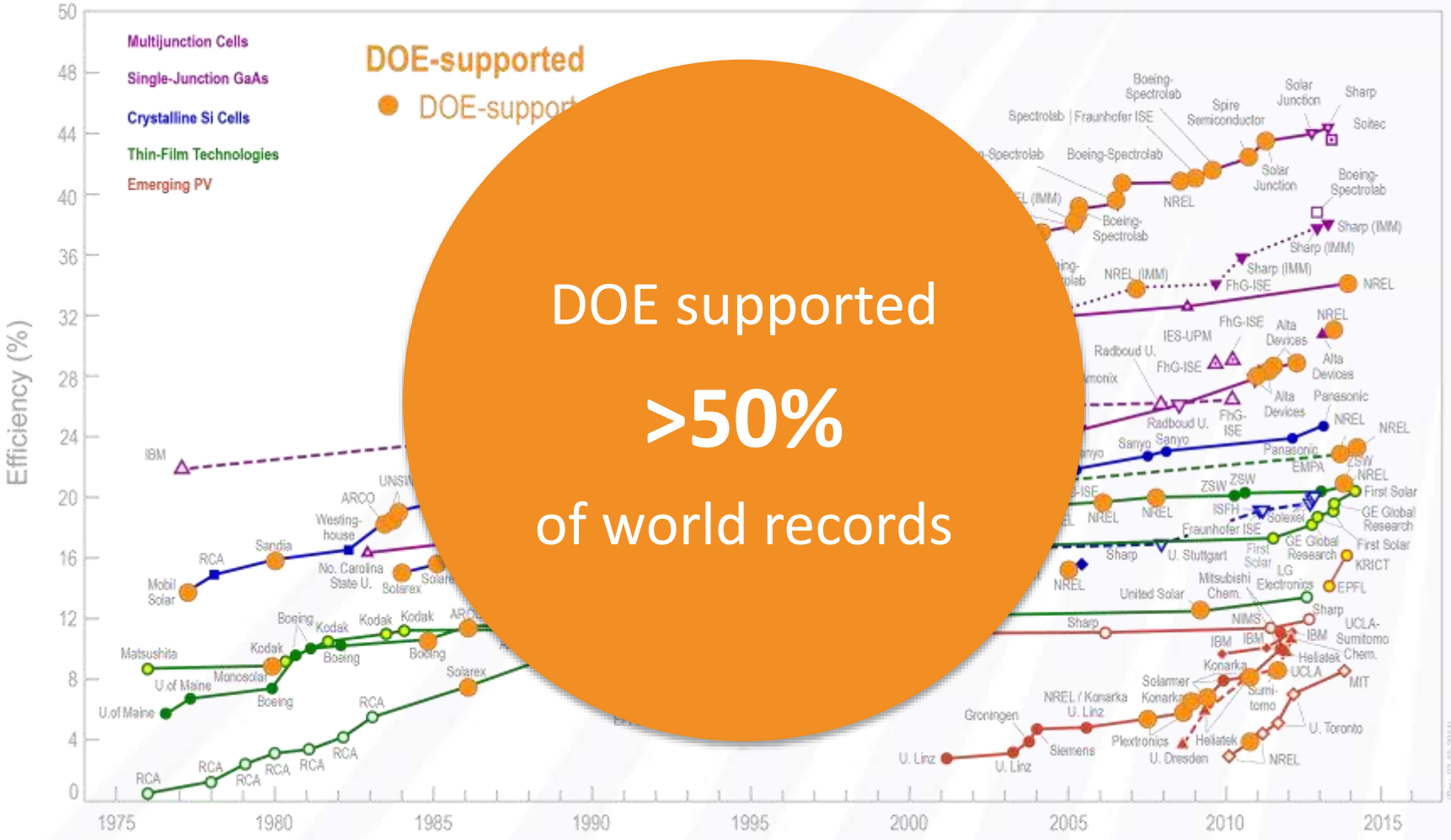
PV Module Prices



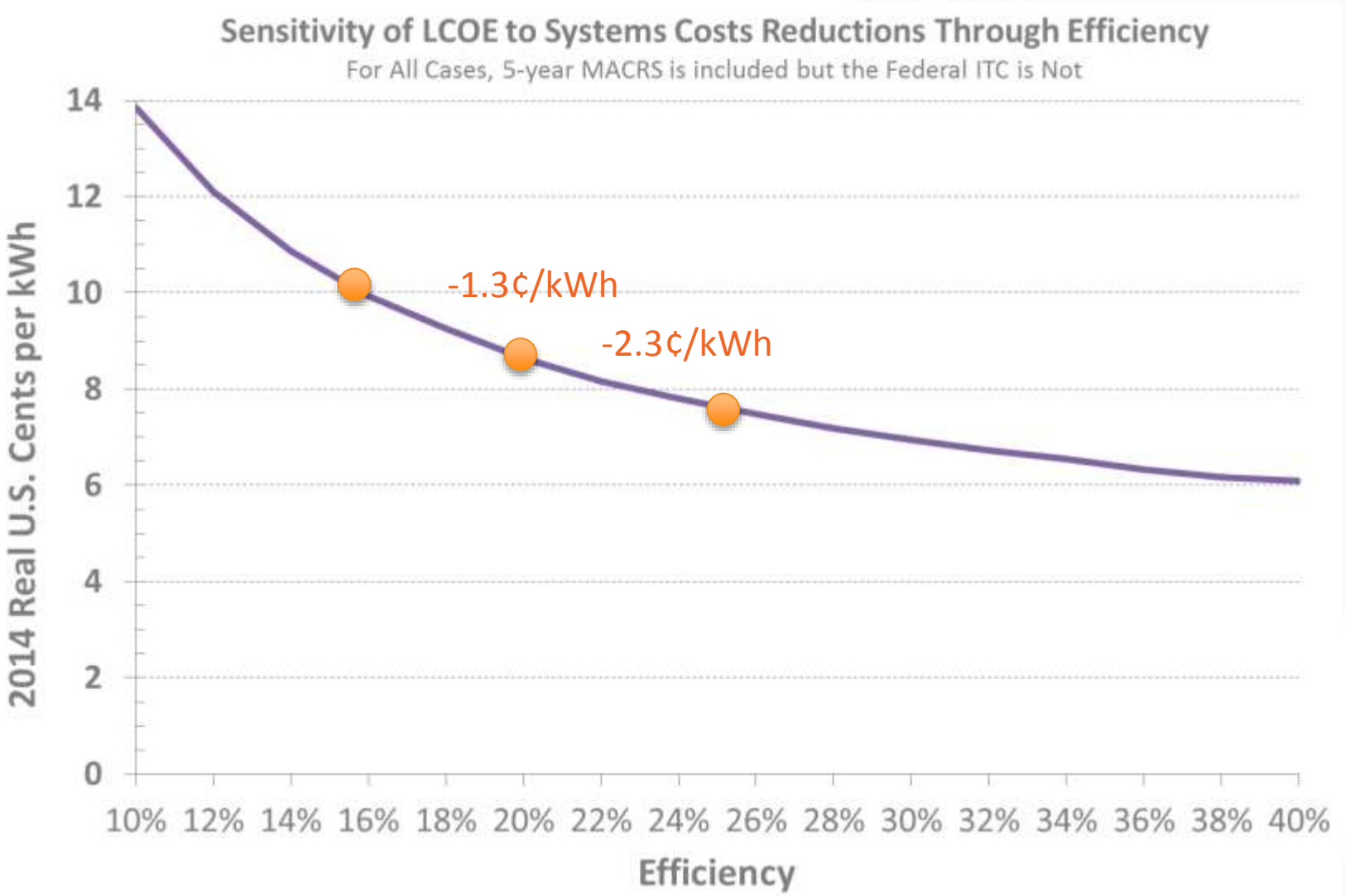
As Solar Module Costs Decline, Annual Installations Rise



Maintaining U.S. Leadership in PV R&D

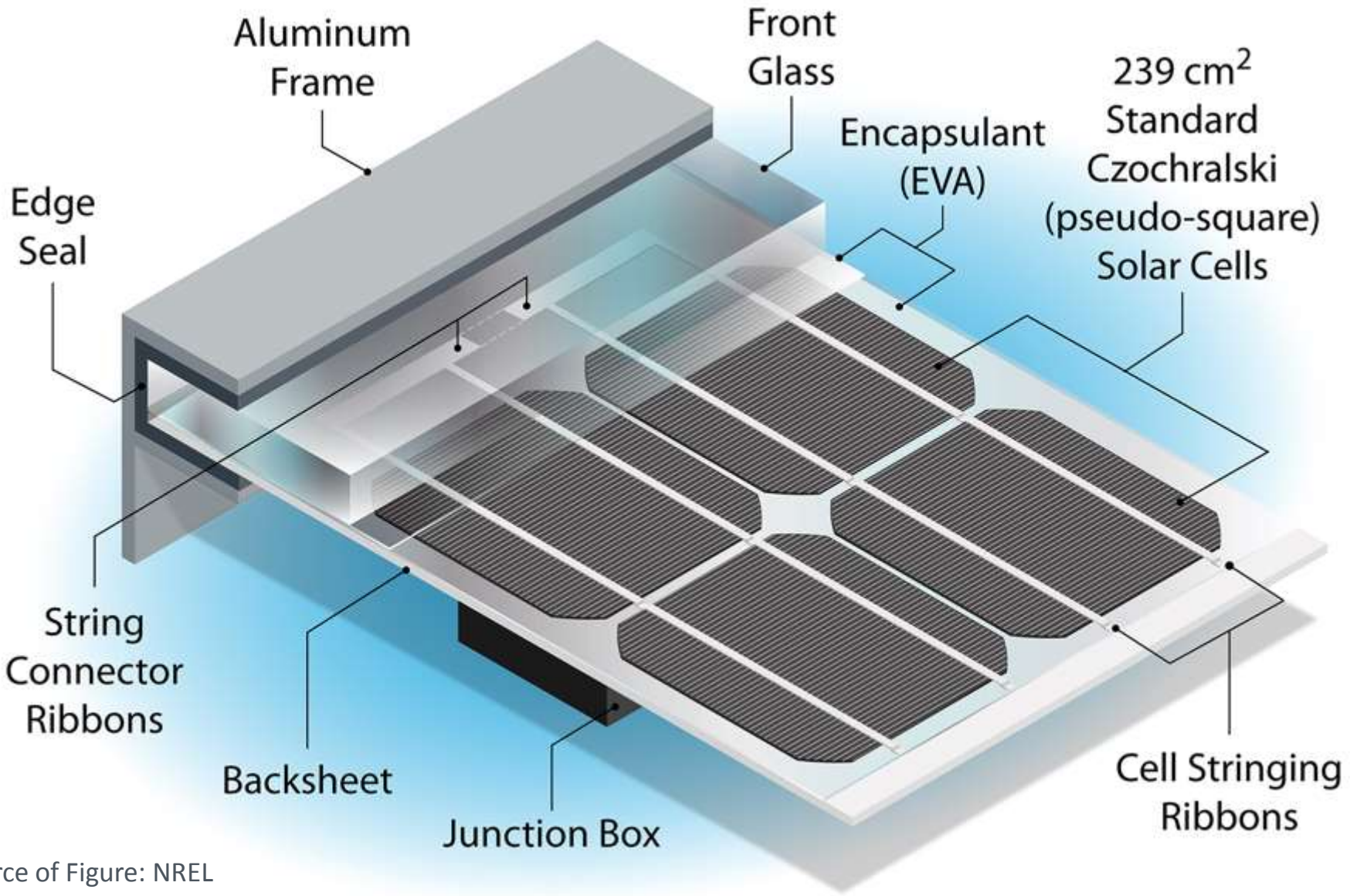


The Impact of Efficiency



Metric Sets to Achieve the SunShot Goal (6¢/kWh)

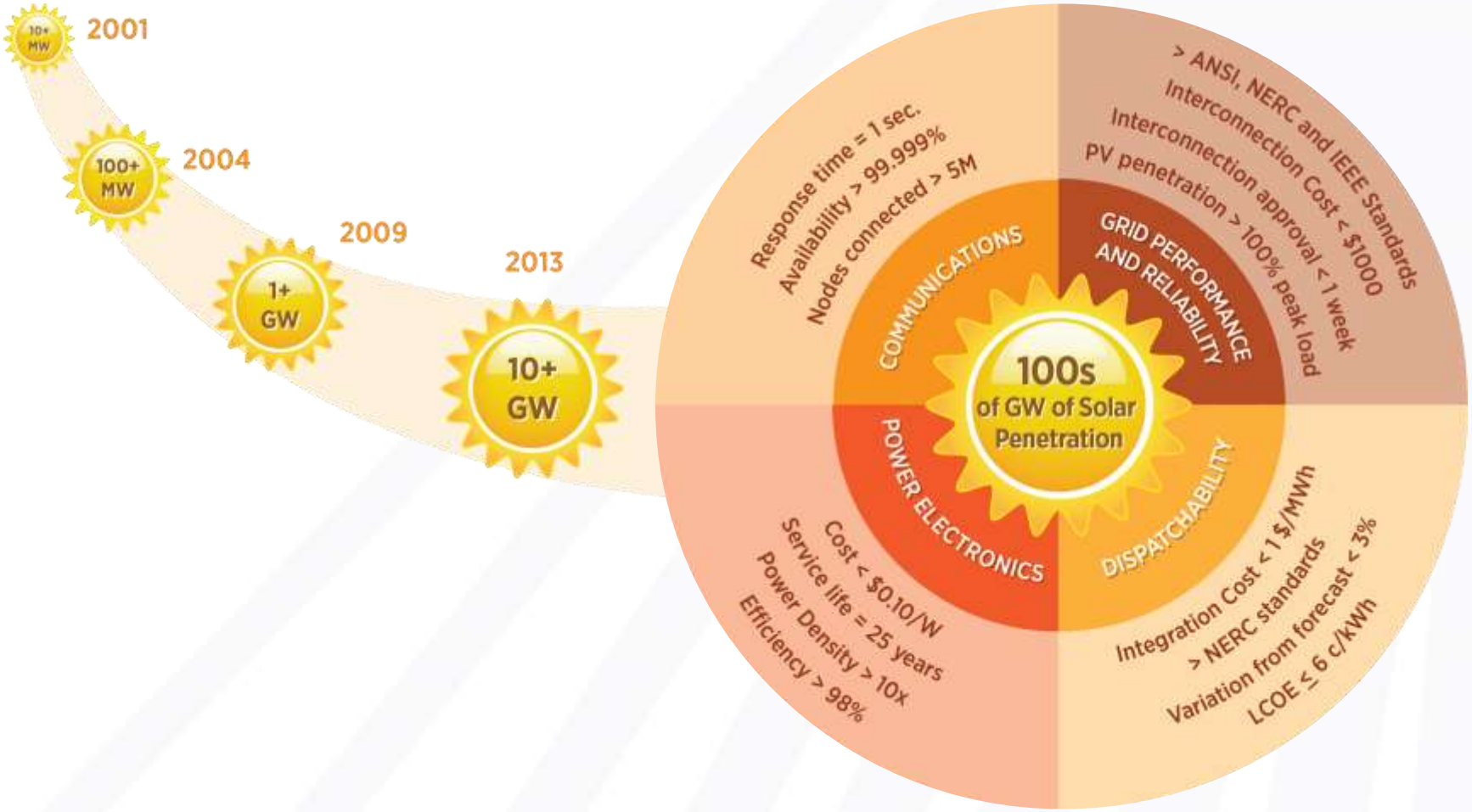
What are the Opportunities for Module Innovation?



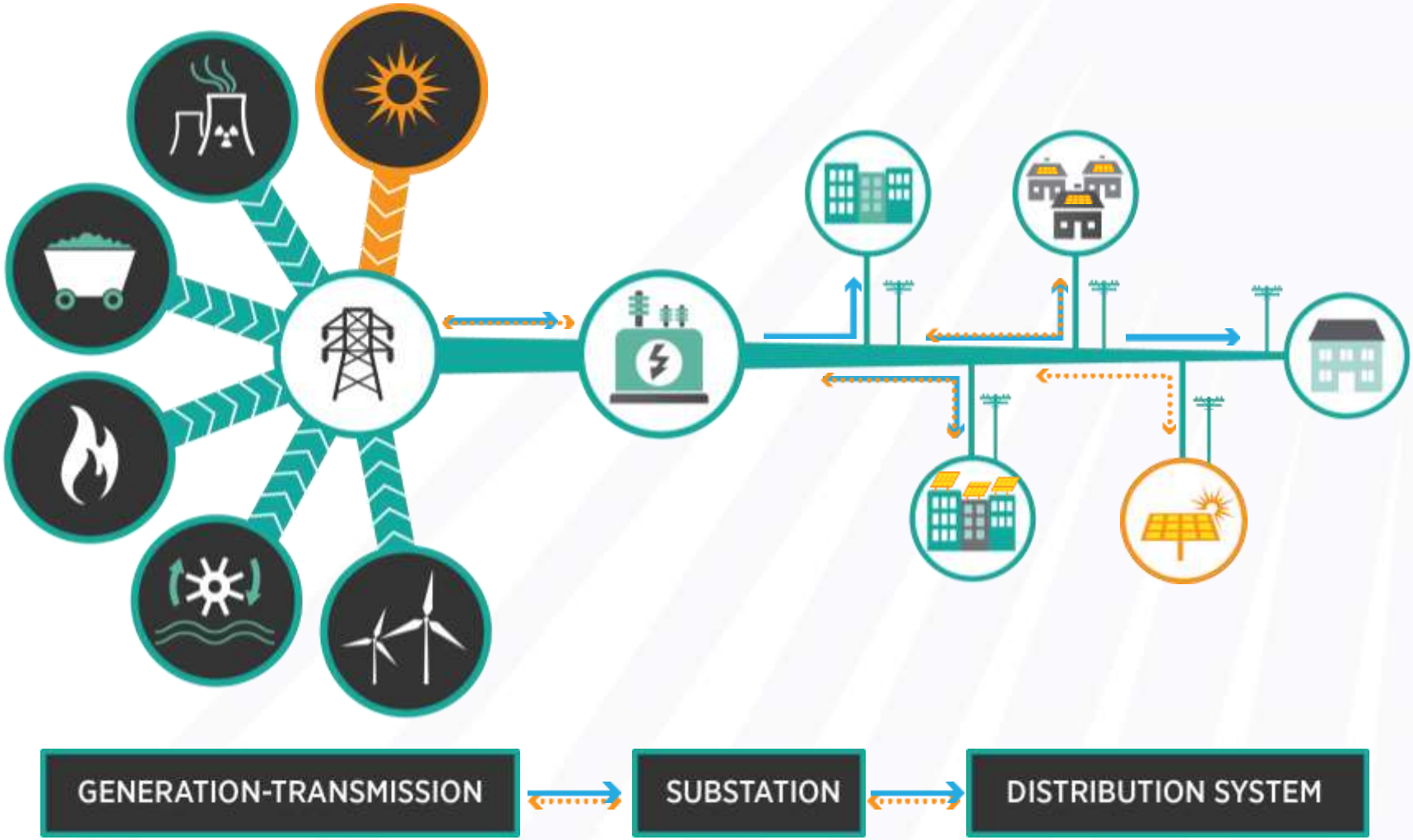
Source of Figure: NREL

Physics of Reliability: Evaluating Design Insights for Component Technologies in Solar (PREDICTS)

The Systems Integration Vision

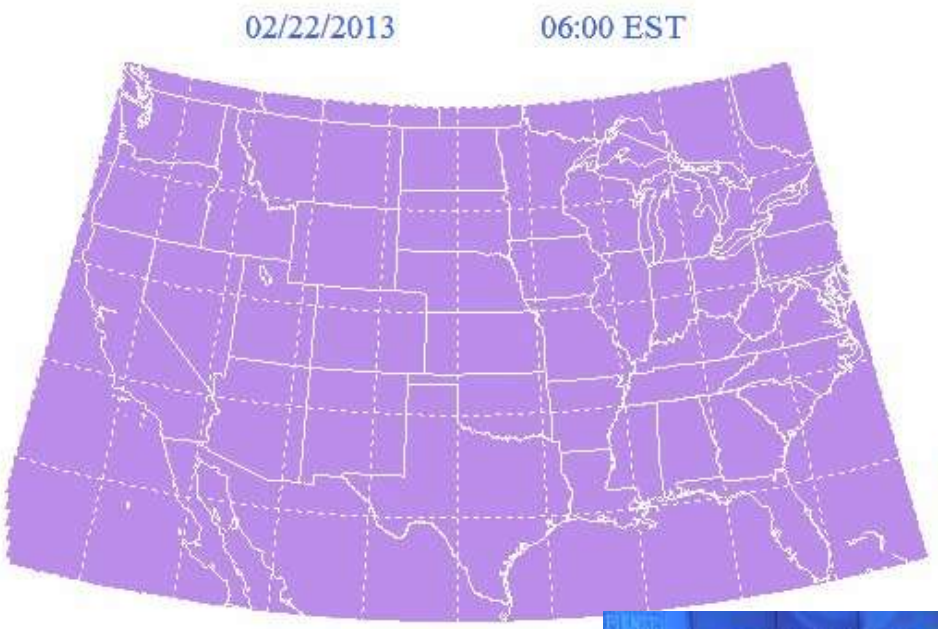


Today's Power System: Two-Way Power Flow

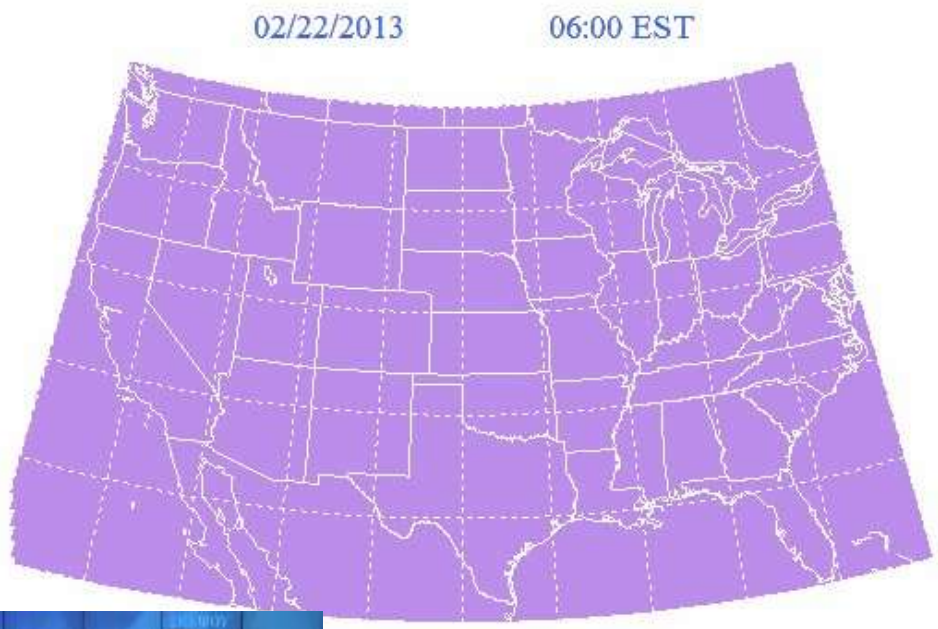


Watt-Sun: A multi-model, machine-learning renewable energy forecasting technology

Direct Irradiance



Diffusive Irradiance



IBM

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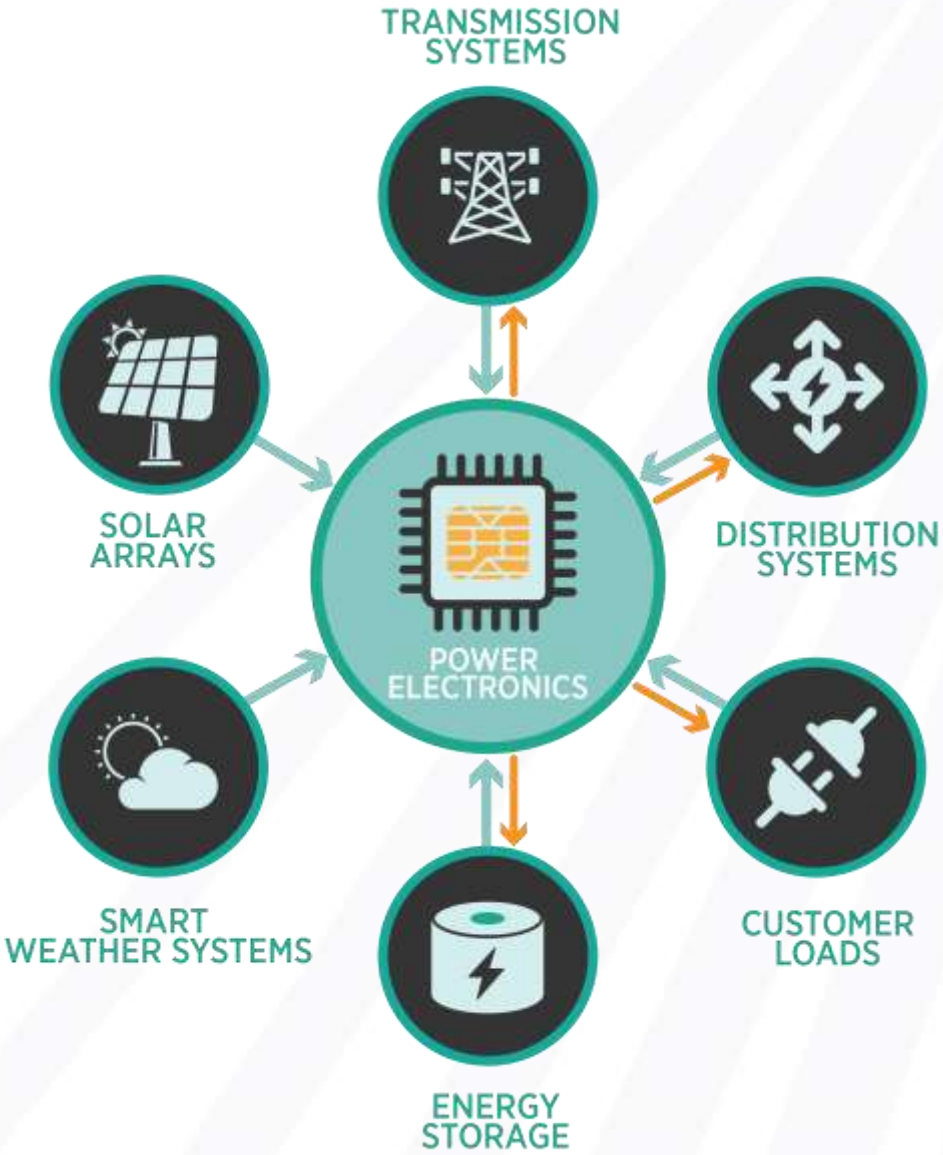
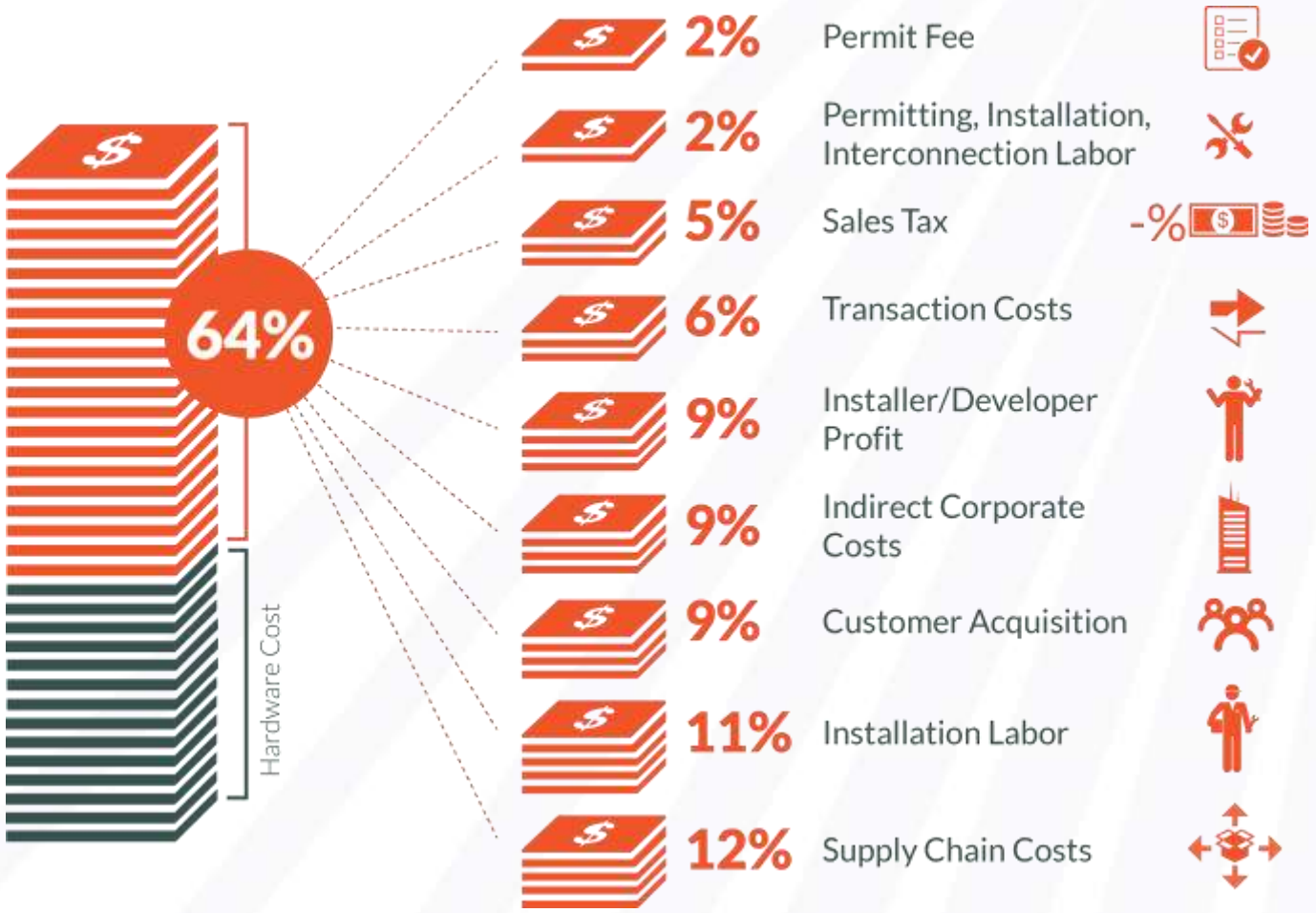
Power Electronics



Balance of Systems (Soft Costs)



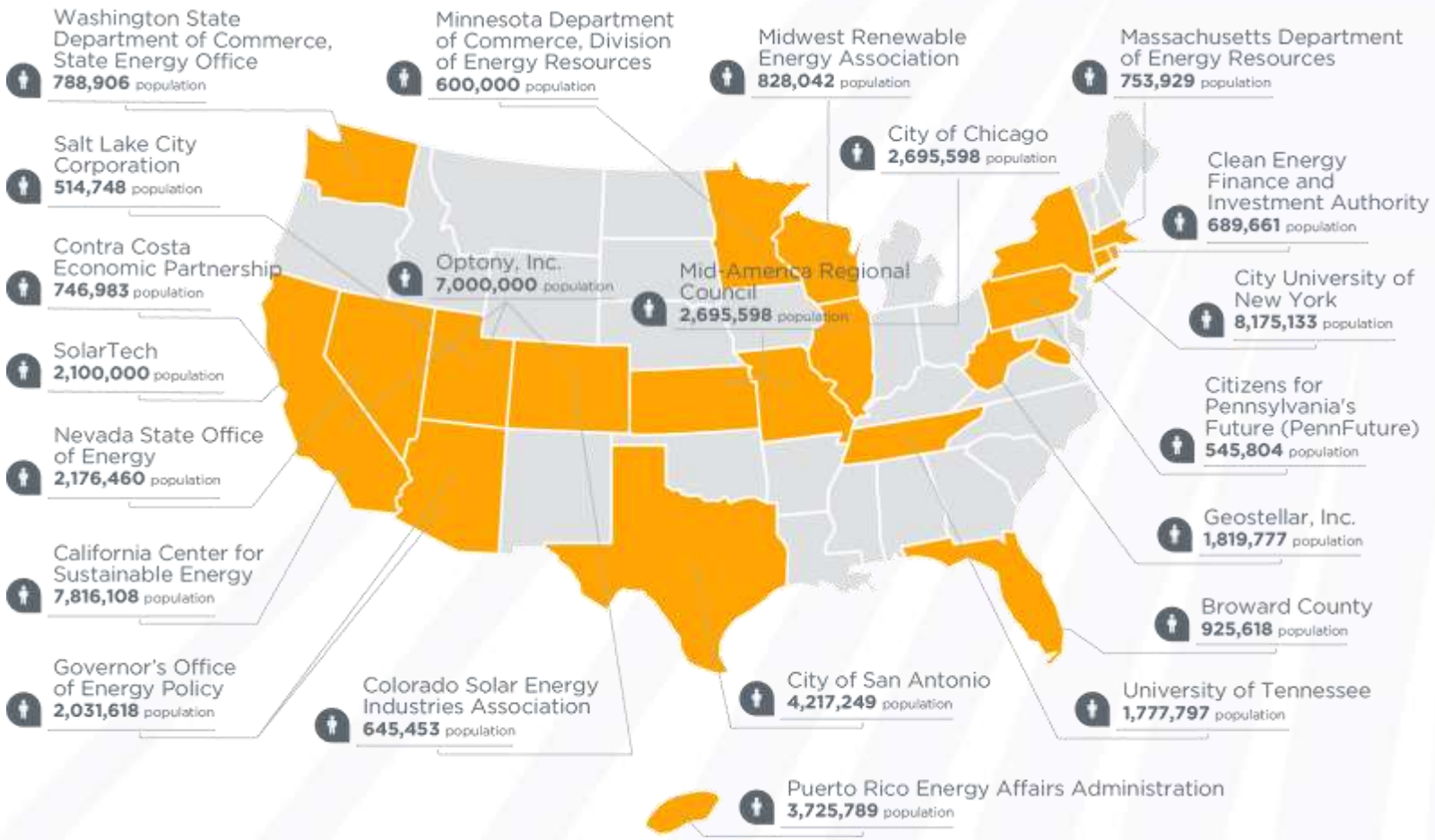
Red tape related to solar installations can drive up costs and limit solar adoption. In the U.S., there are

18,000 JURISDICTIONS,
3,000 UTILITIES,
50 STATES,

with different rules and regulations.

Unlike physics, where we can fundamentally figure out the upper limit for the efficiency of solar cells, there is no such limit to bureaucracy.

Rooftop Solar Challenge Team Locations



Solar Market Pathways

The Solar Market Pathways Program brings together 14 diverse teams under a single goal: **increase solar adoption by reducing solar's soft costs.**

Program Strategies:

- Expanding Community Solar
- Enhancing Resiliency
- Deploying Solar on Campuses
- Supporting Strategic Planning

DATA: The Orange Button Project

The Orange Button Initiative simplifies and standardizes solar data so you can use it.

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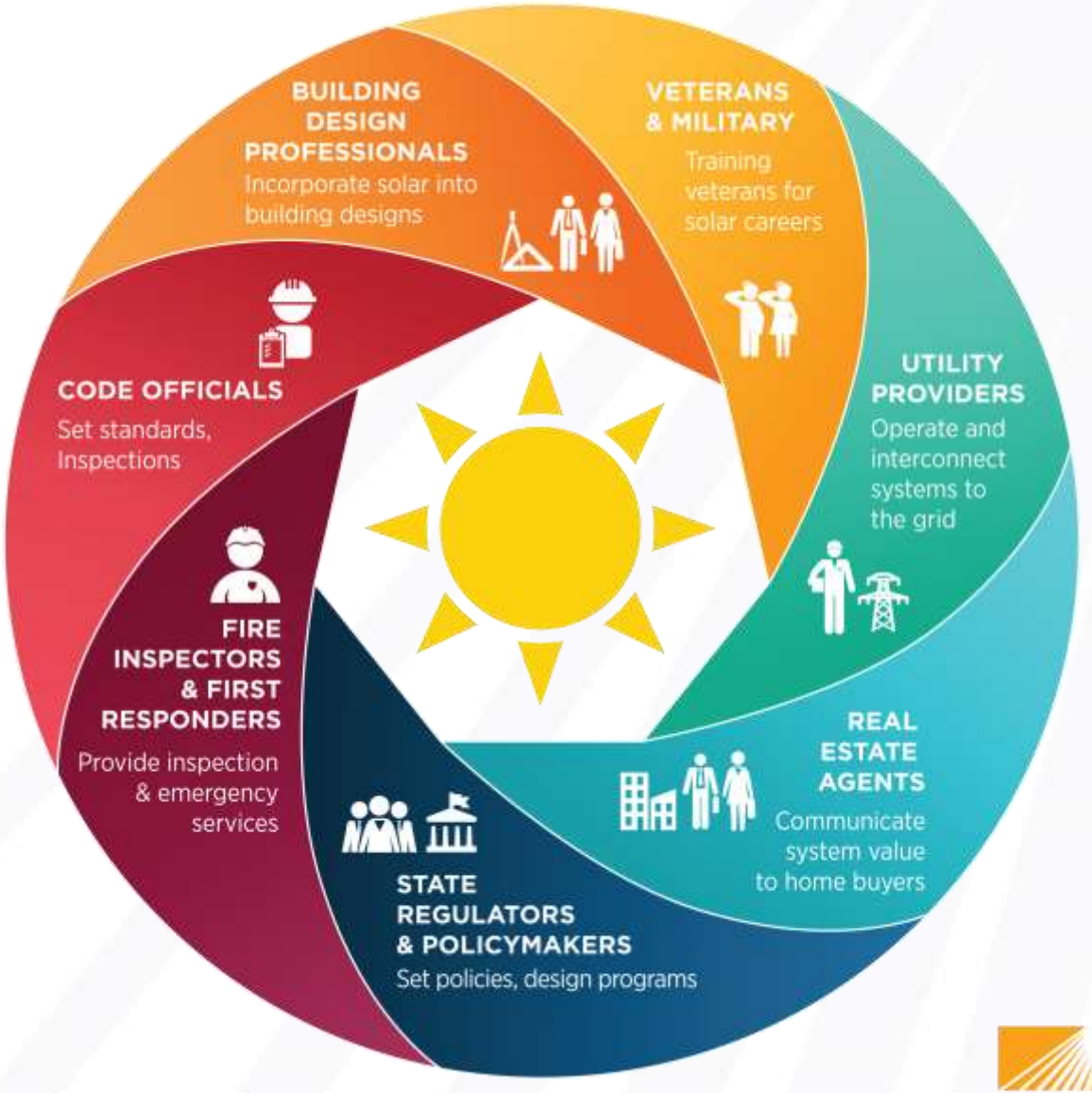
Solar Training and Education for Professionals (STEP)



Opportunities Beyond the Residential Rooftop

Community Solar

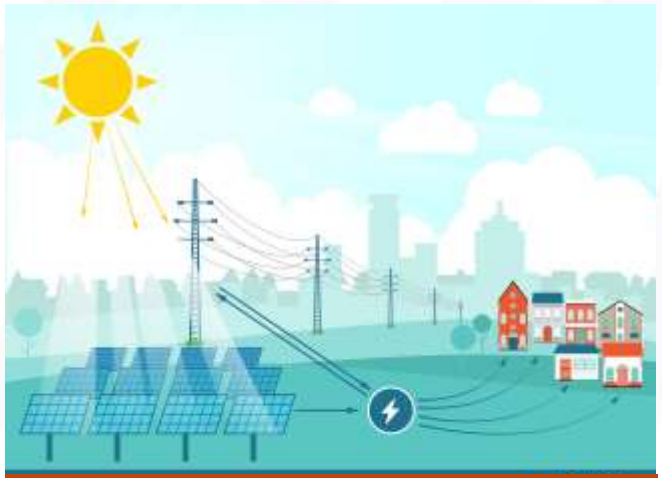
Community members work together to enable solar in their community

Group Purchasing

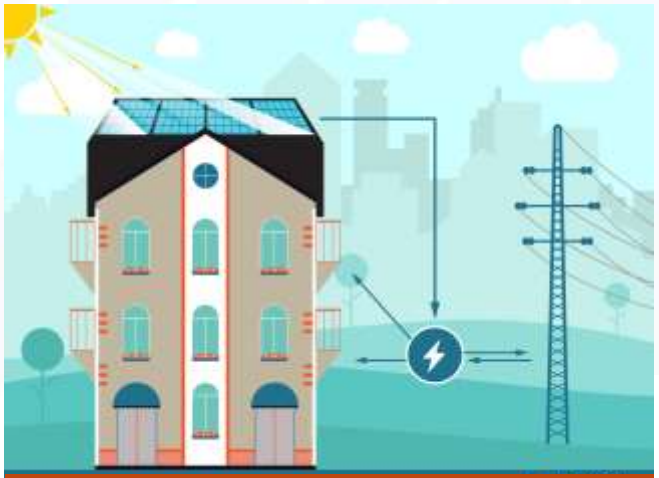
Financial (Invest or Donate)

Shared Solar

Participants own or lease panels, buy kWh blocks of generation, or own an interest in a shared system

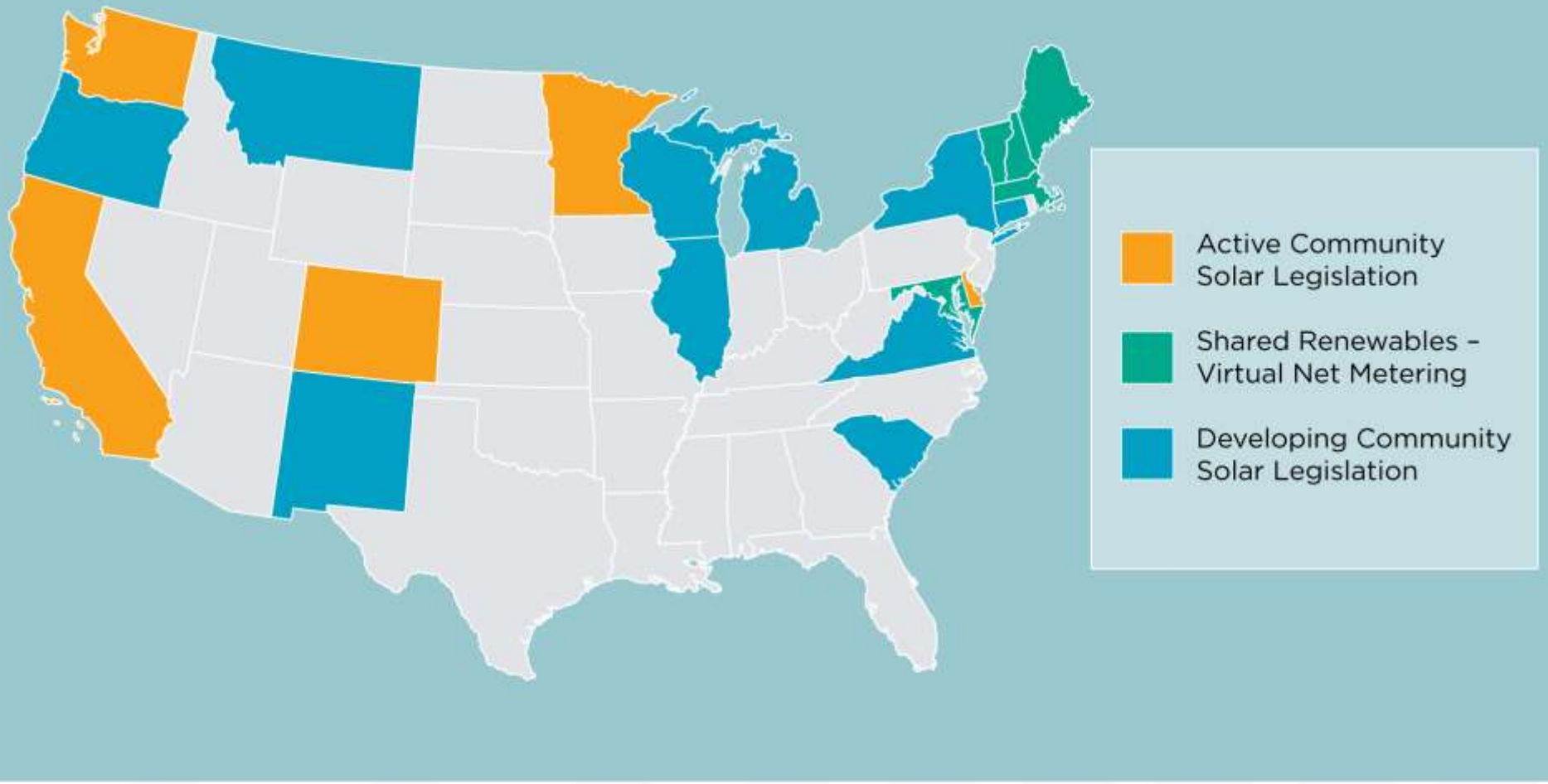


Offsite



Onsite (Multi-Unit Buildings)

Community Solar Legislation



SUNSHOT PRIZE: **RACE TO 7-DAY SOLAR**

$4 MILLION PRIZE COMPETITION

Inefficient processes and uncoordinated administration obstacles make going solar in the U.S. long and arduous

Customers could wait

180 days

or longer to obtain a solar installation

5 teams competing

to make it possible for customers to obtain solar in just **7** days

Solar Energy Evolution and Diffusion Studies (SEEDS)

State Energy Strategies

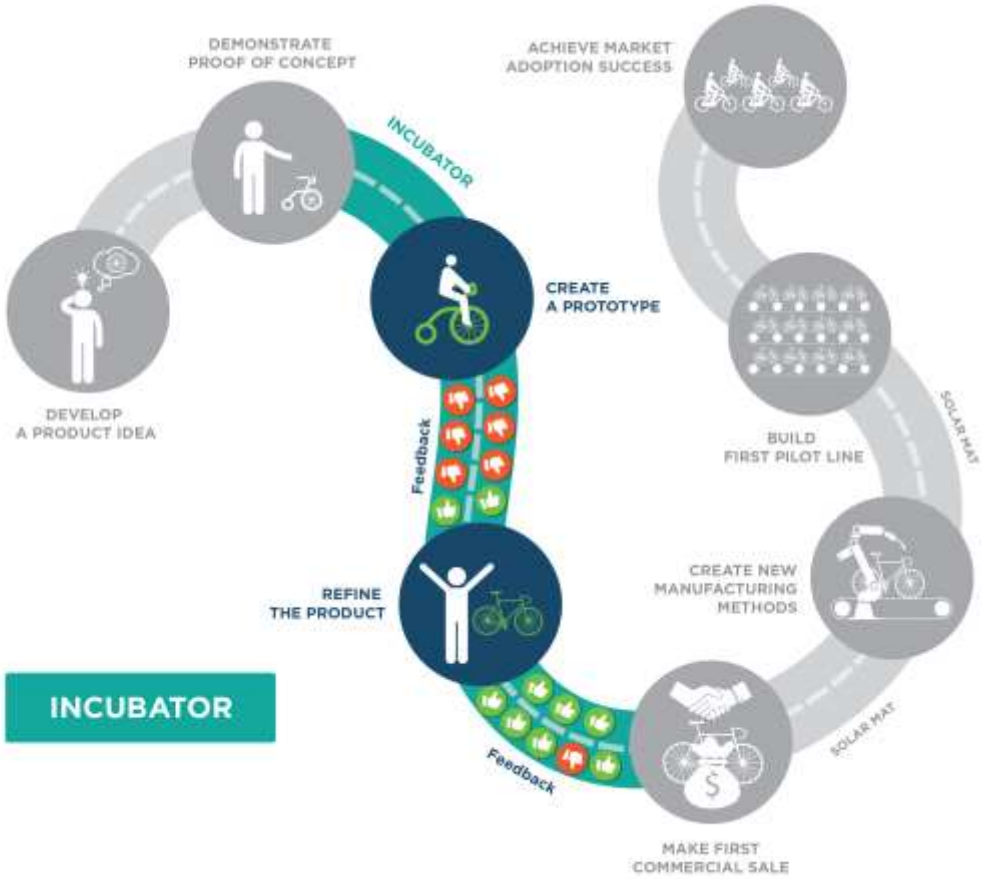
SunShot Incubator Program

The Incubator program provides early-stage assistance to help startup companies cross technological barriers to commercialization.

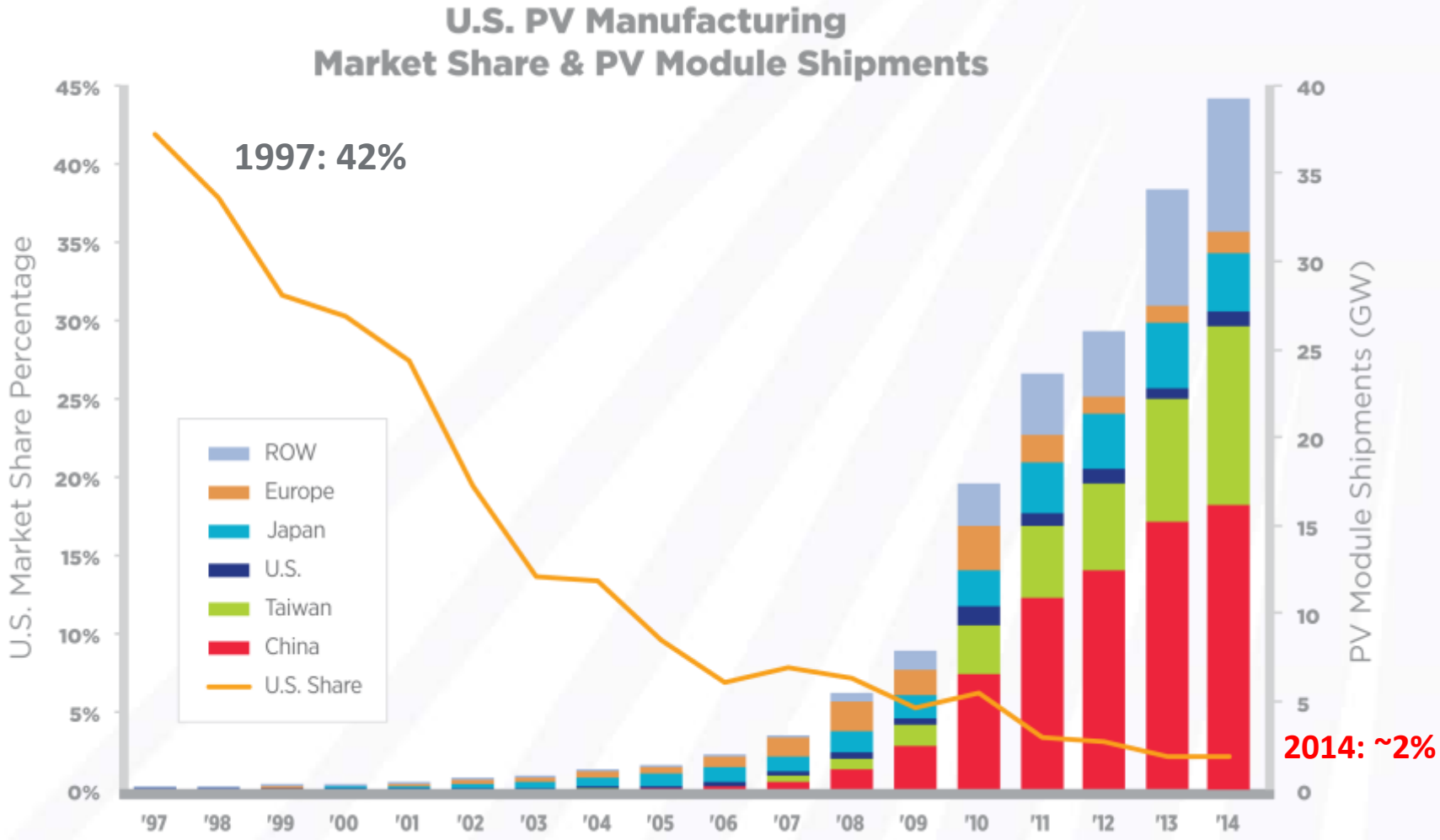
For every $1 of federal support, **$22 in private sector investment** follows

= 121

97 startup companies have received a total of 121 awards to participate in the SunShot Incubator program since it began in 2007



Erosion of Domestic PV Manufacturing



DOE Solar Manufacturing Investments Paying Off

New York Draws Another Solar Manufacturer as it Shapes New Hub

New York is about to become a hub for U.S. solar manufacturing as the state lured a start-up called 1366 Technologies Inc. to build its first factory in Genesee County.

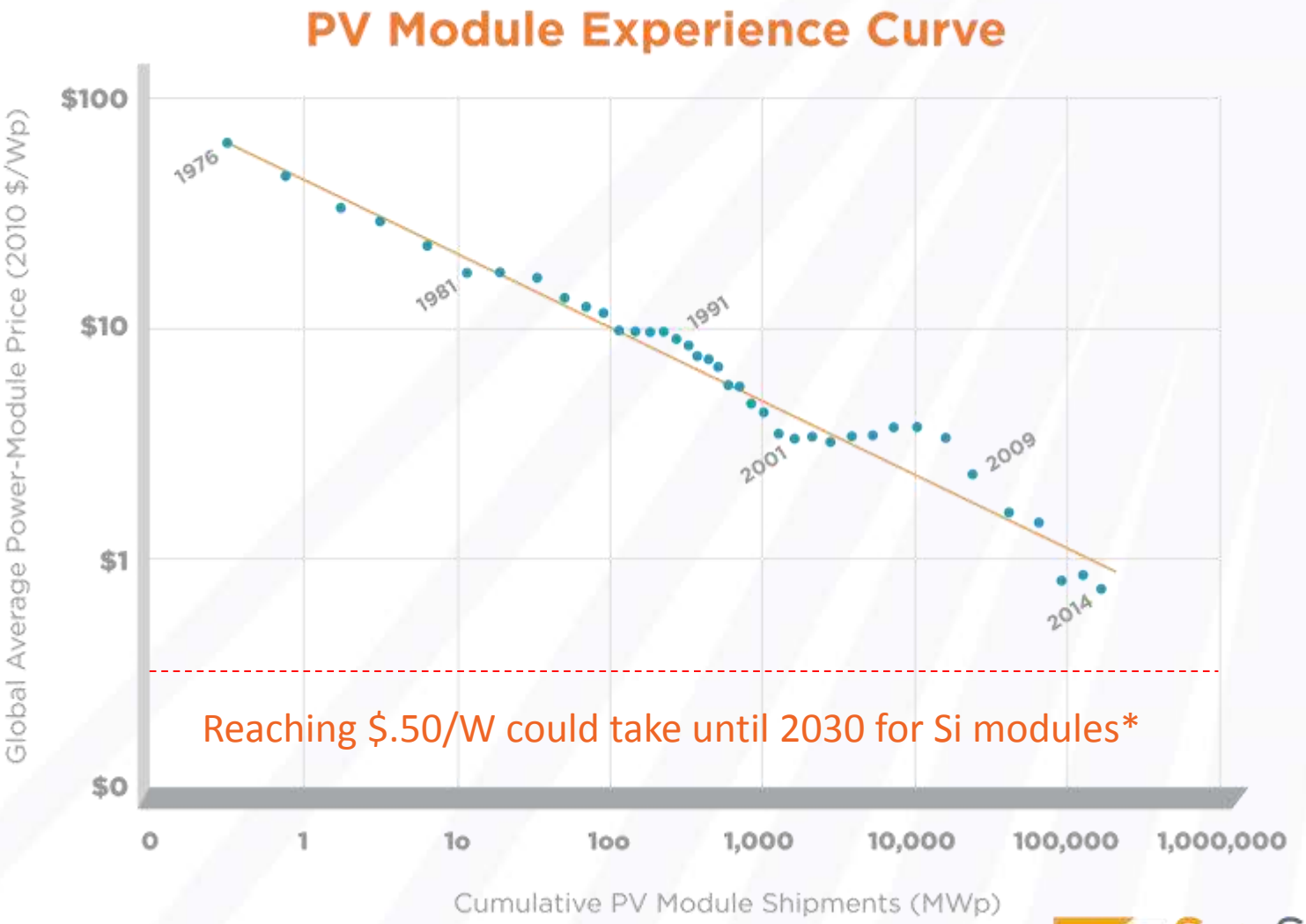
Bloomberg Business

Suniva Inc. Expands its Solar Cell Manufacturing Facility in Gwinnett County, Georgia

Suniva, a leading manufacturer of high-efficiency crystalline silicon solar cells and modules, will expand its facilities and invest $96 million in Georgia and create up to 500 jobs.

AREA DEVELOPMENT ONLINE
SITE AND FACILITY PLANNING

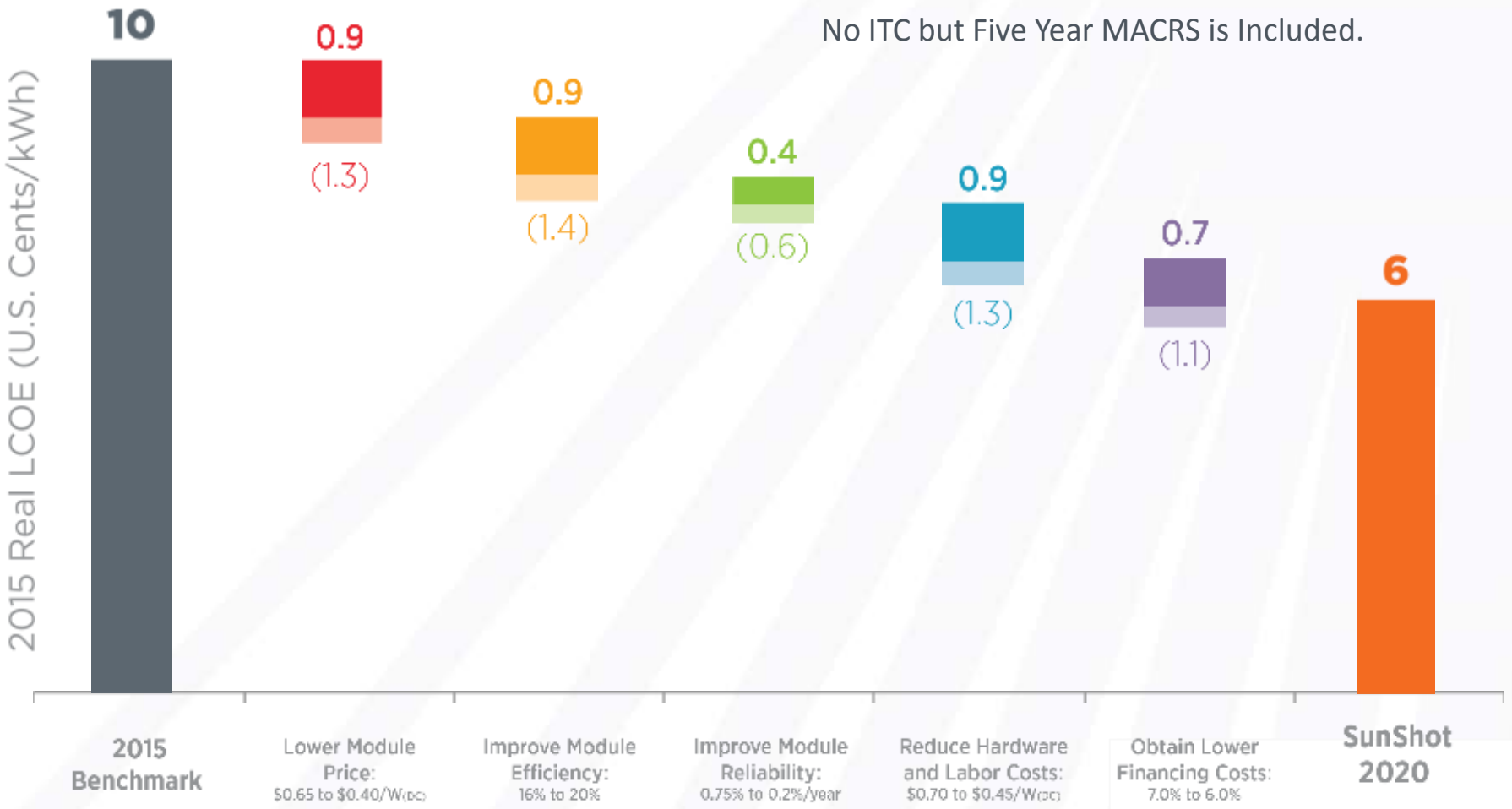
Towards Ubiquitous Solar



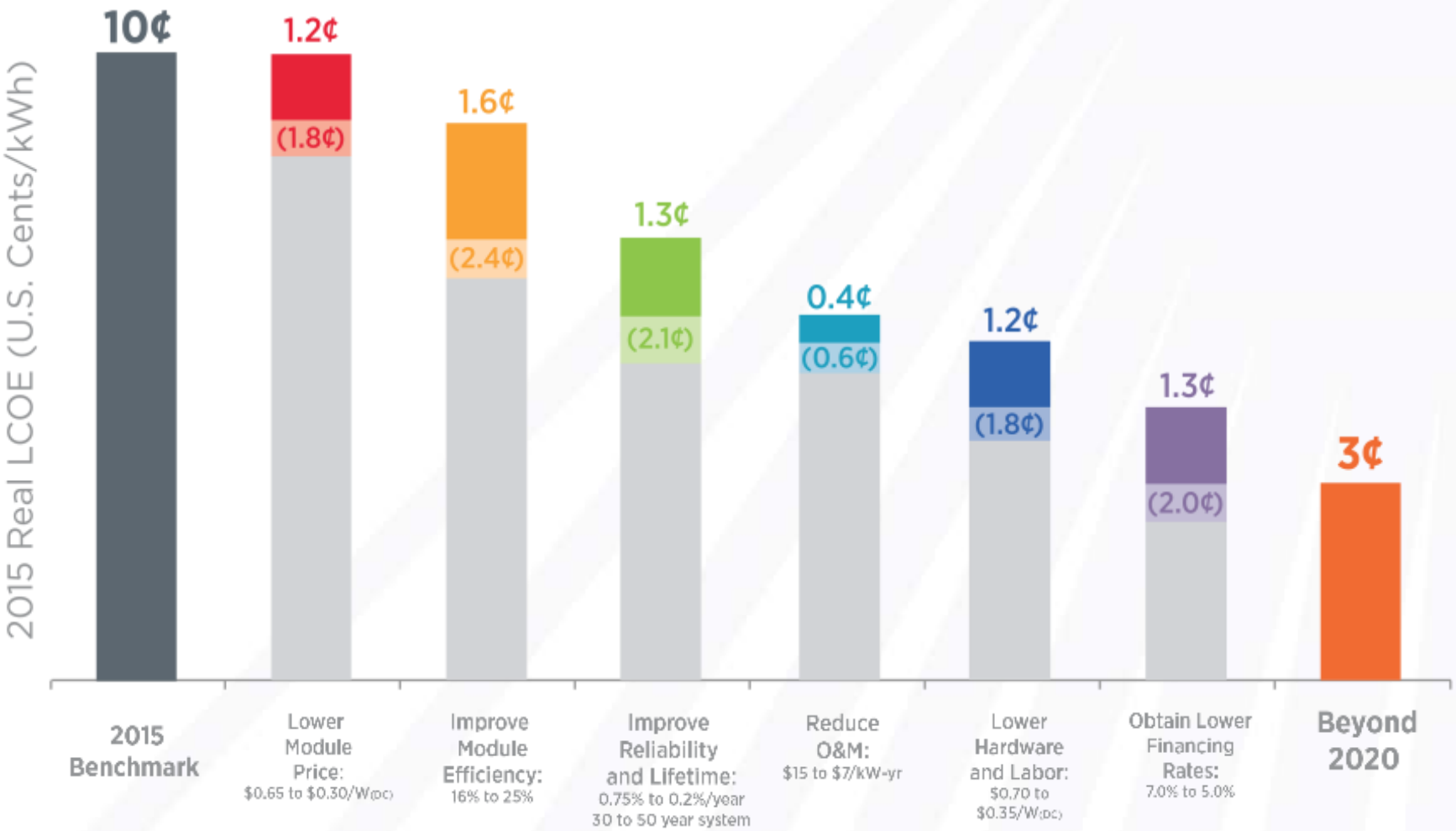
A Pathway Toward the 2020 SunShot Goal

Benchmark 100 MW Utility Systems With 1,480 kWh/kW First Year Performance.

No ITC but Five Year MACRS is Included.



Cost Reductions Needed to Reach 3¢/kWh*



*Benchmarked from a 100 MW PV utility system with 1,480 kWh/kW first-year performance. Assumes no ITC, but five-year MACRS is included.

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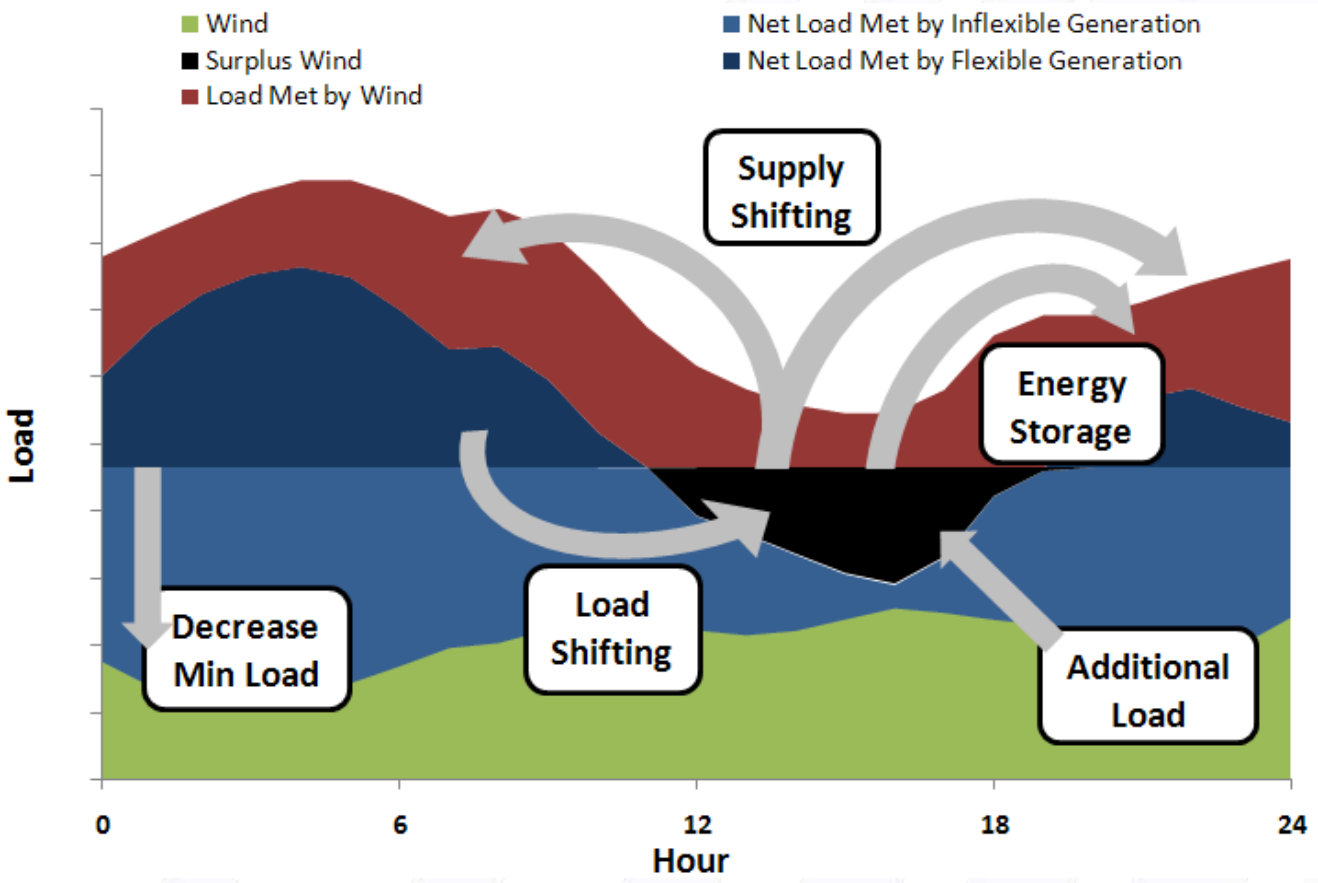
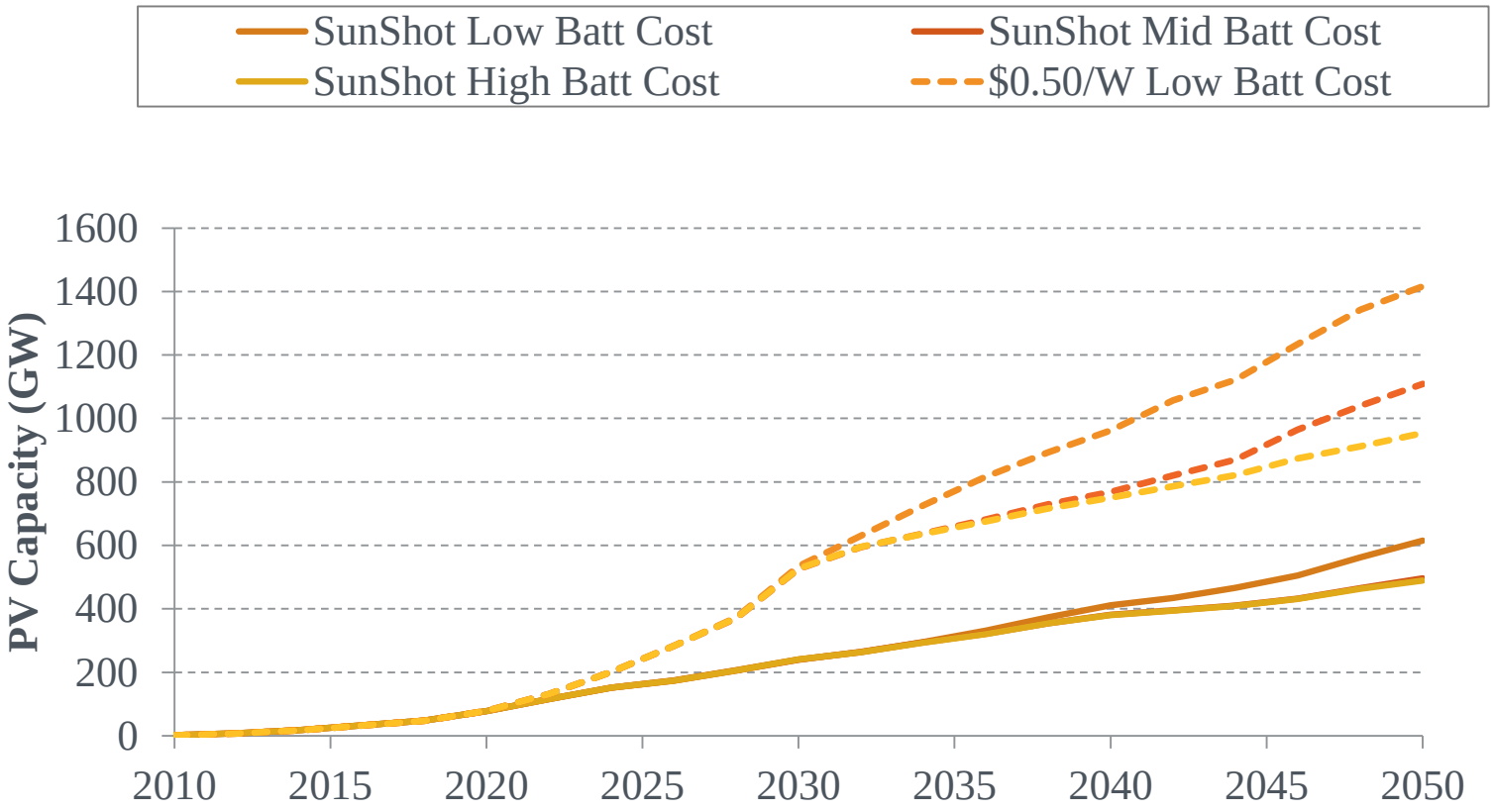
Increasing PV Value and Avoiding Curtailment

While storage provides an “obvious” answer to the problem of supply-demand coincidence, there are a number of other options



PV capacity and Storage Costs

PV capacity can be strongly influenced by low cost storage.



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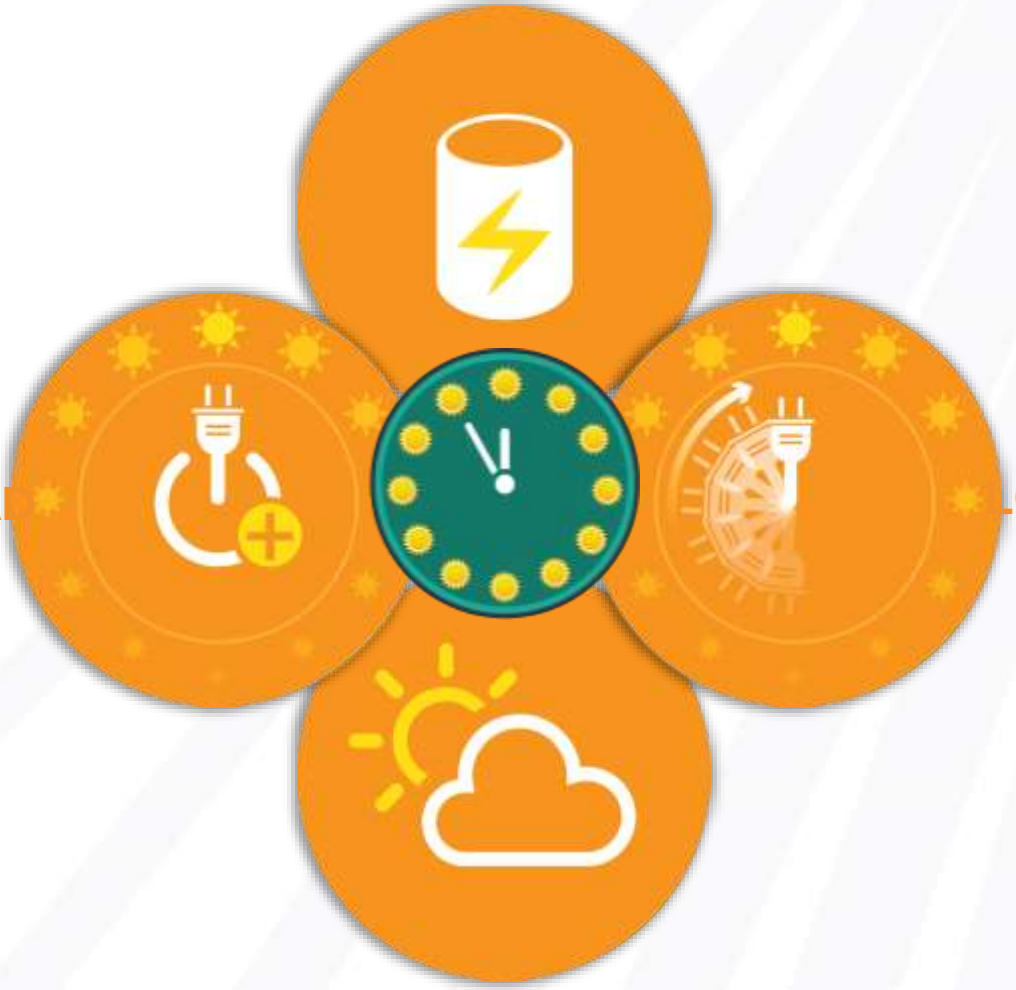
SHINES


Enabling solar
energy storage solutions
to build a more reliable grid

Dispatchability Solution Set

SUPPLY SHIFTING

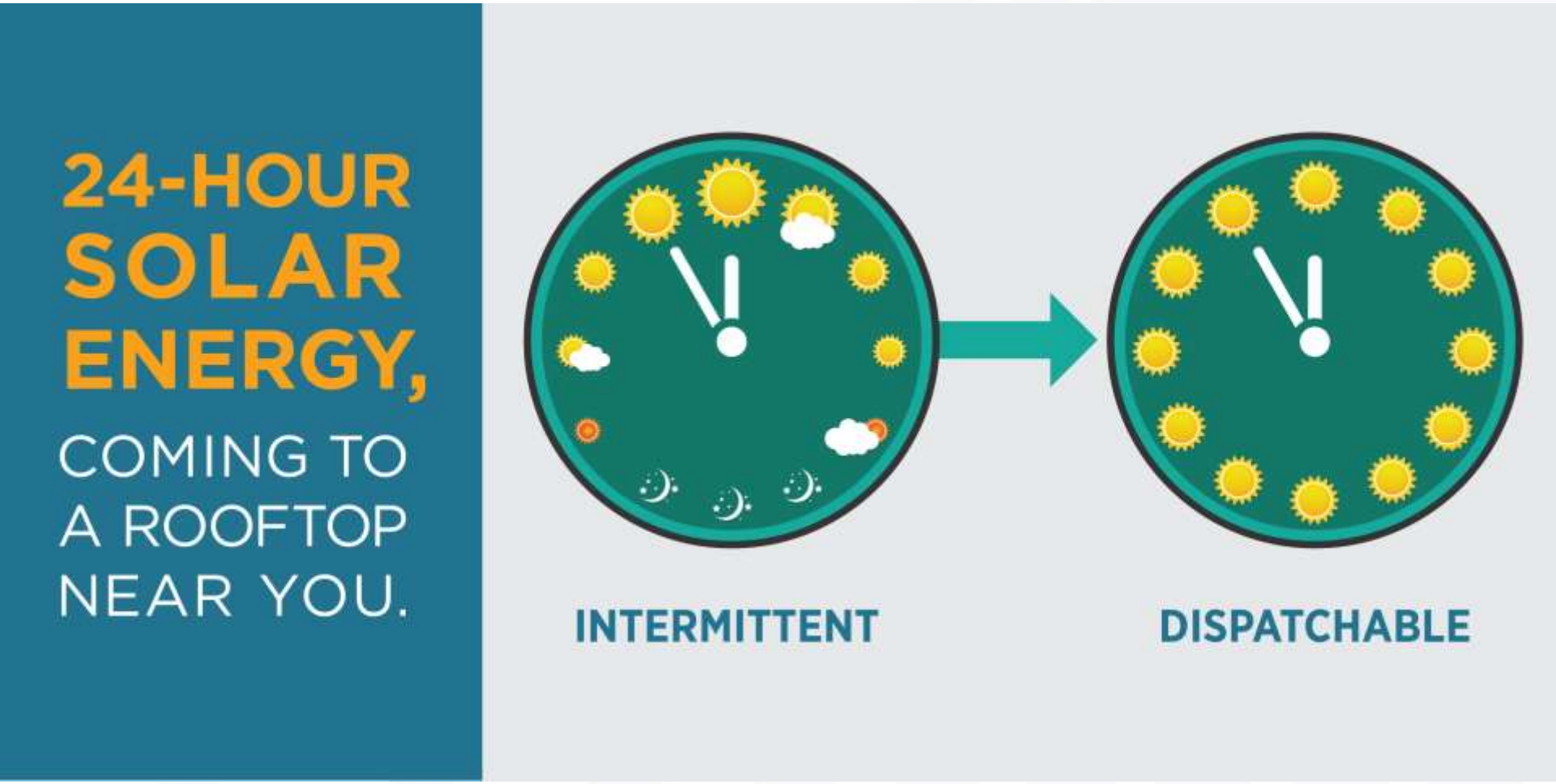


ADDITIONAL LOA

LOAD SHIFTING

FORECASTING

Towards Ubiquitous Solar: Dispatchability



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Thank you!

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