



Expanding Mid-Scale Solar: Examining the Economic Potential, Barriers, and Opportunities at Offices, Hotels, Warehouses, and Universities

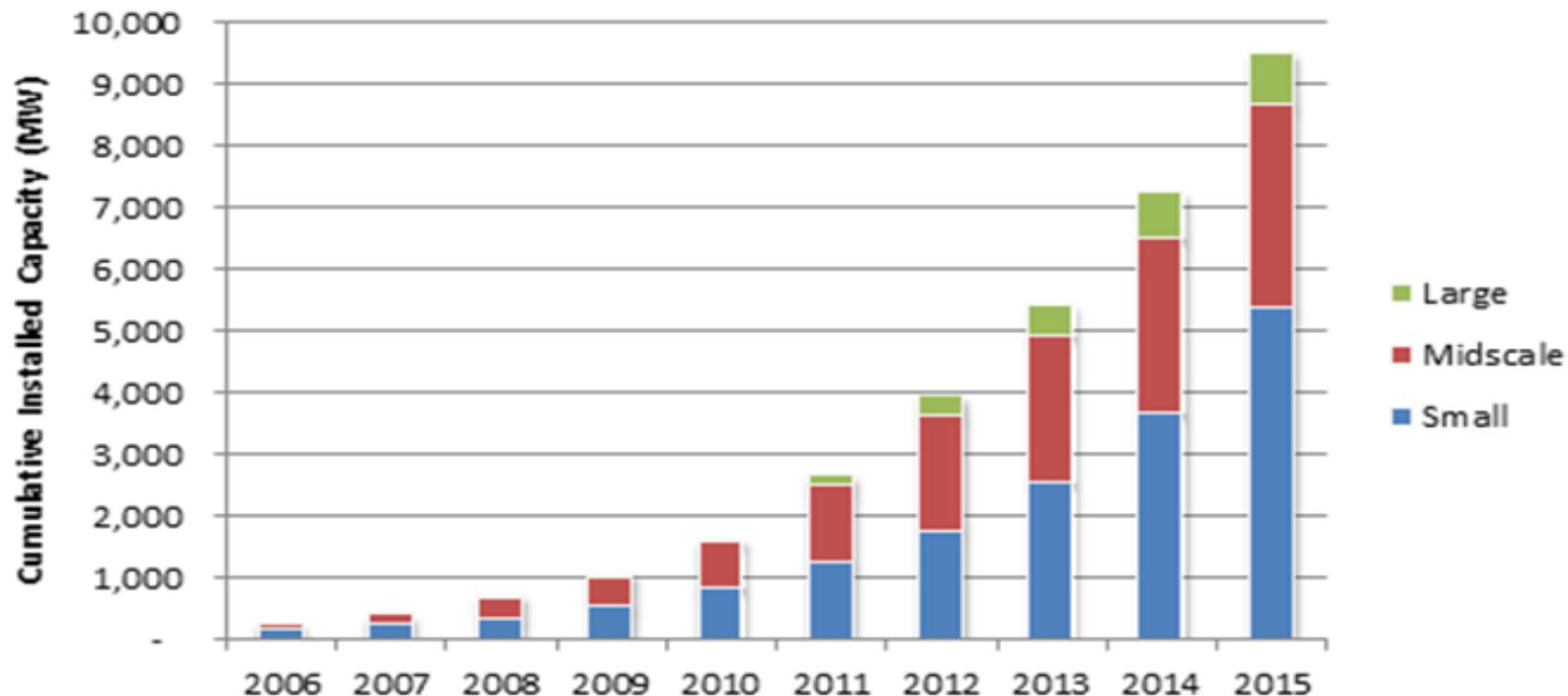
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Background – Why a Focus on Midscale Market?

- Midscale solar – loosely defined as behind-the-meter PV systems between 100 kW and 2 MW
- Midscale market segment has grown more slowly than the residential and utility-scale market segments recently
- Megawatts installed in the non-residential sector have been stagnant for the past several years
- What are the key barriers and potential strategies for expanding the midscale market?

Trends in Midscale Installations

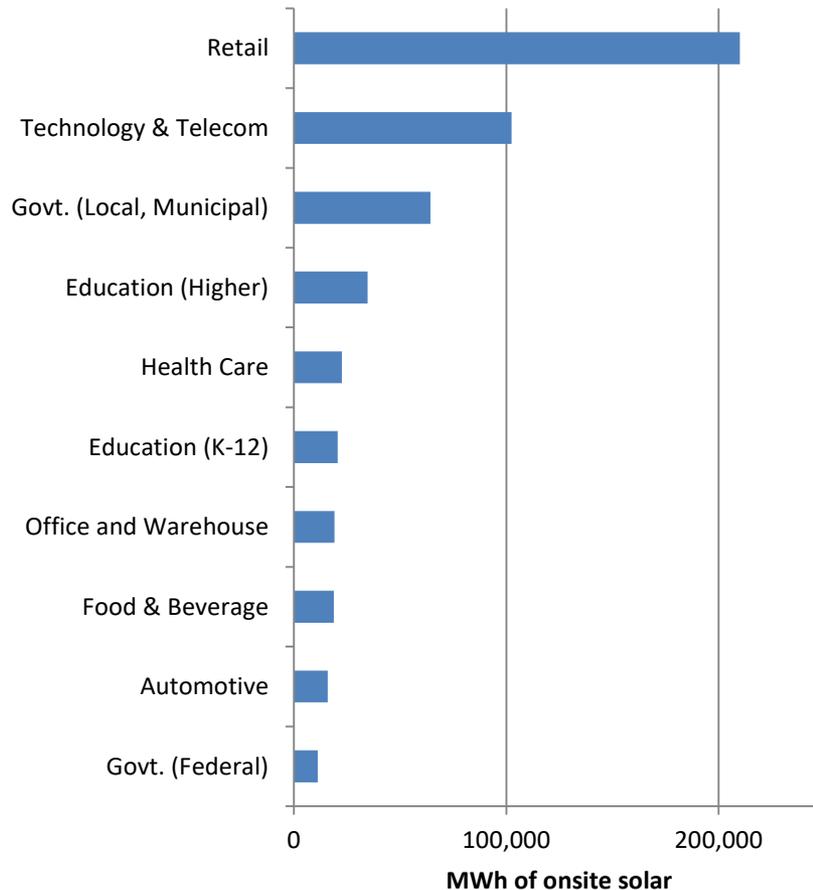
Cumulative capacity of small, midscale, and large installations in the *Tracking the Sun* data set (3rd party installed systems not included).



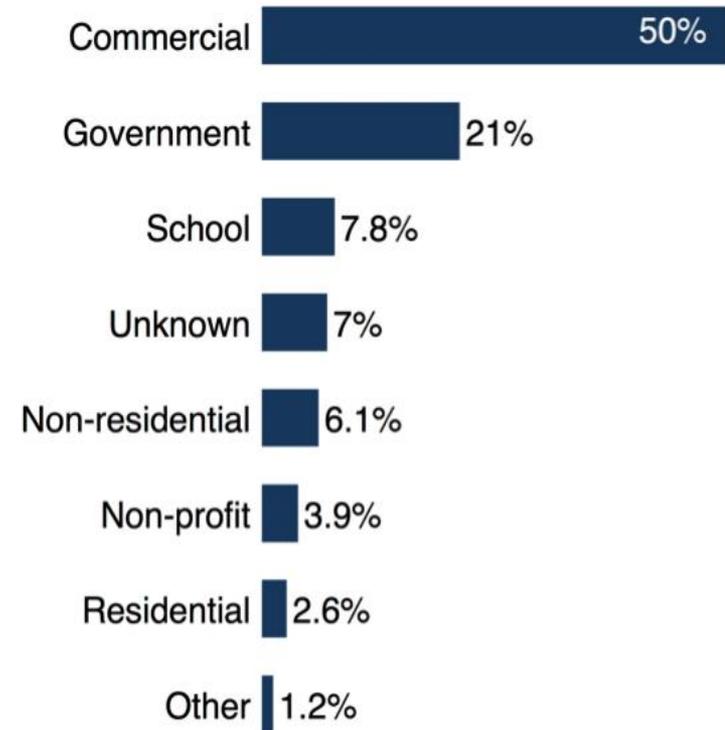
- Midscale installations have remained relatively steady in recent years
- Midscale systems (100kW to 2 MW) totaled 3,300 MW of installed capacity in 2015, 34% of total
- Data are snapshot of total market (25 GW PV installed by 2015)

Source: Data from *Tracking the Sun* Barbose and Darghouth 2016

Midscale onsite solar by end-user category



Share of onsite solar by participants in EPA's Green Power Partnership
Source: EPA 2015



Share of midscale installations
Data sourced from *Tracking the Sun*
Barbose and Darghouth 2016

Key Barriers

- Tenant/landlord split incentives
- Building ownership or lease term
- Building ownership structure
- Credit worthiness of off-taker
- Roof condition and obstructions
- Transaction costs
- Interconnection
- Permitting and siting

Building ownership challenges

- **Tenant/landlord split incentives**
 - Split incentive is created if the tenant pays the energy bill and gets PV bill savings, but the owner is responsible for maintenance and building upgrades
 - Individual tenants may not have sufficient loads to justify a project.
 - In the United States 57% of office buildings, 45% of warehouses and storage units, and 21% of lodging buildings are not owner-occupied
- **Building Ownership or Lease Term**
 - Often the term of the building lease is significantly shorter (e.g., 6–8 years) than the 20+ year lifetime of the PV asset, which makes financing difficult.
 - Typically, financing PV to yield positive economic benefits requires spreading costs over a 10–20 year period.
- **Building Ownership Structure**
 - Some building owners can claim the federal ITC (universities, NGOs, and LLCs, which often do not have sufficient tax liability)
 - Properties that are owned by joint ventures, where multiple parties must approve contracts, can make PV projects challenging.

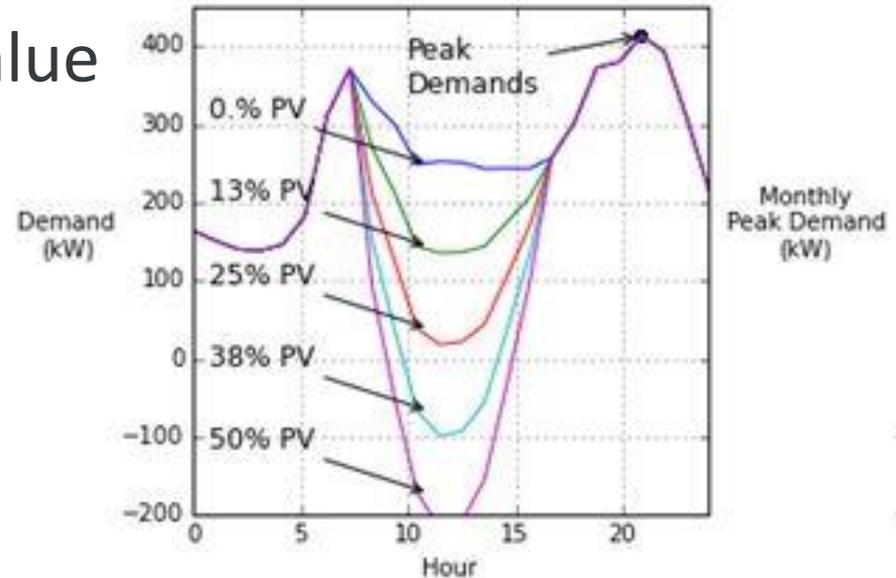
Financial challenges

- **Credit Worthiness of Off-taker**
 - For 3rd party-owned or host-owned systems using a loan, creditworthiness of off-taker is important for project financing.
 - Difficult to get credit profiles of potential off-takers for C&I projects. Credit ratings not available for private companies
- **Transaction costs**
 - Relatively high fraction of costs given project size
 - Can represent 5%–20% of deal for midscale projects, similar in dollars to those of larger systems
 - Standardized contracts are not widely used, although extensive negotiation typically can't be supported
- **Interconnection**
 - Uncertainty of interconnection costs, can have long processing and approval timelines, potentially onerous impact studies

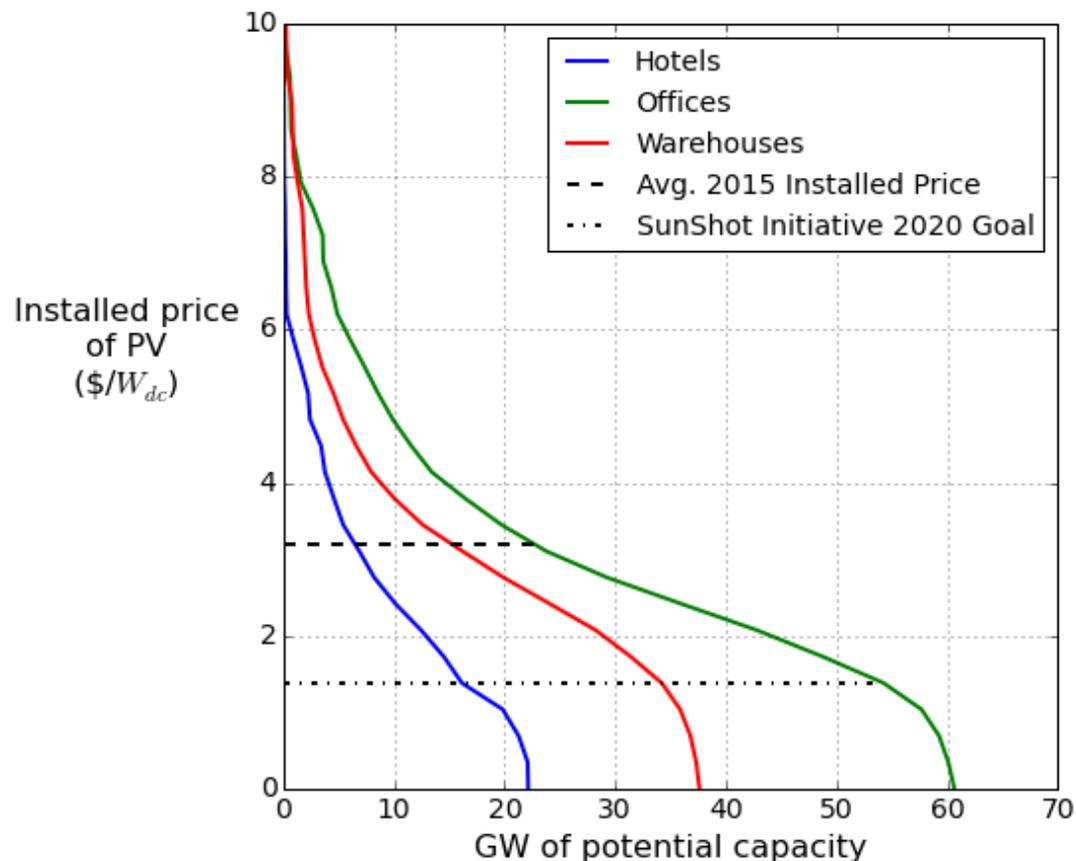
Potential for Expanding Midscale Solar

Benefits of Midscale Solar

- Energy savings/bill stabilization
- Demand charge savings
- Achievement of sustainability goals
- Green building certification
- Higher rents/customer value



National Technical Potential for Offices, Hotels, Warehouses



- At 2015 average installed prices (\$3.20/WDC), the techno-economic potential for these building segments is 44 GW (22 GW offices, 15 GW warehouses, and 6 GW hotels)
- With price declines on par with DOE SunShot 2020 targets, techno-economic potential could reach more than 100 GW (16 GW hotels, 34 GW warehouses, 54 GW offices)

Strategies for Expanding Midscale Solar

Policy Options

- **Alternative Financing Mechanisms for Midscale Market --PACE and FITs**
- **Expansion of Access to PPA Options**
- **Increased Metering and Locational Siting Flexibility -- Virtual Net Metering and Community Solar**
- **Streamlined Interconnection Processes; Cost Certainty**

Transactional Improvements

- **Aggregated Bidding**
- **Standardization of Transactions**
- **Contracting Innovations**

Education and Data

- **Data Transparency**
- **Targeted Education Efforts**

Full report:

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<http://www.nrel.gov/docs/fy16osti/65938.pdf>

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