WORLD RESOURCES INSTITUTE

Fact Sheet

BEHIND-THE-METER SOLAR PV: UNDERSTANDING COST PARITY

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Renewable energy generation that is connected behind-the-meter supplies electricity at the point of demand without first interacting with the grid (the transmission and distribution system). The most common examples to have been installed since the mid-2000s are residential, commercial, and industrial solar photovoltaic (PV) systems. These systems have accounted for roughly 70 percent of new PV capacity globally – more than 19 gigawatt (GW) of a total 28GW in 2012.[1]

Typical end-use consumers of behind-the-meter PV generation are retail electricity customers — homeowners or businesses — where behind-the-meter generation replaces retail electricity supply and the retail electricity price ($/kWh) on their utility bill.

Key Takeaway:

Behind-the-meter PV generation is cost-competitive when the average cost of energy for the system is lower than or equal to the retail electricity price over a project's lifetime or — in developing economies, where power supplied by the grid is not always reliable — the retail price plus the portion of backup generation costs avoided by behind-the-meter generation.

1 Gauntlett, Dexter, and Mackinnon Lawrence. 2013. Distributed Solar Energy Generation - Executive Summary. Navigant Research. http://www.kcet.org/news/rewire/DSEG-13-Executive-Summary.pdf.

The average cost of the energy must be calculated using information from past projects or the levelized cost of energy (LCOE), that is, the projected total system and operating costs divided by total kWh produced over the lifetime of the project or contract. In addition to the average cost of energy, any system charges for behind-the-meter generation in a given market (for example, backup power and interconnection fees) must be taken into account.

Key to any LCOE calculation are project lifetime, timing of generation, and capacity factor — the percentage of time a project is expected to produce electricity. Several other variables may be considered, depending on the precision of the calculation, including subsidies and "net metering" policies, project finance, and fuel input prices (depending on the technology).

Four popular, publicly available LCOE resources are: Black and Veatch's overview of basic LCOE methodology, the National Renewable Energy Laboratory's precise System Advisory Model (SAM), and two annually updated resources on current costs used across the industry, Bloomberg New Energy Finance and Lazard.

Additional Factors

LCOE does not take into account benefits to the grid, such as power provided during peak loads and reduced transmission losses, or costs to the grid, such as distribution system upgrades and other services. LCOE also does not take into account any protection that behind-the-meter generation might provide for the end-use consumer against electricity price fluctuations.

Figure 1 | **Bridge to India: Commercial Tariff vs Solar Power LCOE[2]**

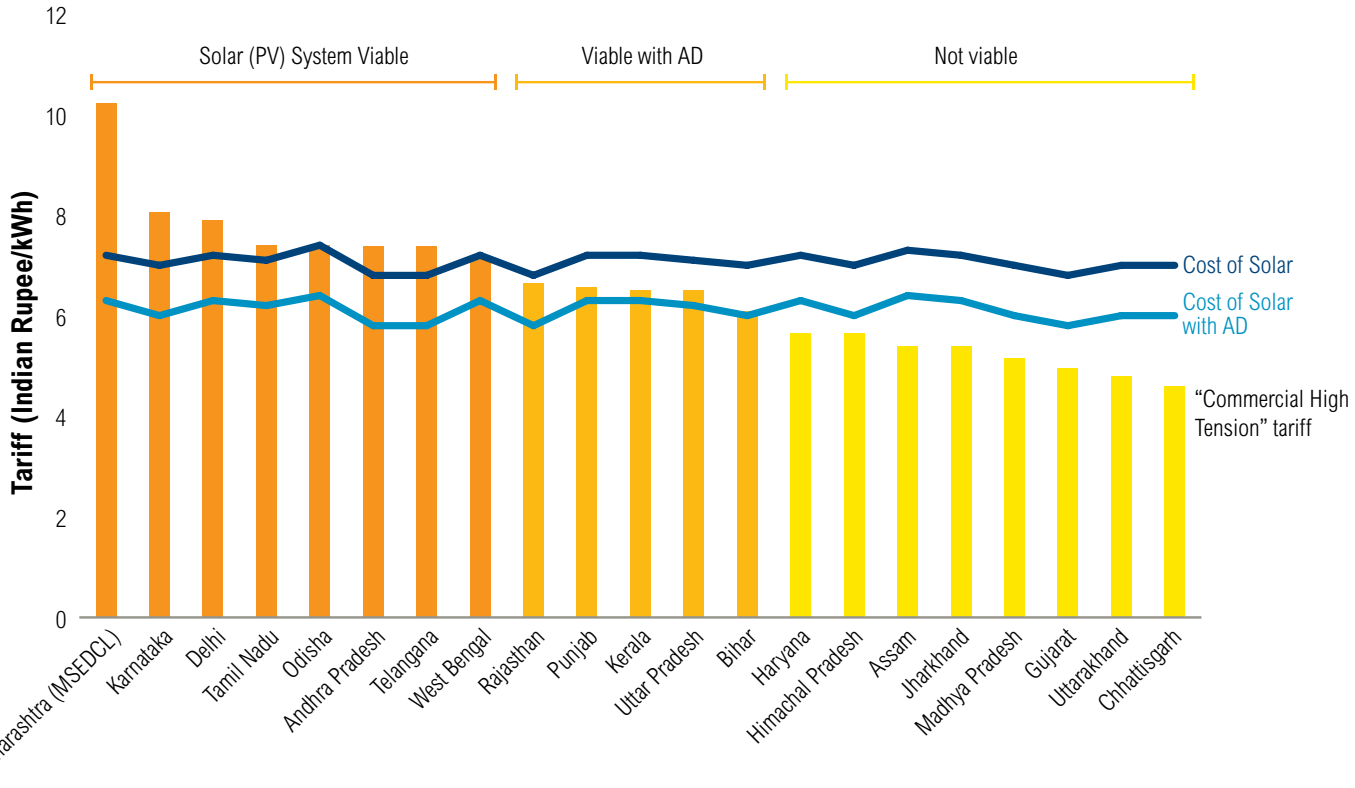

Figure 1 is a comparison of the LCOE for PV systems with retail electricity prices (tariff) in India. This analysis is limited to commercial customers and PV systems smaller than 50kW. The figure shows that, in Q4 2014, PV systems were cost-competitive without subsidy in eight states and were cost-competitive in five more with a support policy called accelerated depreciation (AD).

2 Bridge To India. 2014. "Viability for Rooftop Solar." http://www.bridgetoindia.com/

Box 1 | Third Party Ownership Models

In the United States, most behind-the-meter PV systems are contracted through a third party who owns the behind-the-meter system and sells the electricity to end-use consumers at a negotiated price. The third party sets the contract price using an LCOE, which includes a return on investment and any incentives. They can contract either using either a lease for the system hardware or a power purchase agreement (PPA) — a fixed-price contractual agreement to purchase the system's energy. This model has become popular because it eliminates the up-front cost of PV systems to end-use consumers. Unfortunately, third party models are currently allowed in only 23 of 50 states.

This model is cost-competitive if the price offered to end-use consumers is below the electricity retail price over the contract period.

GLOSSARY

Cost parity: Cost-competiveness between a renewable energy option and the comparable, traditional electricity supply option(s)

Behind-the-Meter Generation: Generation that supplies electricity at the point of demand without first interacting with the grid

The Grid: The transmission and distribution system that connects generators and end-users

Average Cost of Energy: The cost of each unit of energy a project produces calculated using information from past projects or the levelized cost of energy (LCOE)

Levelized cost of energy (LCOE): The projected total system and operating costs divided by total kWh produced over the lifetime of the project or contract

Capacity Factor: The percentage of time a project is expected to produce electricity

Power Purchase Agreement (PPA): A fixed-price contractual agreement to purchase a power plant's energy, typically calculated using project finance LCOE or set at the feed-in-tariff price

ADDITIONAL RESOURCES

BEHIND THE METER GENERATION

NREL, Breakeven Prices for Photovoltaics on Supermarkets in the United States – US commercial solar PV compared to retail electricity prices, including all PV subsidies and policies

ADDITIONAL FACTORS

DSIRE – Database of incentives and policies that support renewables and energy efficiency in the US

REN21 Policy databases – A global tool for tracking renewable energy policy frameworks

ABOUT THIS SERIES

WRI's Charge initiative has developed a factsheet series on "Renewable Energy Cost Parity" — a series of tools to help policymakers, journalists, corporations, and advocates breakdown the most cost-competitive ways to supply energy with greater clarity and precision.

These simple, go-to resource outlines which electricity supply options (renewable vs. traditional) can be compared and lays out what additional factors, like financial incentives or reduced transmission costs, must be considered. Each factsheet focuses on a particular market or technology to provide insight from this unique perspective.

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ABOUT WRI

WRI is a global research organization that works closely with leaders to turn big ideas into action to sustain a healthy environment—the foundation of economic opportunity and human well-being.

Our Challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our Vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our Approach

COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.