Promoting Rooftop Solar Systems – TERI's Contribution

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Flow of the presentation

Creating Innovative Solutions for a Sustainable Future

- TERI's activities in solar roof top segment
  - **Solar roof top systems potential**
  - **Business models**
  - **Implementation issues**
  - **Regulatory issues**
  - **Training and capacity building**
  - **Financing**
- Way forward

Overview

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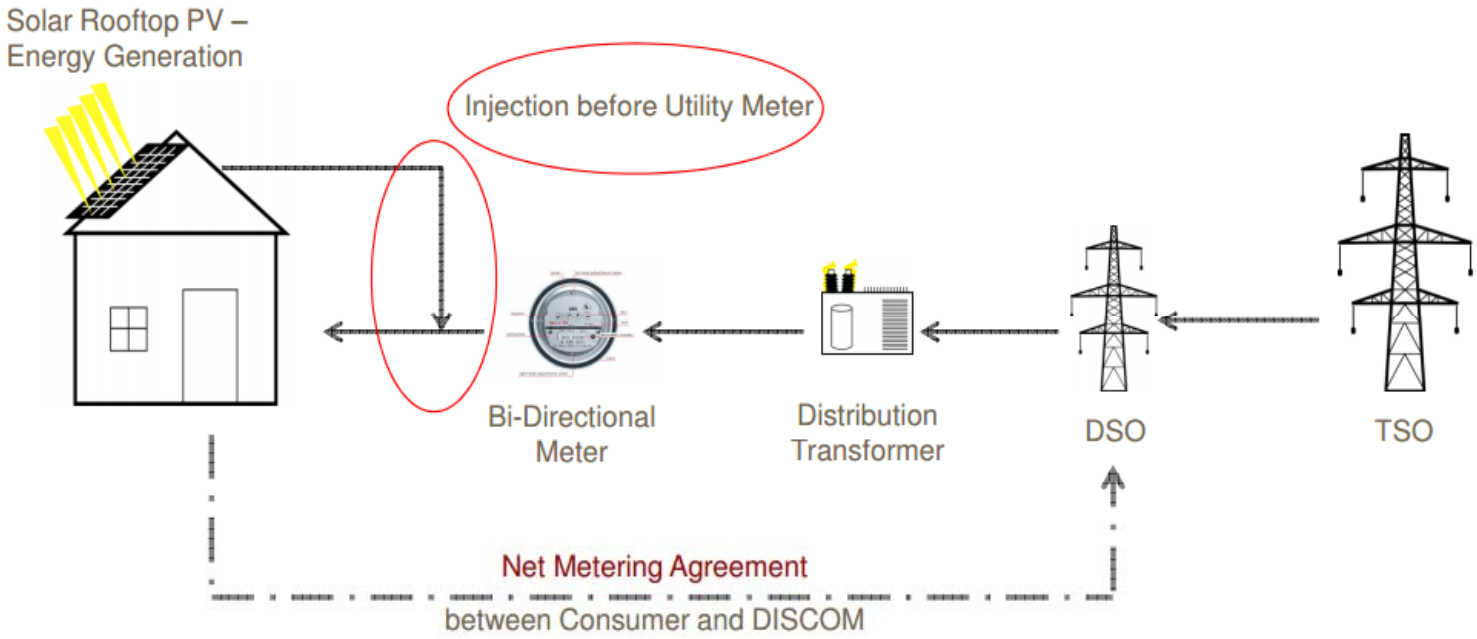
Central Policy (MNRE) and State Policies (SNAs)



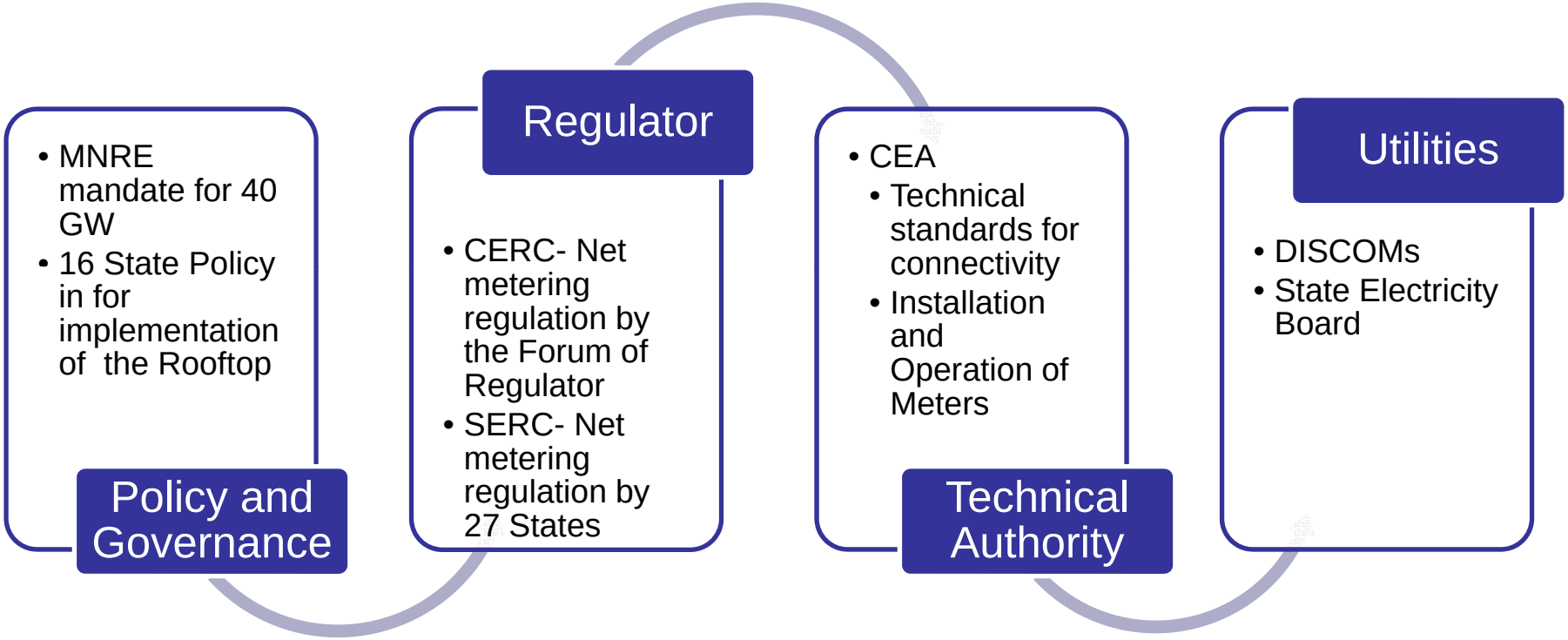
- ✓ Consumer
- ✓ Installers/ Developers
- ✓ Equipment suppliers and manufacturers

- ✓ Metering Arrangement
- ✓ Interconnection
- ✓ Billing

- ✓ Implementation
- ✓ Load Balancing
- ✓ Grid Stability

- ✓ Regulations
- ✓ Technical Standards as per CEA

Institutional Arrangement



The necessary institutional arrangement is in place which is essential for the implementation of Solar Rooftop in country

GLIMPSES OF OUR CONTRIBUTIONS

TERI's focus Areas in solar Roof top segment

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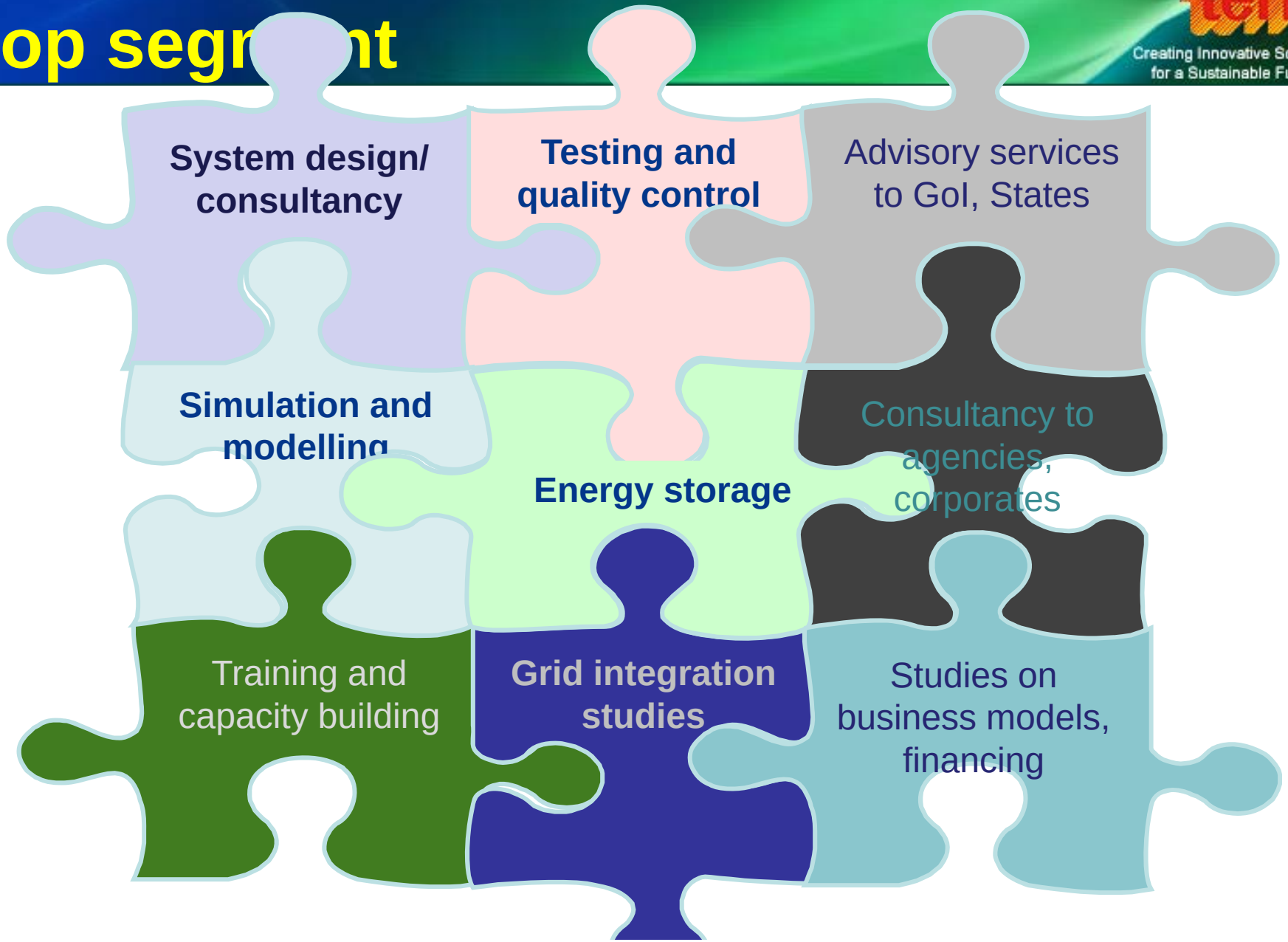
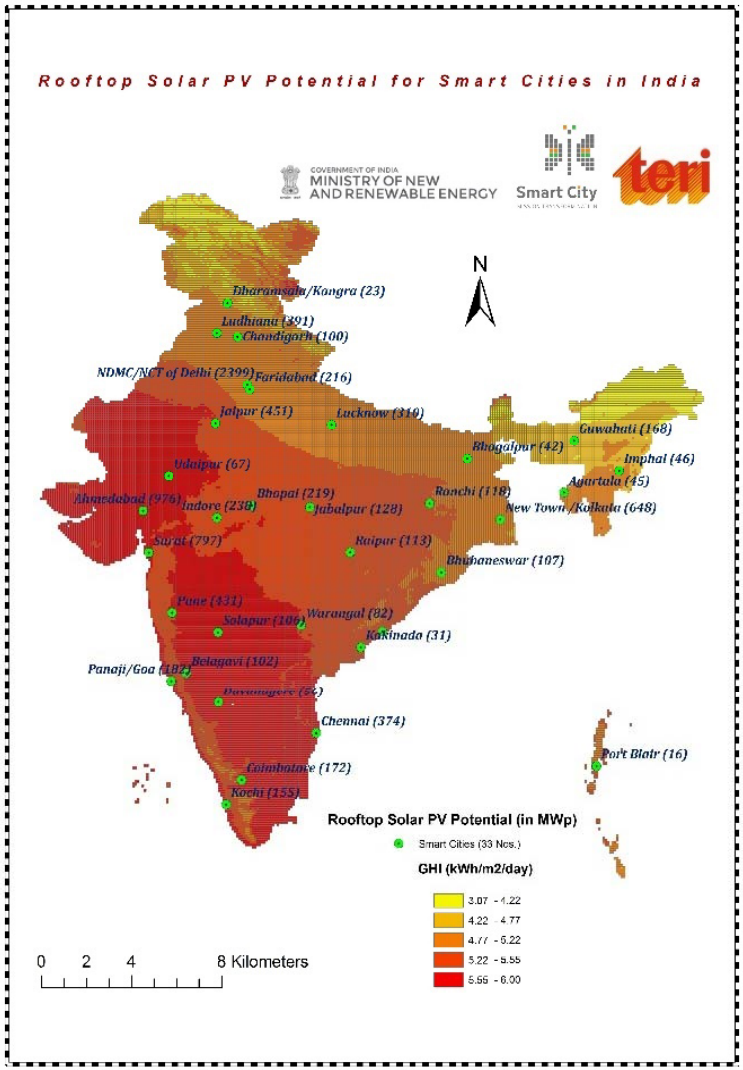


Potential assessment



- Initial assessment of 125 GW of solar roof top PV potential in 2015
- Recently potential assessment for 33 smart cities carried out using census data for cities infrastructure

Way forward- **Need to develop flexible Web-GIS based tool to estimate the rooftop solar power potential for potential city (Smart Cities, Solar Cities).**

Sources: India Solar Resource Maps & Data (updated March 2016): http://www.nrel.gov/international/ra_india.html
Smart Cities (Cities Profile): http://smartcities.gov.in/
The Geospatial Information Regulation Bill, 2016 (Draft Copy): http://mha.nic.in/sites/upload_files/mha/files/GeospatialBill_05052016_eve.pdf

Support to MNRE

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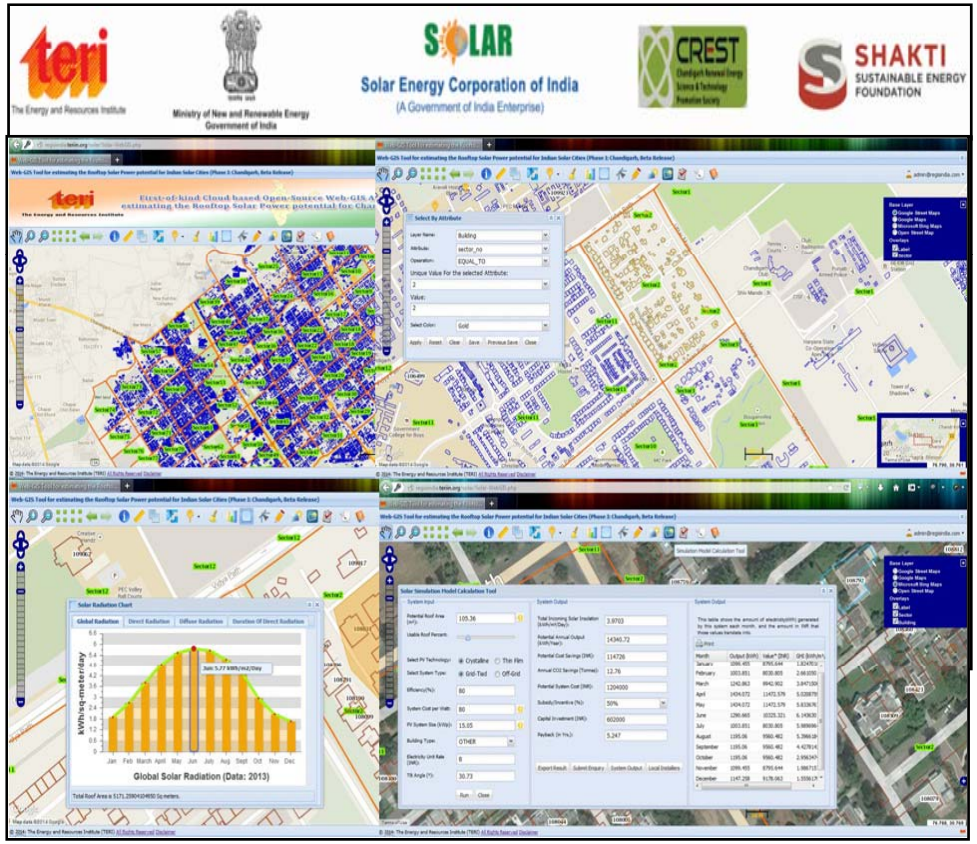
- TERI is supporting MNRE as retained consultant for last 1.5 years
- Support under MNRE funded projects
- RPO / REC analysis
- Advisory support
- Analytical inputs through other projects funded by organisations like Shakti Foundation. KfW and so on
- Developed GIS based tool SPV4ALL
  - This helps in estimating solar roof top system sizing and financial analysis for a particular building
  - Currently available for city of Chandigarh

SPV4 All – GIS based tool for solar roof top system sizing

- Developed by TERI for the city of Chandigarh
- It calculated solar roof top potential, sizing, and financial benefits based on basic information
- Handy tool for quick assessment.
- Available on google store.



Summary of review of regulations

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Parameter	Status
Net metering regulations	8/13 Regulations, 2/13 Draft Regulations Regulations issued in 2014 & 2015
Max & Min solar system capacity	Mostly between 1 kw to 1 MW, Delhi – not upper limit
System size as % of connected load	Mostly 80-100% (Delhi allows higher size)
% cumulative solar capacity allowed at DTR level	15%-30% (Delhi requires utility to ensure at least 20% excess capacity of DTR while other states restricts solar power integration into grid between 15%-30%)
Cap on energy generation	4/13: 90% , 5/13- no restriction, 4/13- not specified
Treatment of excess solar energy	8/13 (Carry forward & financial settlement) 5/13 (Carry forward but no financial settlement)
Treatment of solar energy supplied during peak hours	Settlement first at peak but extra at off-peak (barring Delhi)
Price for financial settlement	2/13- levelised tariff for solar, 3/13-APPC, 3/13-fixed by utility, 6/13-NA
Settlement period	1 Year

Financing of solar roof top systems

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- TERI published two major reports prepared under funding rom Shakti foundation and KfW which extensively covered financing and business models
- TERI also prepared manual for financing community on solar roof top program under MNRE's guidance and support
- Training and advisory support to banks and financial institutions in designing loan schemes
- In depth analysis of business models

Some of our recent publications

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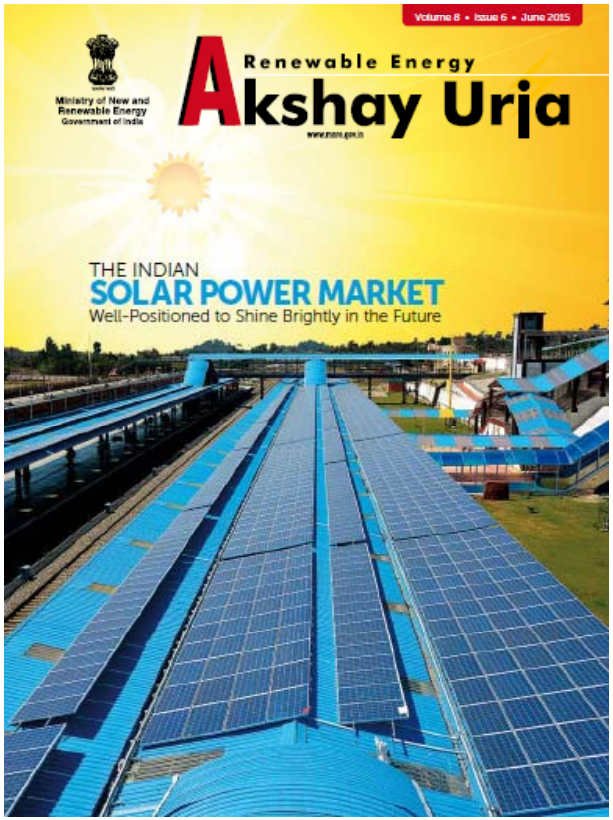

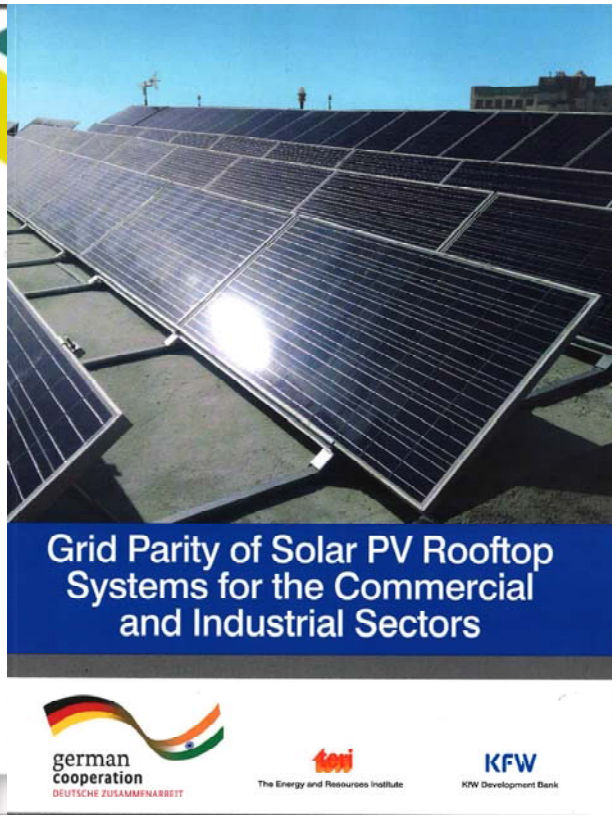

Training and capacity building

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- TERI conducted 10 training programs for officials and professional in three categories
  - **Officials of SNAs, DISCOMs, Regulators Commissions and so on**
  - **Financial institutions**
  - **Channel partners**
- Conducted ‘SuryaMitra’ training program for Skill Development of Technicians
- State of the art facility for testing and training including solar PV plants in our campus designed for R & D and, training activities

Impact on DISCOM revenue:- TERI study with Delhi DISCOMs

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TERI recently undertook a study to estimate impact of rooftop solar deployment on utility revenues the analysis is summerised below

	Cost parameter	Power-Deficit Utility	Power-Surplus Utility	
			Excess power not purchased	Excess power sold on PX
LOSSES	Tariff loss from C&I customers with rooftop solar installations	**Yes**	**Yes**	**Yes**
GAINS / SAVINGS / AVOIDED COSTS	Revenue gain from sale of excess power equivalent to solar generation to other customers in the utility network	**Yes**	*Not Applicable*	*Not Applicable*
	Reduced wheeling charges in power transmission	*No impact*	**Yes**	*No impact*
	Reduced distribution losses	*No impact*	**Yes**	**Yes**
	Power sale on power exchange	*Not Applicable*	*Not Applicable*	**Yes**
	Savings on energy charge component of power purchase cost	*No impact*	**Yes**	*No impact*
	Savings on capacity charge component of power purchase cost	*No impact*	*No impact*	*No impact*
	Avoided cost of RPO compliance	**Yes**	**Yes**	**Yes**

Quality improvements

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- TERI is working closely with MNRE and NISE to develop quality standards and monitoring protocols for solar roof top systems
- We are also offering services as third party inspection of systems
- We help use agencies in designing, procuring and installation of quality systems

Walk the talk

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- TERI installed first building integrated solar PV roof top system in 2000
- Currently, we have one 50 kW and one 49.5 kWp solar rooftop systems at our campuses besides systems for research purposes.
- Laboratory infrastructure for module testing approved by NABL.

PV system at TERI University in RESCO model

Upfront Investment	NIL
PPA with Company	25 years
Tariff differential	Rs 2.5/ kWh
Annual Savings	Rs 1.5 Lac

Way forward

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- TERI would like to contribute to the development of solar rooftop systems market
- TERI plans to enhance its activities in all above mentioned areas with special focus on
  - **Improving quality of systems**
  - **Developing capacities**
  - **Improving regulatory and policy regime**
  - **Improving operational aspects of financing schemes and so on.**

Thank you for your attention and time!!!

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