

UNCTAD-Invest India Workshop

on

Promoting FDI in Solar Energy Projects

10 March 2016

New Delhi, India

Investment Opportunities in Solar Off-Grid & Decentralized Segment



UNFORTUNATELY NEARLY 50% OF
INDIA'S RURAL POPULATION – 80
MILLION HOUSEHOLDS – HAVE LITTLE
OR NO ACCESS TO GRID-BASED
ELECTRICITY,

But this unfortunate situation brings an
opportunity for growth and investment

- Off-grid Solar Systems –
Not connected to the central grid and also those systems which underserved by the grid
- Decentralized Solar systems –
Smaller power plants that generate close to site of distribution Connecting single or multiple consumers

Off grid & decentralized solar energy segment

1. Electricity supplied thru solar energy systems without connecting to Grid is off grid & decentralized solar energy system.
2. India is the largest country for solar energy demand.
3. India's per capital power consumption is lowest in the world. It is around 1010 Kwh in 2014-15 whereas in our neighborhood China it is 4000 Kwh.

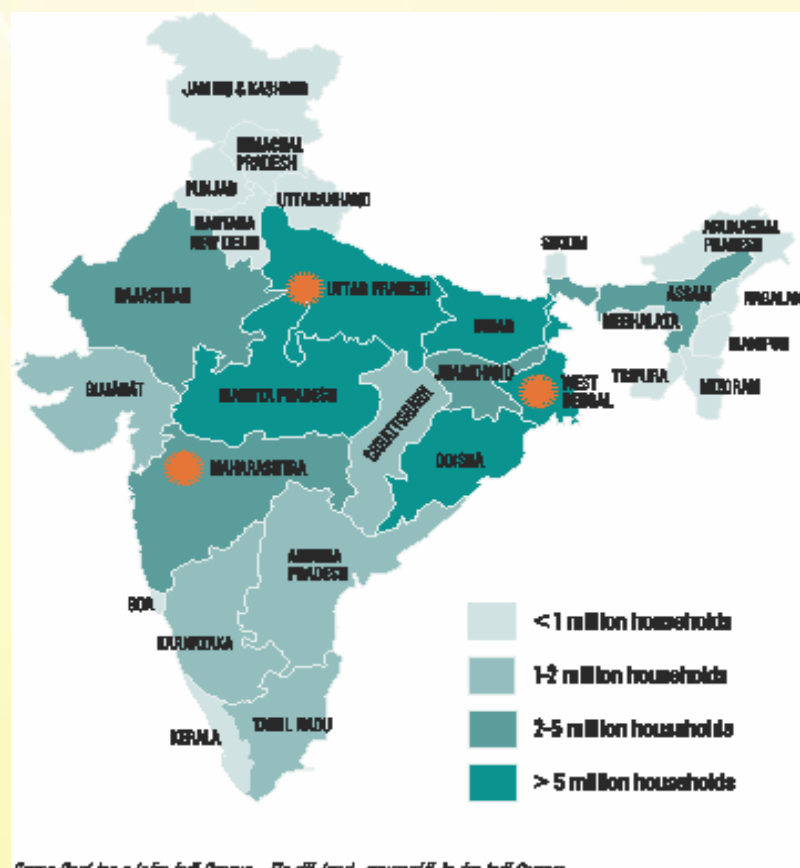
Off grid & decentralized Solar energy systems:

- Micro/Mini Grid for rural areas
- Solar Rooftops
- Solar Home Lighting System
- Solar Street Lighting System
- Solar Water Pump
- Solar Power Plant Stand alone
- Solar Lanterns/Fan/ Coolers/ TV/ Refrigerators
- Solar Water/ Air Heating System
- Solar Steam Generation System
- Telecom Towers

- Best solution to replace hazardous & polluting kerosene lamps.
- Highly useful in rural areas.
- Highly useful in remote areas where normal electricity inaccessible due to their geographical location. There is around 30% pollution having no access to electricity – this area can be easily electrified through off grid systems
- Easy to install & operate.

A study in few states

MORE THAN HALF OF
THE TOTAL RURAL
POPULATION LIVES IN
FIVES STATES UTTAR
PRADESH, BIHAR,
ODISHA, WEST BENGAL
AND MADHYA RA DESH.



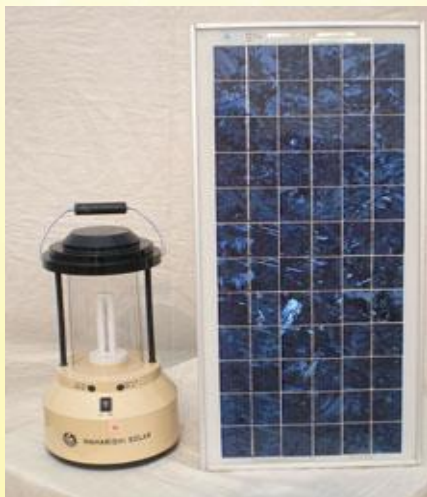
Off grid & decentralized Solar energy systems are useful in these areas :-

- Residential



Residential Area

- Solar Lantern
- Solar Home Lighting System
- Solar Water Heating Systems



[Solar Lantern]



[Solar Home Lighting System]



[Solar Water Heating System]

Agricultural

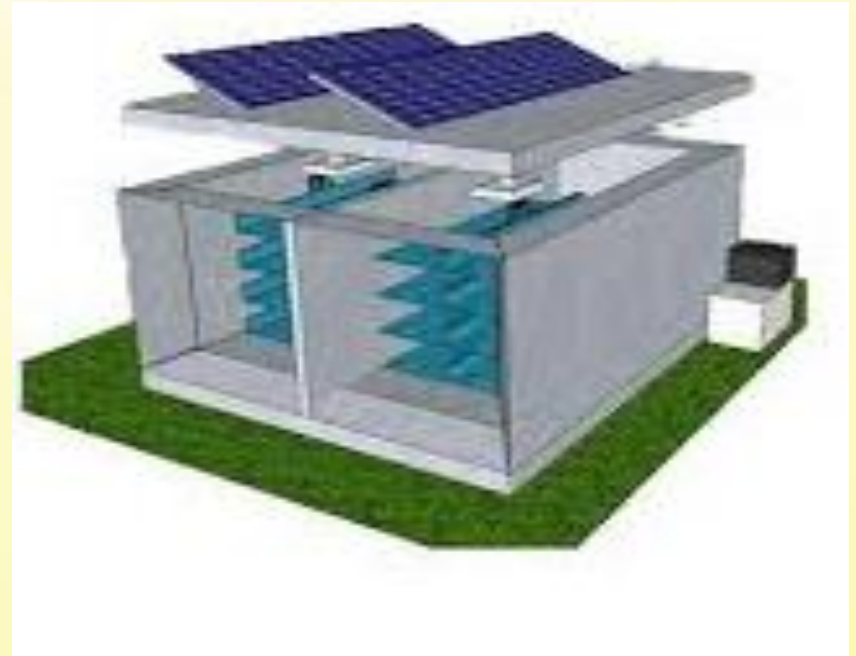


[Solar Water Pump]

Agricultural



[Solar Dryer]



[Solar Cold Storage]

- Social



Social



[Solar Street Light]



[Solar Cooker for Community Cooking]

Social



[Solar Operated Telecom Tower]

- **Industrial**



Industrial

Solar Steam Generating System through Parabolic trough Technology for Industrial Application

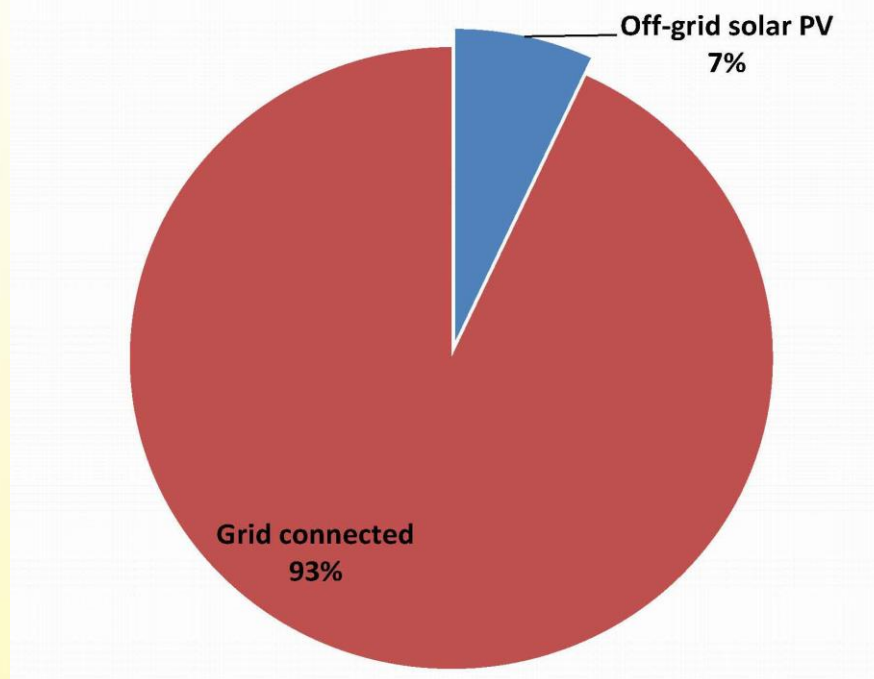


Solar PV products: Market Segments

- Household Applications
 - 280 million households have poor access to electricity
 - Govt. is spending US\$ 5.1 billion on kerosene subsidy
- Water pumps for irrigation
 - 8 million diesel pumps and 10-12 million electric pumps are in operation
 - Subsidy on electricity for water pumping is expected to reach US\$ 50 billion by 2021-22

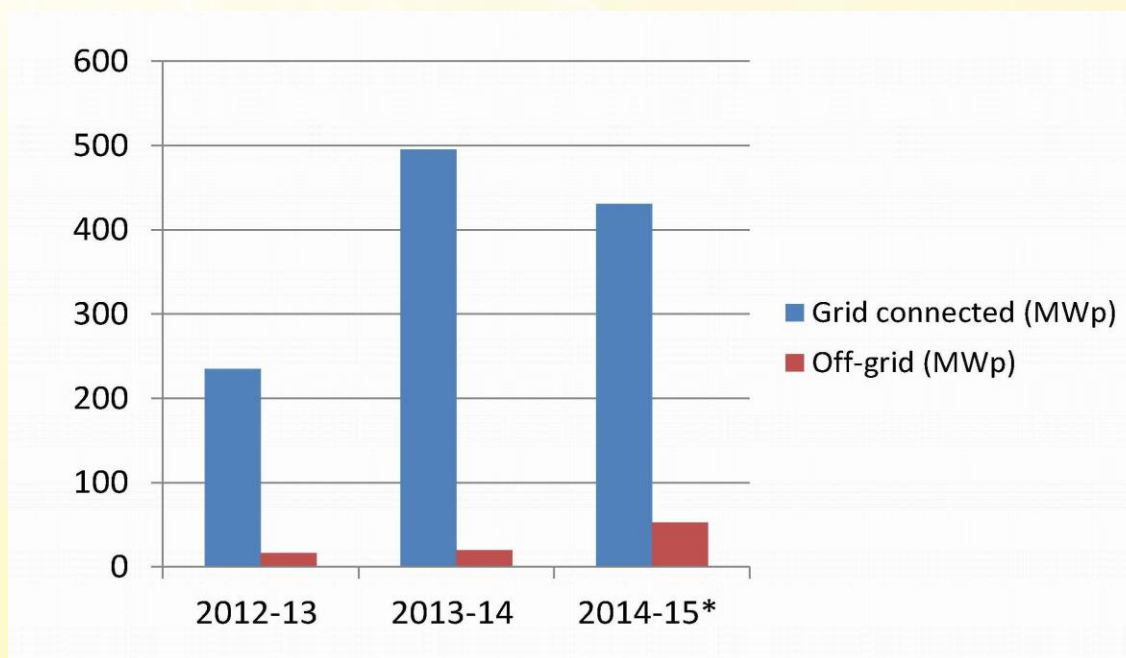


Off-grid Solar PV: Market Status



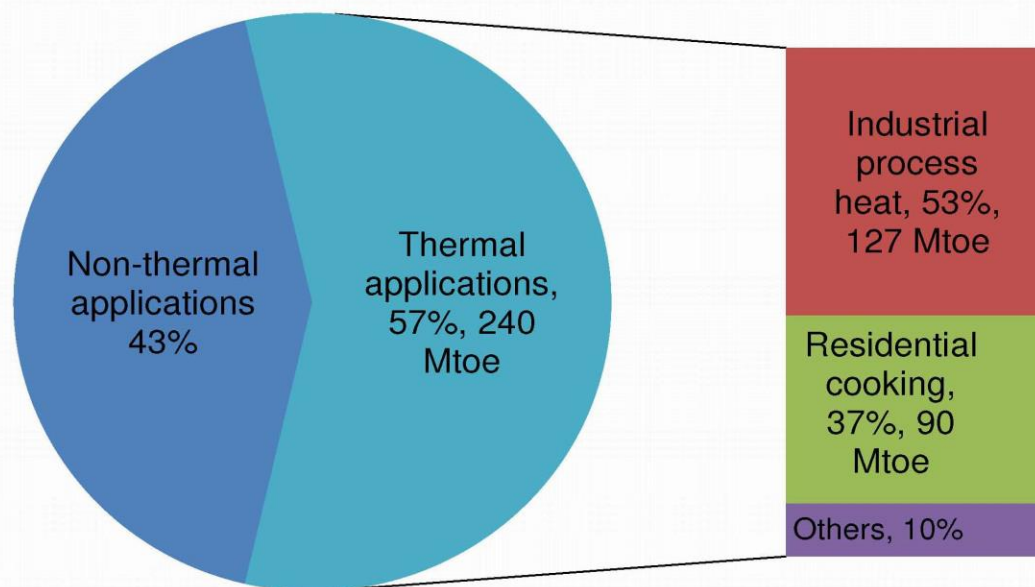
Nearly 350 MWp which is about 7% of the total solar power installed capacity of >5000 MWp (as on 15th January 2016)

Off-grid Solar PV: Opportunity



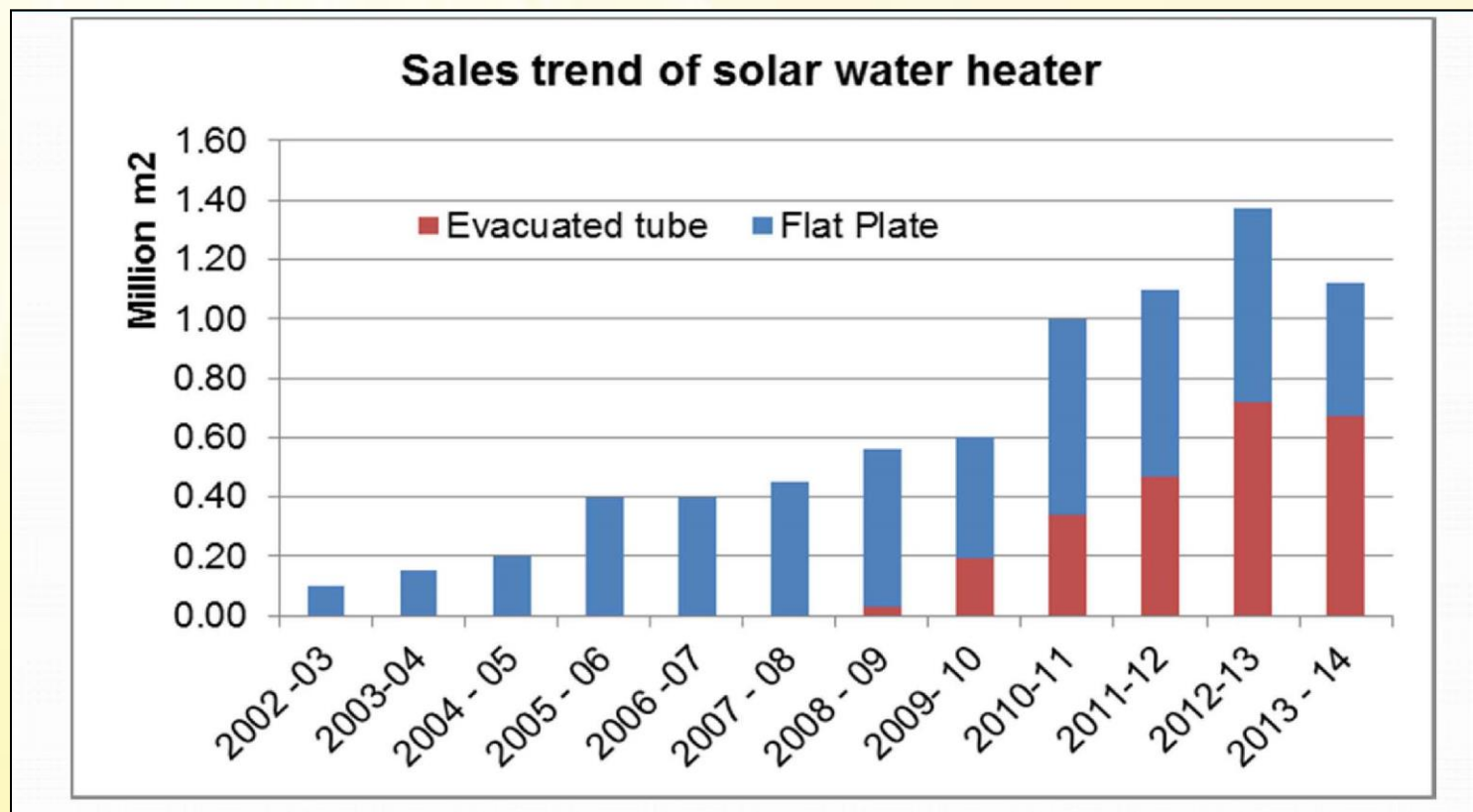
Off-grid Solar PV accounts for 4-10% of the annual Solar PV installations.

Solar thermal



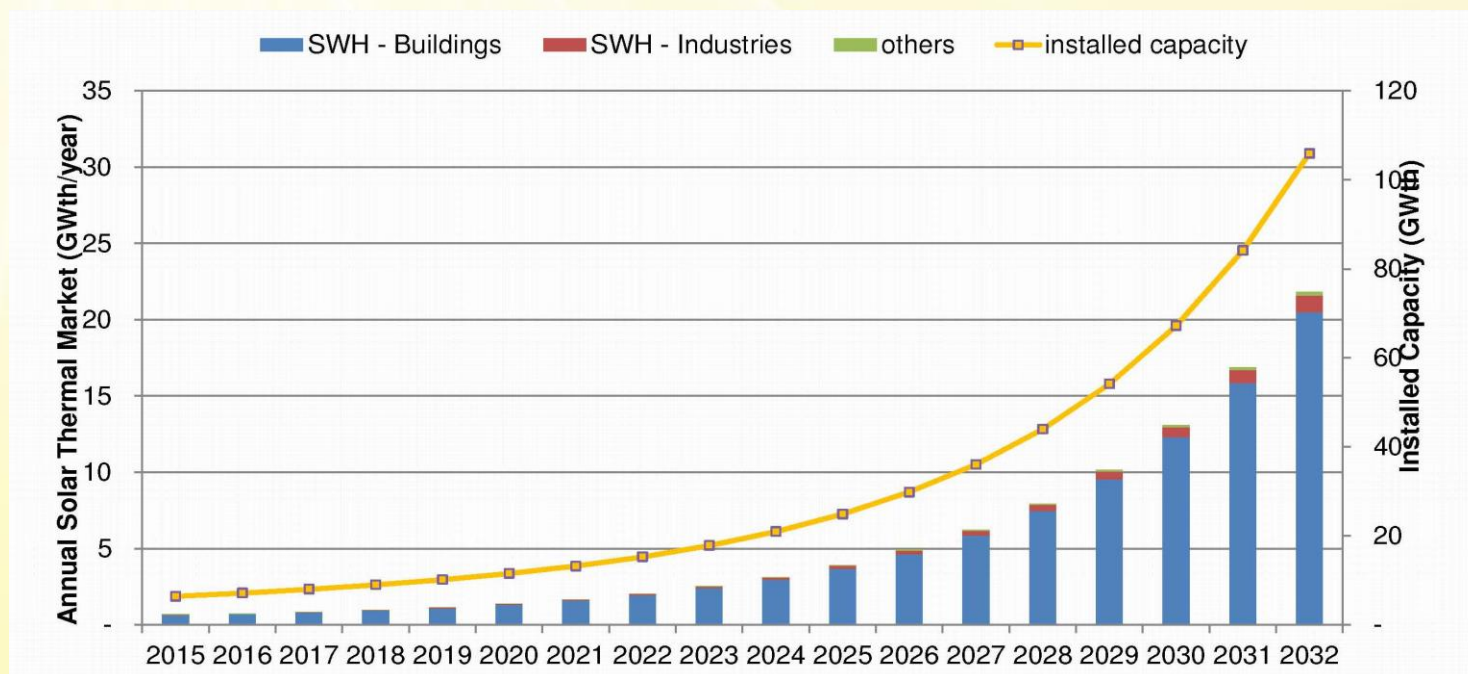
Fifty-seven percent (i.e., 240 Mtoe) of the final energy consumption in India is used for thermal applications.

Solar Thermal : Market



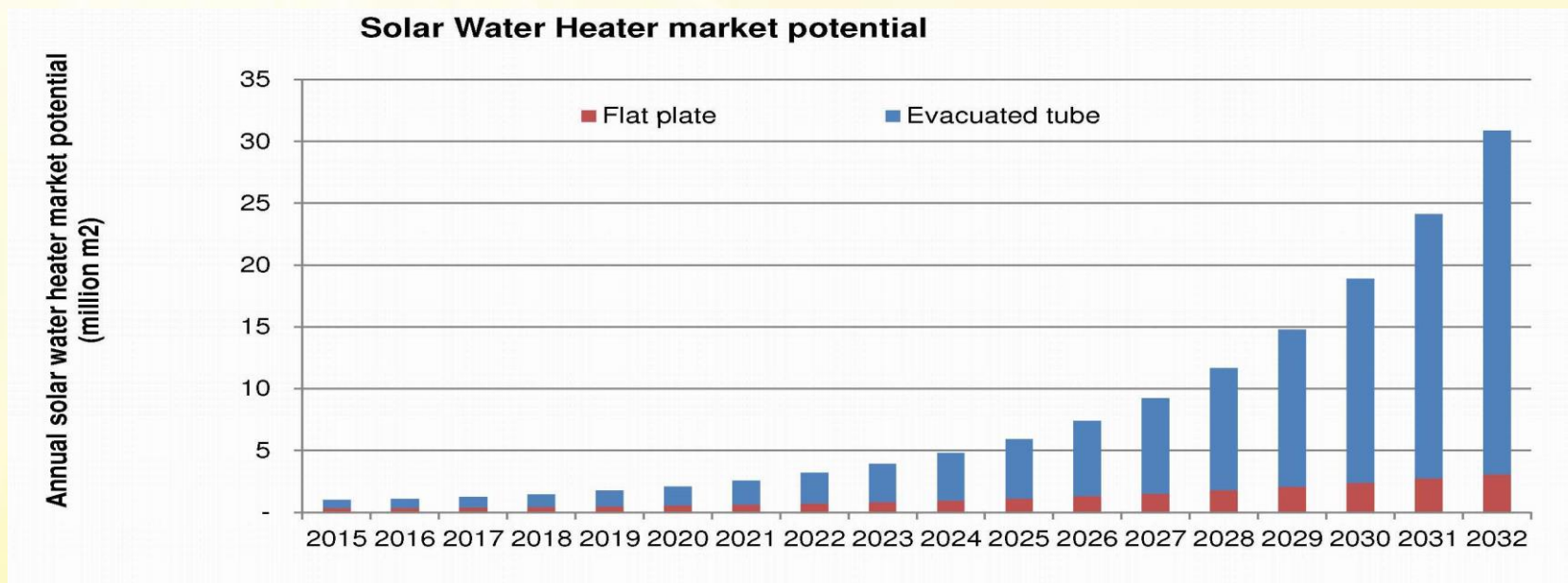
Market for solar thermal, particularly solar water heater has grown steadily over last 15 years

Solar Thermal : Potential (2015-2032)



The market for solar thermal is expected to expand rapidly
 – The installed capacity expected to increase by 10 x (reaching 100 GWth by 2032) and annual sales by 20 x by 2032.

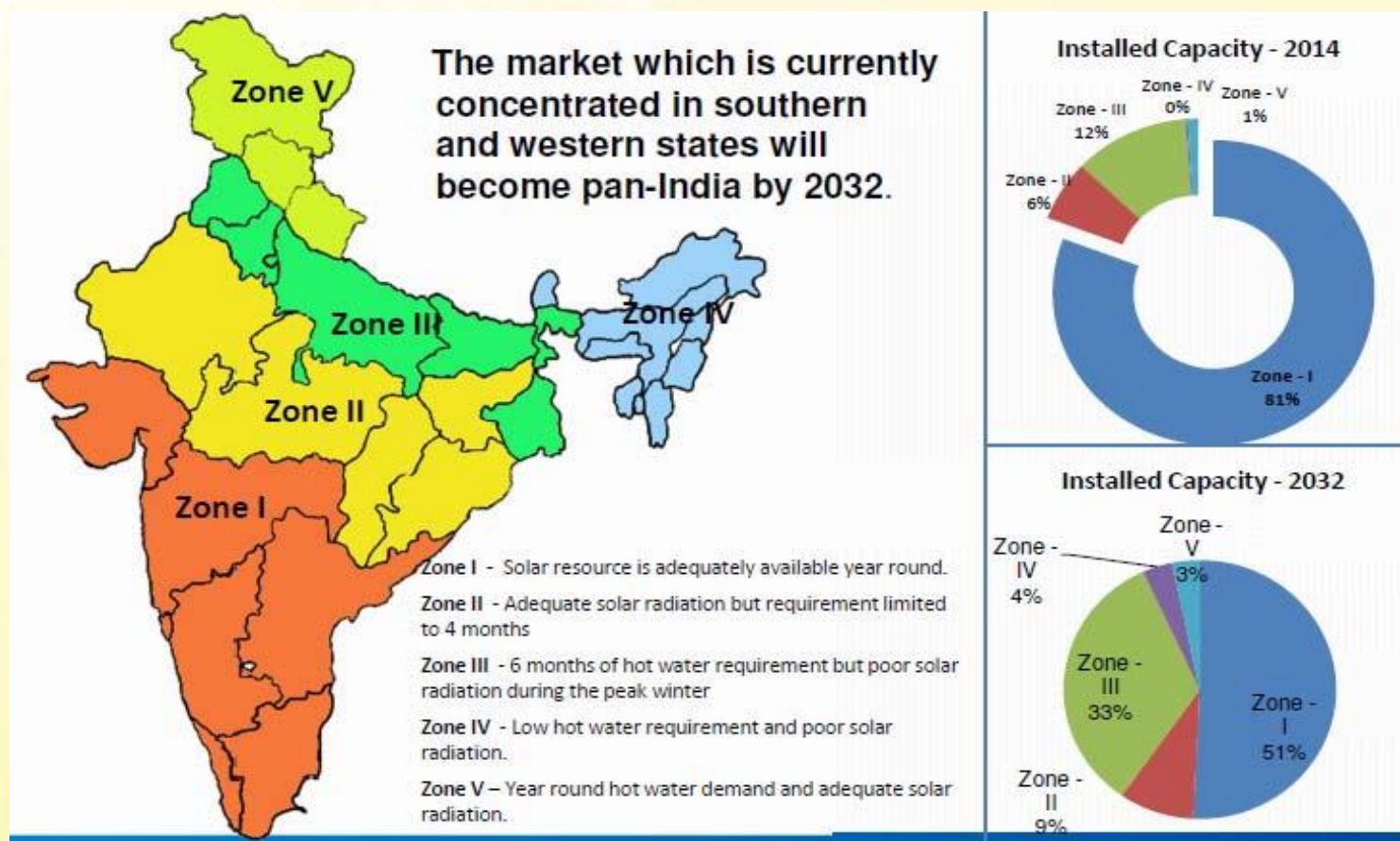
Solar Water Heater Potential (2015-2032)



SWH annual sales expected to reach 3.25 million m2/ year by 2022 and 31 million m2/ year by 2032.

- Residential sector to remain the main market segment
- Market to expand to small towns and rural areas

Solar Thermal: Market (2014 & 2032)



Solar Thermal: Investment Opportunities



Total investment required (2015 – 2032) in solar thermal sector is ~US\$ 30 billion out of which around US\$ 500 million is required for manufacturing and assembly.

Conclusions

- Enormous social and economic benefits of off-grid systems
- The potential is high
 - Solar thermal installed capacity could reach ~ 15GW by 2022 and 100 GW by 2032.
 - Off-grid solar PV installed capacity could reach around 40 GW by 2022
- The market is diverse and dispersed, efforts are needed for:
 - Customizing and developing products for specific needs
 - Sales and supply network
 - Ensuring quality products
 - Making available access to finance

Investment Potential

Based on National Solar Mission's target of 100 GW the investment in off-grid & decentralized solar systems, is estimated at around US\$ 40 - 50 billion by 2022.

Thanks

Ajay Prakash Shrivastava

President, Solar Energy Society of India

President, Maharishi Solar Technology

E-mail : solar@maharishi.net