

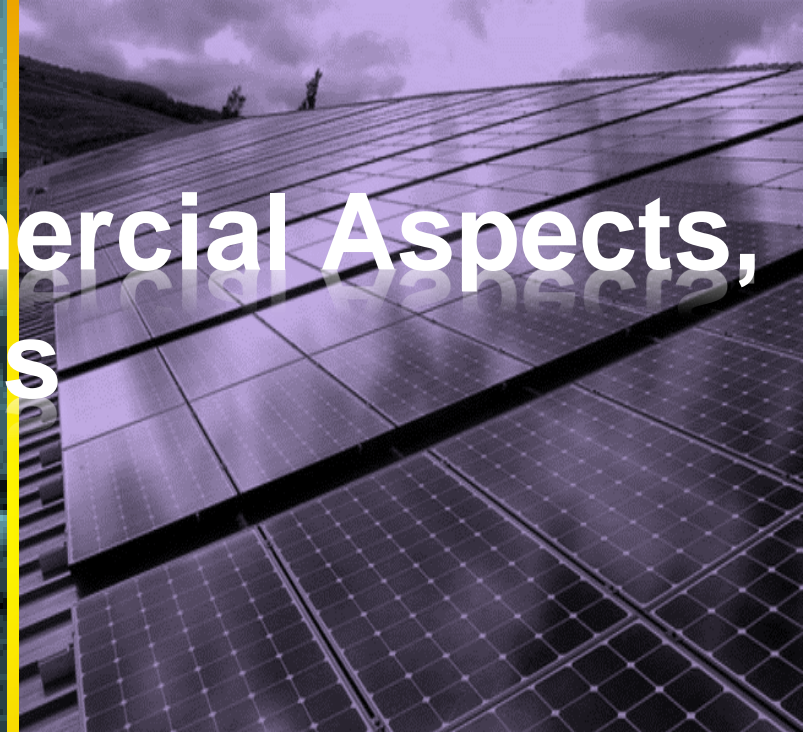




Rooftop Solar: Commercial Aspects, Issues and Challenges

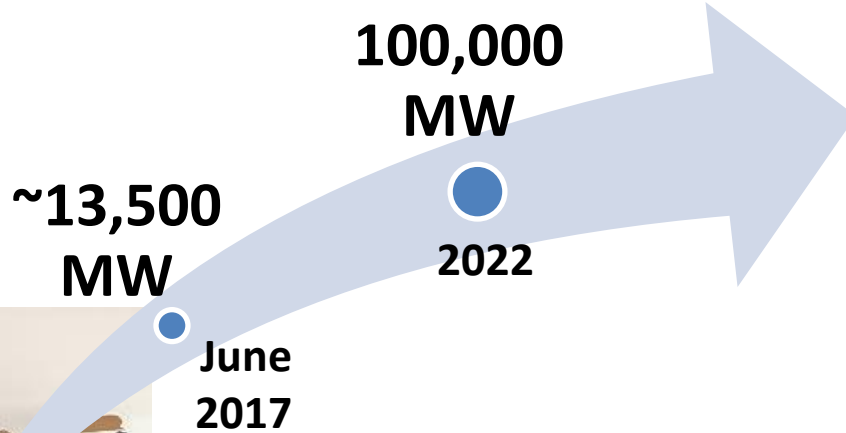
Amplus Solar

GRIHA, December 19, 2017, Ritu Lal



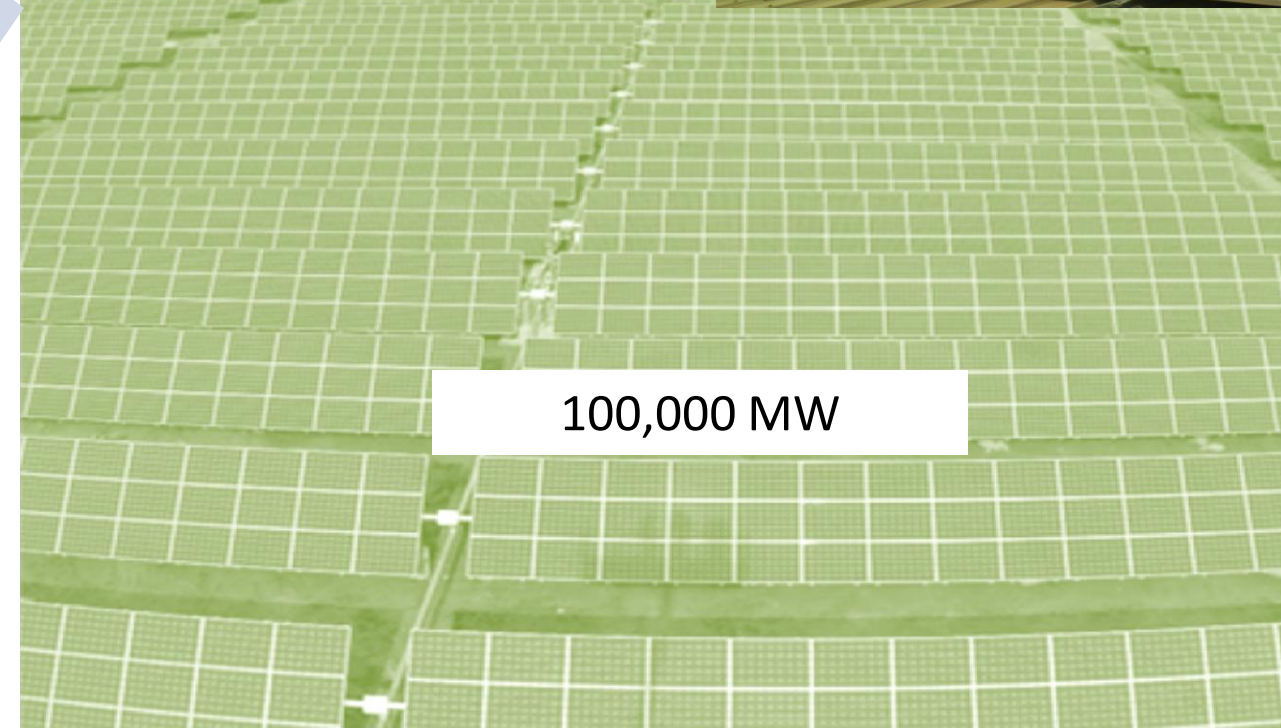
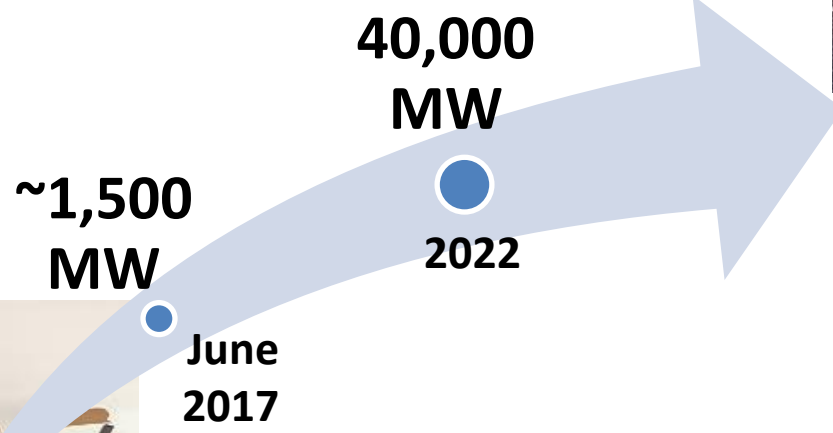
The Solar Opportunity

Target 2022: Overall



The Solar Opportunity

Target 2022: Rooftop



100,000 MW

Centralised vs Distributed

Grid scale

Multi-megawatt plants

Fed directly to grid

Economies of scale

Land acquisition
Power evacuation

Size

Supply

USP

Challenges

Rooftop

Average size 200 kilowatts

Primarily consumed on-site

No transmission losses




Rooftop suitability
Customer acquisition

Rooftop/Distributed Solar



Why is this a bright idea?

Rooftop Solar: Ideal Energy Choice

-  Seamless grid and/or DG integration
-  Captive energy at your doorstep
 - Eliminate transmission costs/losses
-  Speedy implementation

Rooftop Solar: Ideal Energy Choice

- 💡 Uses idle rooftop/grounds productively
- 💡 No roof damage: non penetrating
- 💡 Modular construction

Pitched roof; non-penetrating



Car Port



Flat RCC Roof; Ballasted



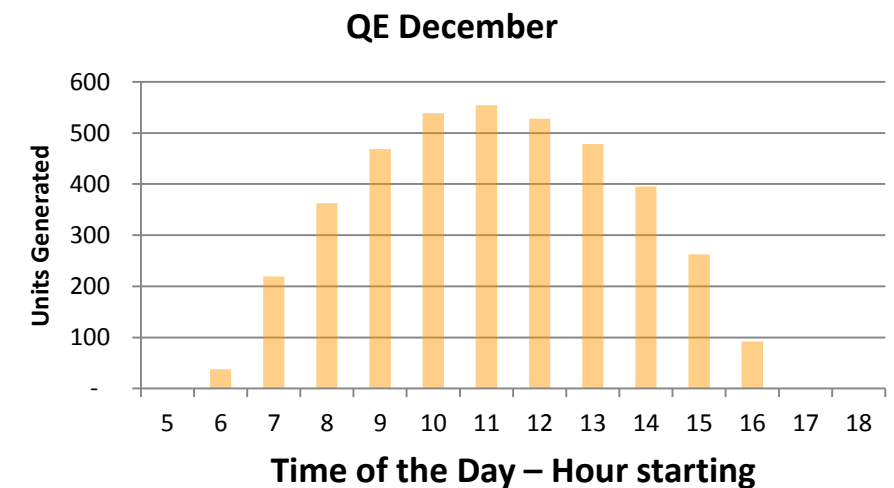
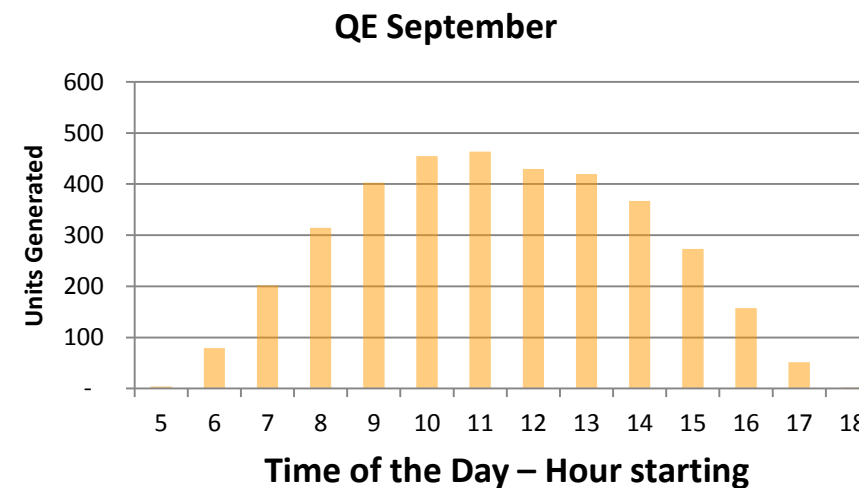
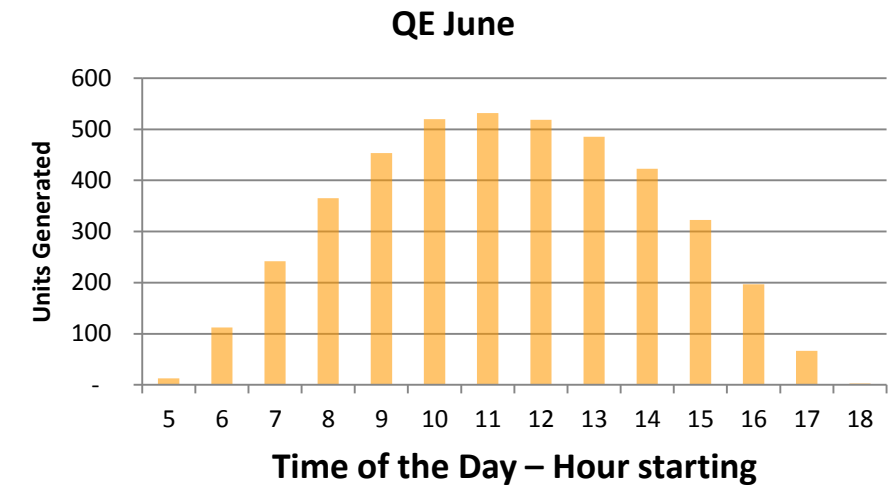
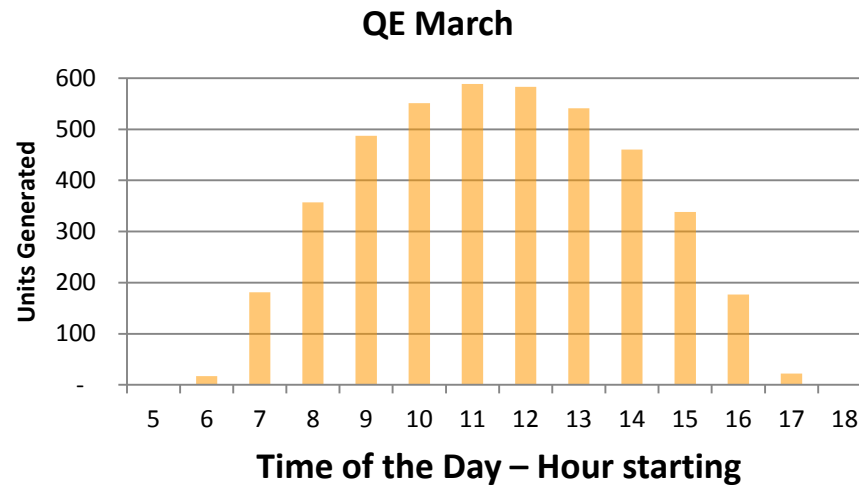
Rooftop Super-structure

Rooftop Solar: The Opportunity



Reliable source of energy: 300+ sunny days in India

Solar Energy Generation
Hourly Averages

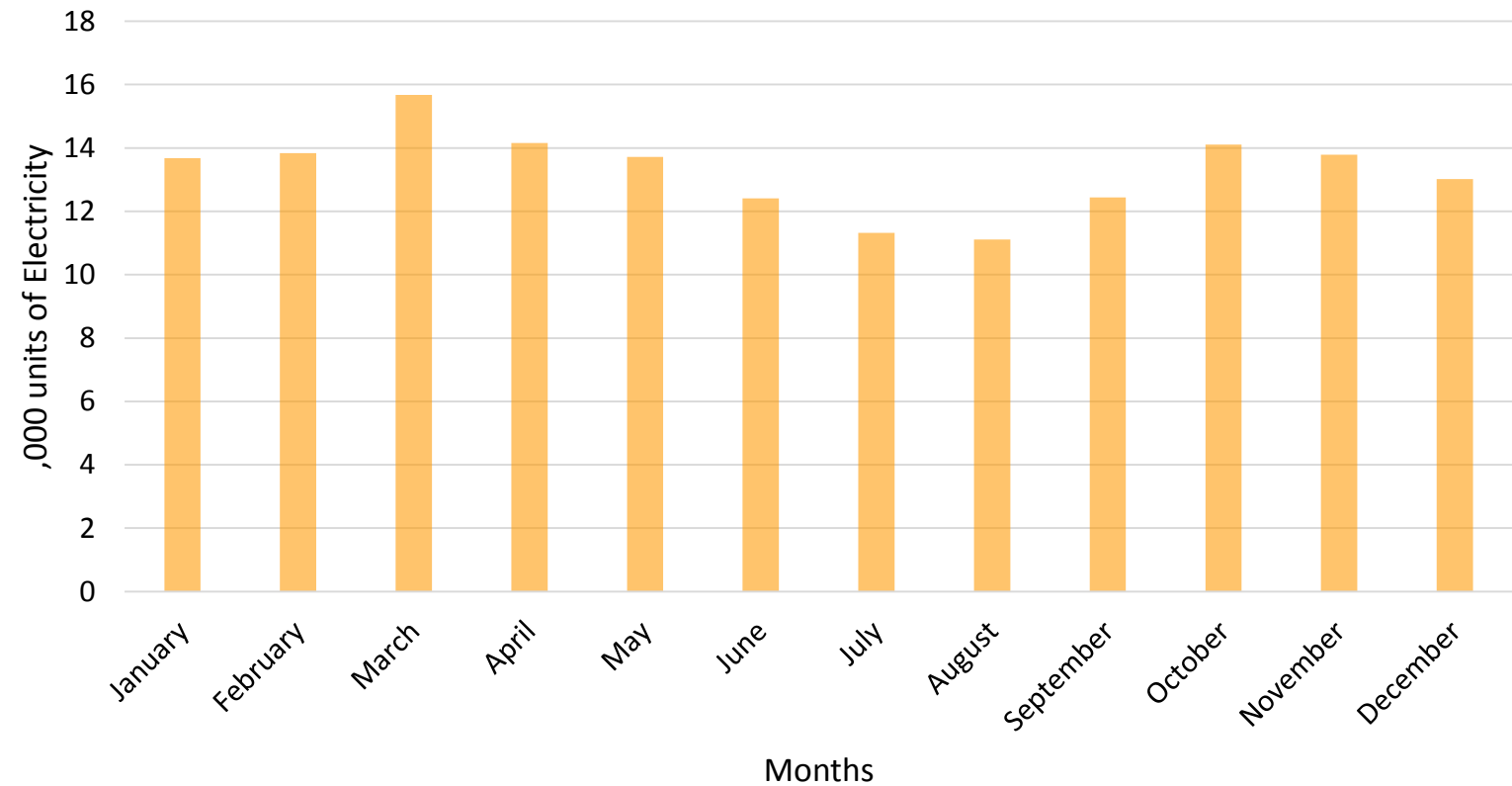


Rooftop Solar: The Opportunity



Reliable source of energy: 300+ sunny days in India

Monthly Generation



Solar Energy Generation
Monthly Pattern

Rooftop Solar: 100% Green



100 kWp Solar Plant



3,450 MT CO₂¹



25,500 barrels of crude²



4,300 trees³

Resulting in improved public health and environment quality and enhance your economic, environmental and societal capital

Note: (1) Based on Central Electricity Agency (CEA) baseline average emission values in tons of CO₂/ MWh generated for the entire Indian electricity grid during FY13-14. To calculate the indicative reduction in tons of CO₂ emitted by installing a solar plant, the cumulative generation over the life of the solar plant of 25 years has been multiplied by the CEA baseline value

(2) According to U.S. Energy Information Agency (EIA), consumption of 7.4 barrels of crude oil in India produced 1 ton of CO₂

(3) According to Grow-trees, an NGO which is the official Tree Planting partner of United Nation Environment Program's Billion Tree Campaign, one tree absorbs 20 kg of CO₂ per year over a 40 year lifetime. Based on a solar project life of 25 years we arrive at an equivalent of 4,300 trees for a 100 kWp plant

Rooftop Solar Challenges

Business

- Awareness
 - Information and misinformation
- Long term PPA
- Quantum of savings
- State solar policy
 - Net metering, open access
- Business model credit risk
- Performance risk
 - Estimated vs actual generation

Implementation

- The rooftop/site
 - Location, design, strength, height, accessibility
- Plant size/layout optimisation
- Limited skilled specialist workforce
- Safety norms, testing labs
- O&M

Rooftop Solar: Future Growth Enablers

Industry

- Cost
- Grid robustness
- Storage
 - Cost
 - Technology

Policy/Regulatory

- Performance based incentives
 - Generation vs Capacity
- Curtail sops and subsidies
 - Accelerated Depreciation
- Competitiveness vs Grid
- Net metering
- Focus on storage
- Credit support for Small business, Domestic

The Solar Opportunity: Demand vs Supply

Demand

- Rapid Solar capacity addition
- Distributed/Rooftop segment fastest growing
 - Amplus up from 30 MW to 167 MW
- GW scale solar parks

Supply

- Domestic Module & Cell capacity @ 8 GW & 3 GW
- China: 93% PV market share
 - Global supply capacity exceeds demand

The Solar Opportunity: Make in India - Issues and Challenges

- Demand – Supply gap
- Cost/Quality competitiveness: Indian vs Chinese
 - Size/Economies of Scale, low-cost power
 - Backward integration: ingots > wafer > cells > modules
 - Indian module/cell makers import heavily from China
 - DCR without subsidy commercially not competitive
- Reverse bidding vs FIT
 - Wind energy has more robust domestic ecosystem
- Solar capacity addition vs Domestic PV manufacturing
- Impact of higher duty on Rooftop segment
 - Industrial/Commercial segment very price sensitive
- Investment in innovation and R&D
 - PV and Storage

The Solar Opportunity: Make in India - Issues and Challenges

- Demand – Supply gap
- Cost/Quality competitiveness
 - Size/Economies of Scale
 - Backward integration
 - Indian module
 - DCR with
- Reliance on China

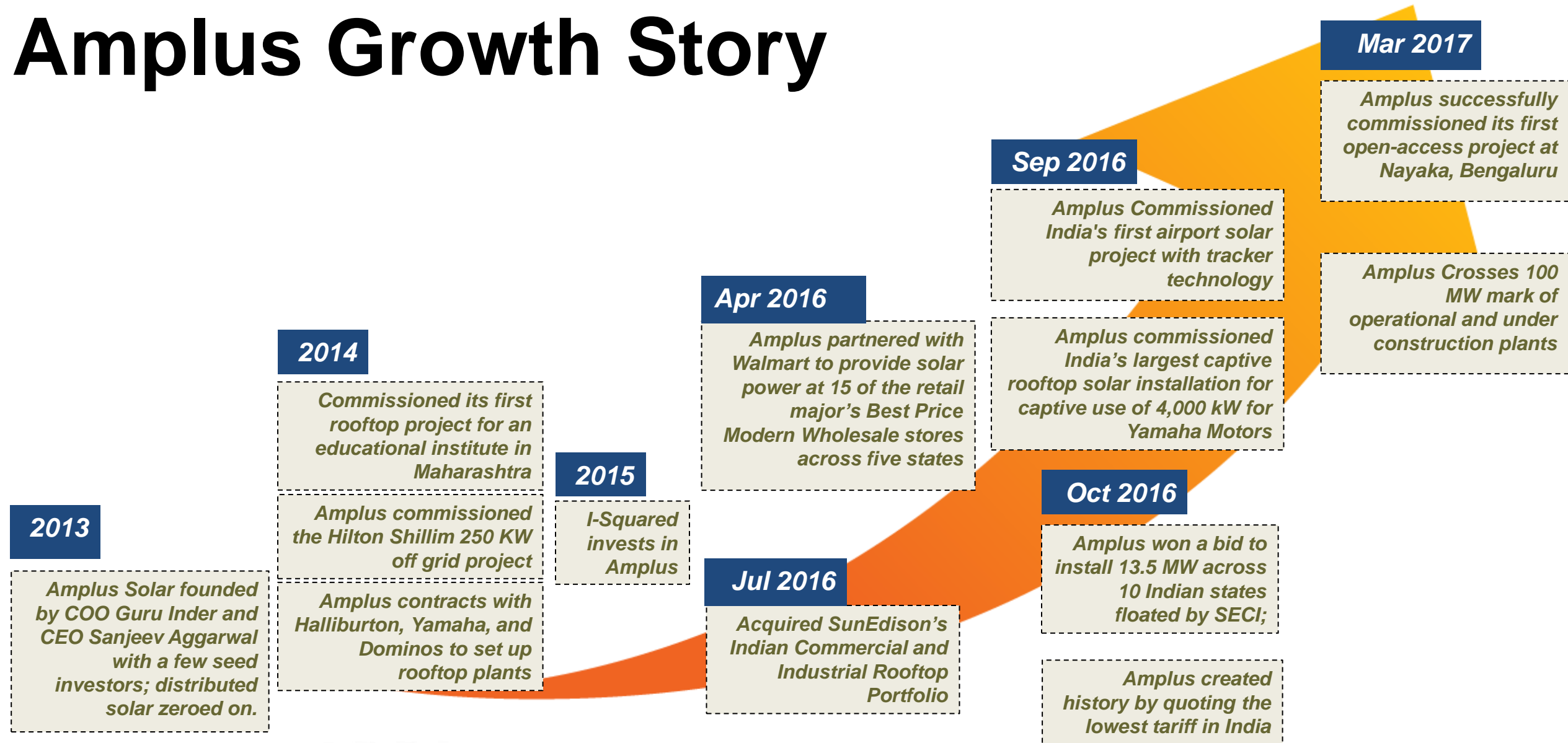
The Downside:

- India's solar growth almost entirely dependent on China
 - Higher long-term risk (enforcing contracts, warranties etc)
 - PV module "commoditization" adds to Indian woes
- Reliance on China
 - Domestic ecosystem
 - Domestic PV manufacturing
 - Duty on Rooftop segment
 - Commercial segment very price sensitive
 - Investment in innovation and R&D
 - PV and Storage

The Solar Opportunity: Make in India – The Upside

- Job addition in RE in USA growing rapidly
 - Despite not much manufacturing growth
- Huge opportunity for employment in Installation
- O&M can be a major industry
 - Grid scale as well as rooftop
 - Minimum 12 cleanings per year * 25 years
- Green energy without the “carbon footprint”!

Amplus Growth Story



30+ MW



120+ MW



270% Growth is a testimony to Model's Viability and Potential

India's Most Awarded Solar Company

INDUSTRY LEADERSHIP



Heading the FICCI Committee on Rooftop Solar interacting with MNRE on behalf of the industry

Leading the formation of Distributed Solar Power Association of India



Member, Advisory Council, Renewable Energy World Conference

Member of the BRICS Business Forum representing India's views on distributed solar



Member of the World Bank Consultation Group on rooftop solar financing

Member of India German Energy Forum (IGEF) representing distributed solar industry from India



AWARDS



Best Renewable Energy company in Asia- 2016



Global CEO Award 2016



For a better life on a greener planet

Gold category of EEF Global Awards 2016



Innovative Project – Rooftop Scale



Ministry of New and Renewable Energy Government of India

National Excellence Award 2016



Green Energy Provider 2016



Rooftop Solar – Project Developer



Commercial Rooftop Installation 2016



Best Green Energy Industrial Solutions Provider India 2017 Award



Best Project Development 2016



National Energy Circle 2017

Our Customers: 167 MW and growing...



500 kWp
Pitched roof
Intel India,
Bangalore



3,500 kWp
Pitched roof
Metro Cash
& Carry



30,000 kWp
HONDA
Karnataka



HEALTH • HYGIENE • HOME
2,000 kWp
Reckitt
Benckiser
Karnataka



250 & 250 kWp
Hilton Shillim
Estate & Spa,
Pune, India



4,500 kWp
Wal-Mart
India Stores



4,000 kWp
Ground
mounted
HAL,
Bangalore



4,700 kWp
Pitched Roof,
Noida,
Faridabad



500 kWp
PEB Roof,
Nishatpura



2,500 kWp
L&T Infotech
Karnataka



Thank you !



600 kWp
Rooftop
LT Foods,
Haryana



200 kWp
Halliburton,
Maharashtra



RAISONI GROUP
a vision beyond
400 kWp
RCC roof
Raisoni
Institute,
Pune



700 kWp
HT Media,
Noida



500 kWp
Pitched roof
DMRC,
New Delhi



1,750 kWp
Manipal
Hospitals,
Karnataka



PI Industries Ltd
100 kWp
PI Industries,
Gujarat



150 kWp
Origami
Tissues,
Bangalore



650 kWp
IMS
Engineering,
Ghaziabad



300 kWp
Vulcan
Express,
Haryana



100 kWp
Scope
International,
Chennai



800 kWp
Pitched roof
Amway India,
Dindigul,
Tamil Nadu



1000 kWp
Pitched roof
Whirlpool
India, Pune,
Maharashtra



100 kWp
Kansai
Nerolac,
Krishnagiri



2200 kWp
Torrent Power,
Gandhinagar,
Gujarat



1000 kWp
TVS Motors,
Hosur, Tamil
Nadu



560 kWp
Dmart Stores
Solapur,
Kolhapur,
Maharashtra



500 kWp
Manav
Rachna,
Haryana