There are no Accidents !!!!

17th September is a very important date for Indian Solar Industry

Birthday of our Hon. Prime Minister

Shri Narandra Modi

Principle Architect: 175 GW Renewable Energy Mission

Mission : 175 GW

Total 175 GW by 2022

- Solar : 100 GW
  - Utility Scale : 60 GW
  - Roof top : 40 GW
- Wind : 60 GW
- Biogas : 10 GW
- Small Hydro. : 5 GW

Indian Live Statistics

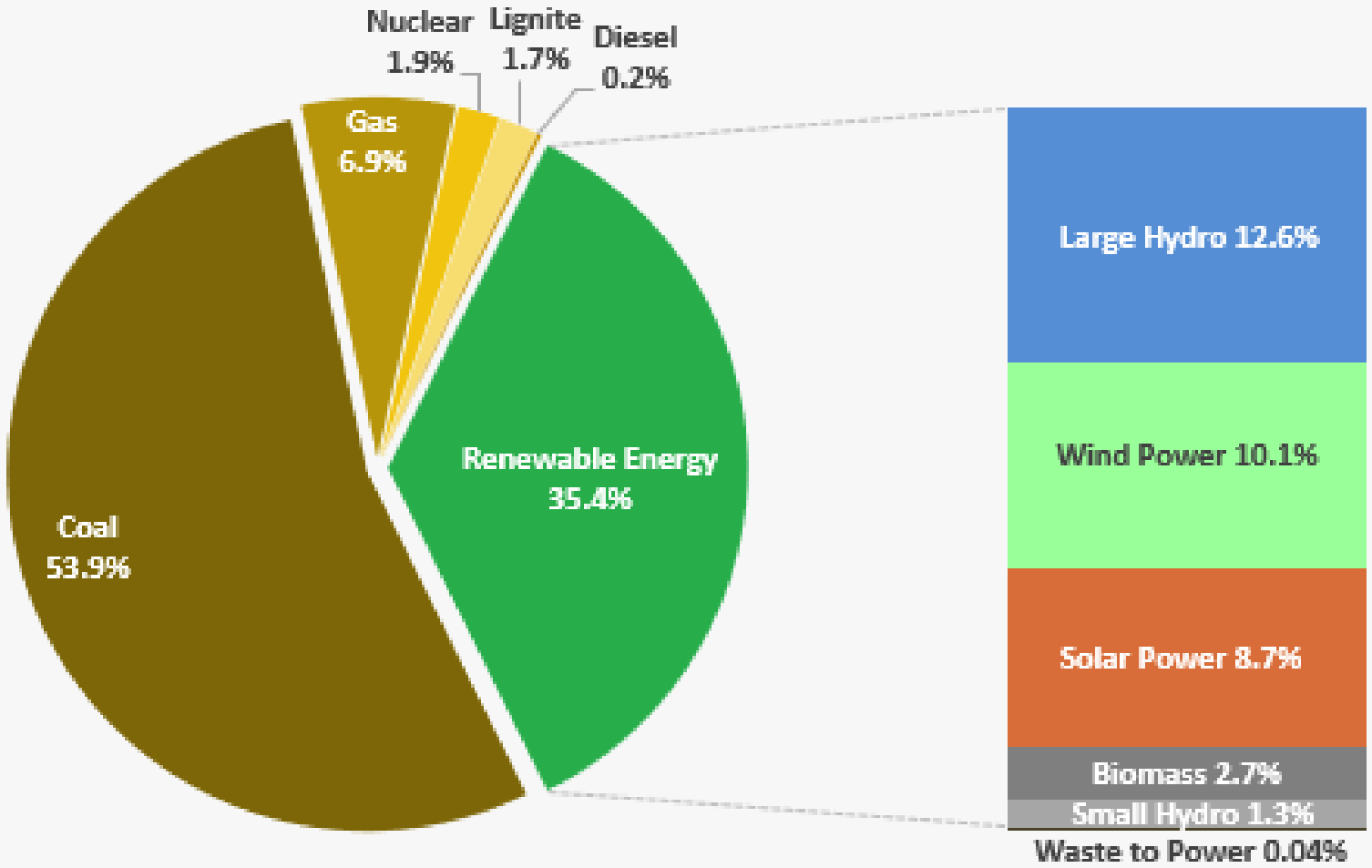
- India accounts for around 18% of world's population
- India is the 3rd largest producer of Electricity behind China and USA
- India Produced 1249,337 BU in 2018-19
- India's per-capita energy consumption is about one-third of the global average. (1)
- India's per capita energy 6% of the world's primary energy.
- India Consumption per capita equals 0.6 Tonnes of Oil Equivalent (toe) as compared to the global per capita average of 1.8 toe. (2)
- 91% - 92.6 % population in India has access to electricity World Bank Report (3) and report by Ministry of Power, Government of India

Electricity Generation by Source F19 (X2)

India - Cumulative Installed Power Capacity Mix (%)

MERCOM India research

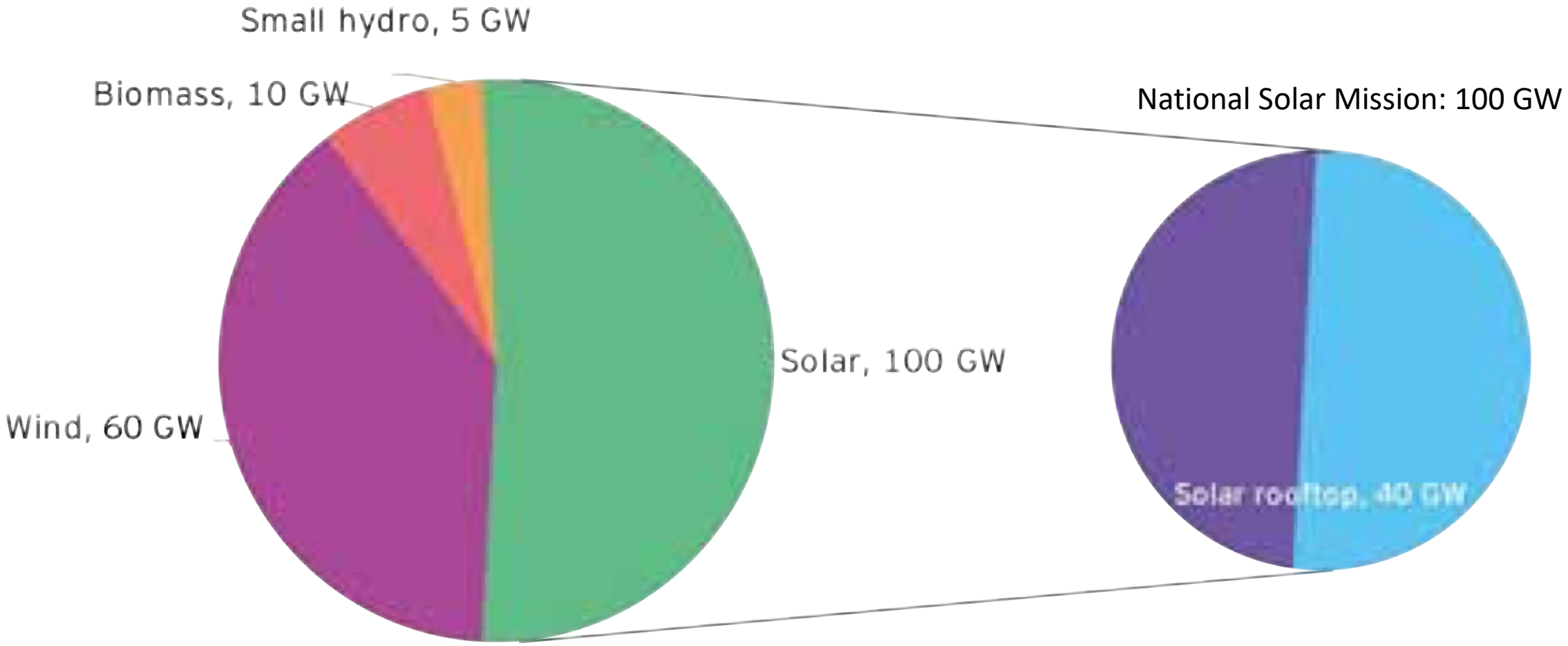
Renewables (including Large Hydro) make up over 35% of India's total installed capacity, with solar accounting for ~8.7%. Among renewables, solar accounts for ~25% of the installed capacity



Data from CEA, MNRE, Mercom India Solar Project Tracker (Installed Capacity as on 30 Jun 2019)

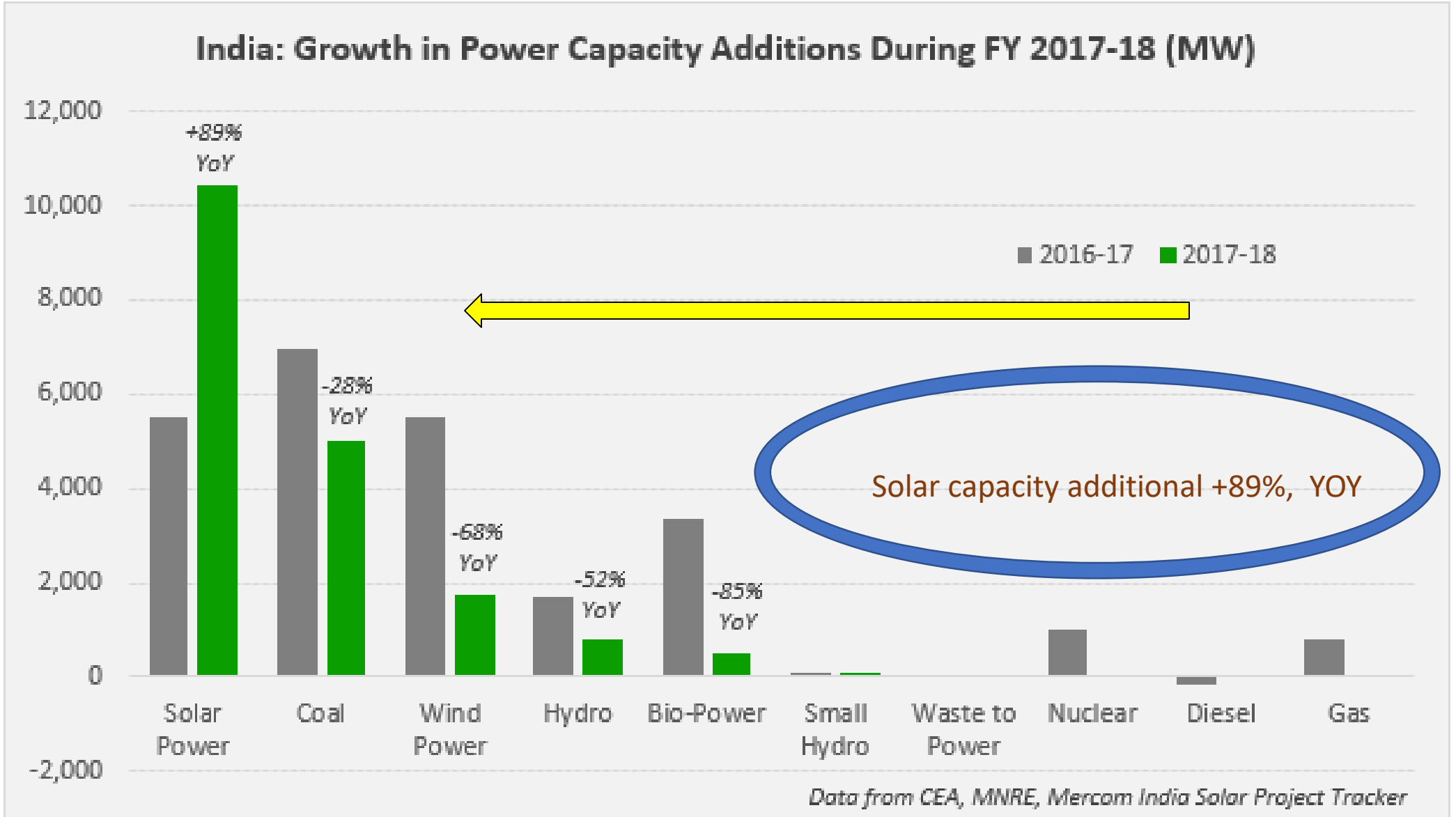
Source: Mercom India Research

175 GW Renewable Energy by 2022

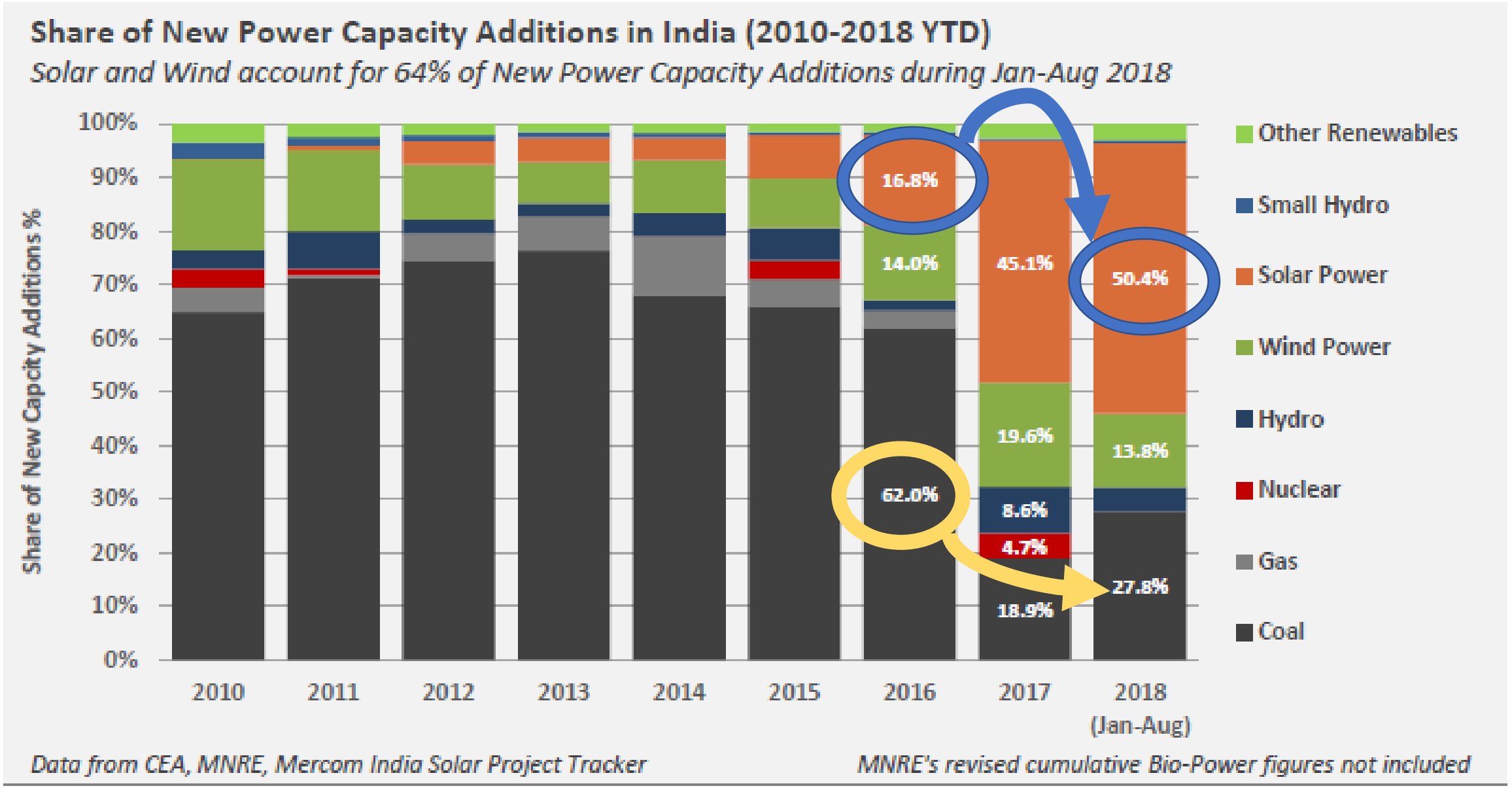


Vision 2030 : 500 GW by 2030

Solar Leads Capacity Growth YOY

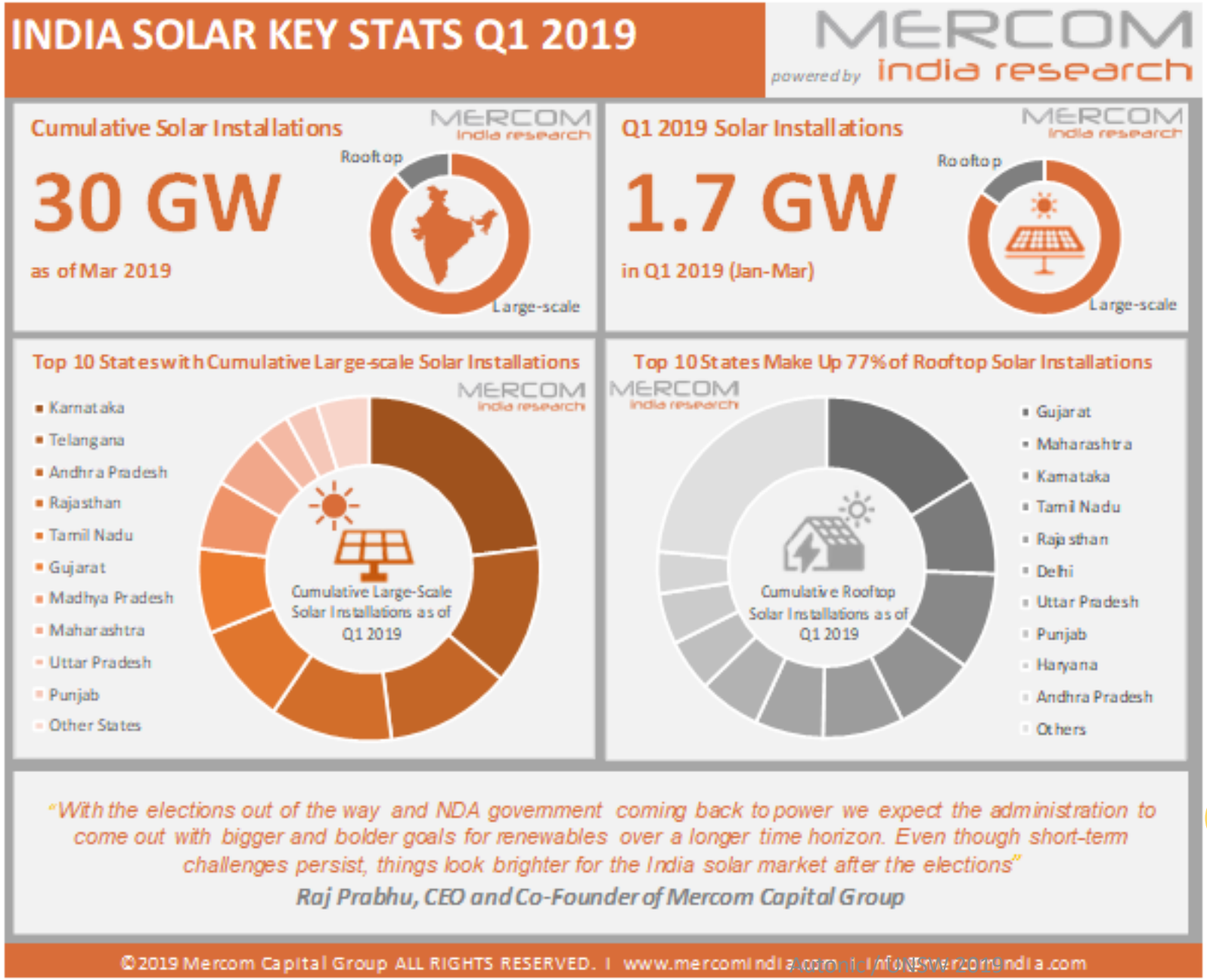


Solar Capacity Additions in 2010 - 18



Solar accounted for 50.4 percent of the new power capacity in 2018.

Top 10 states - Large Scale & Rooftop



Rooftop :

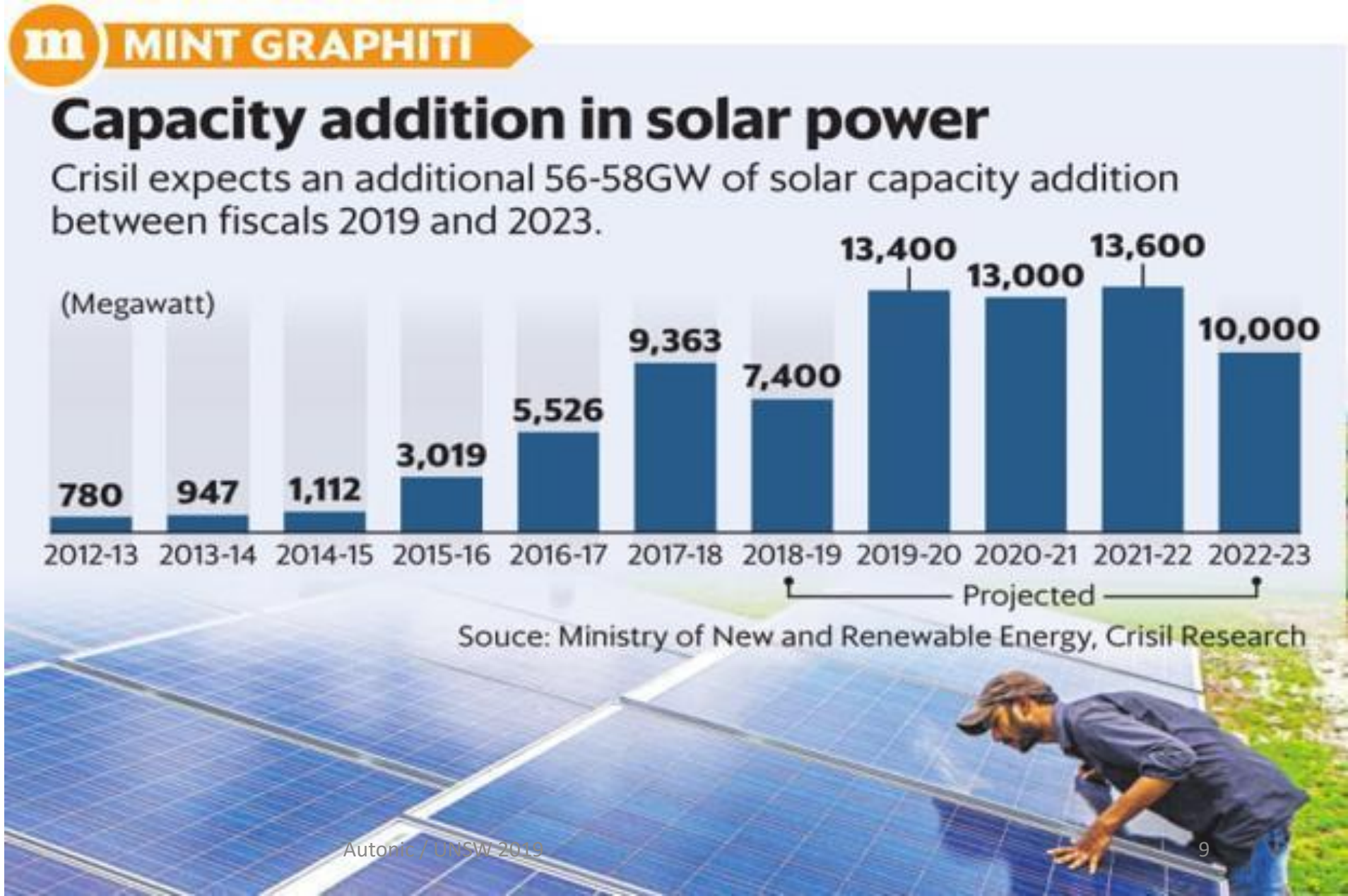
India is estimated to have added new rooftop solar capacity of 1,836 MW in FY 2018-19, up a remarkable 61% over previous year.

Total installed capacity is estimated at 4,375 MW as on March 2019

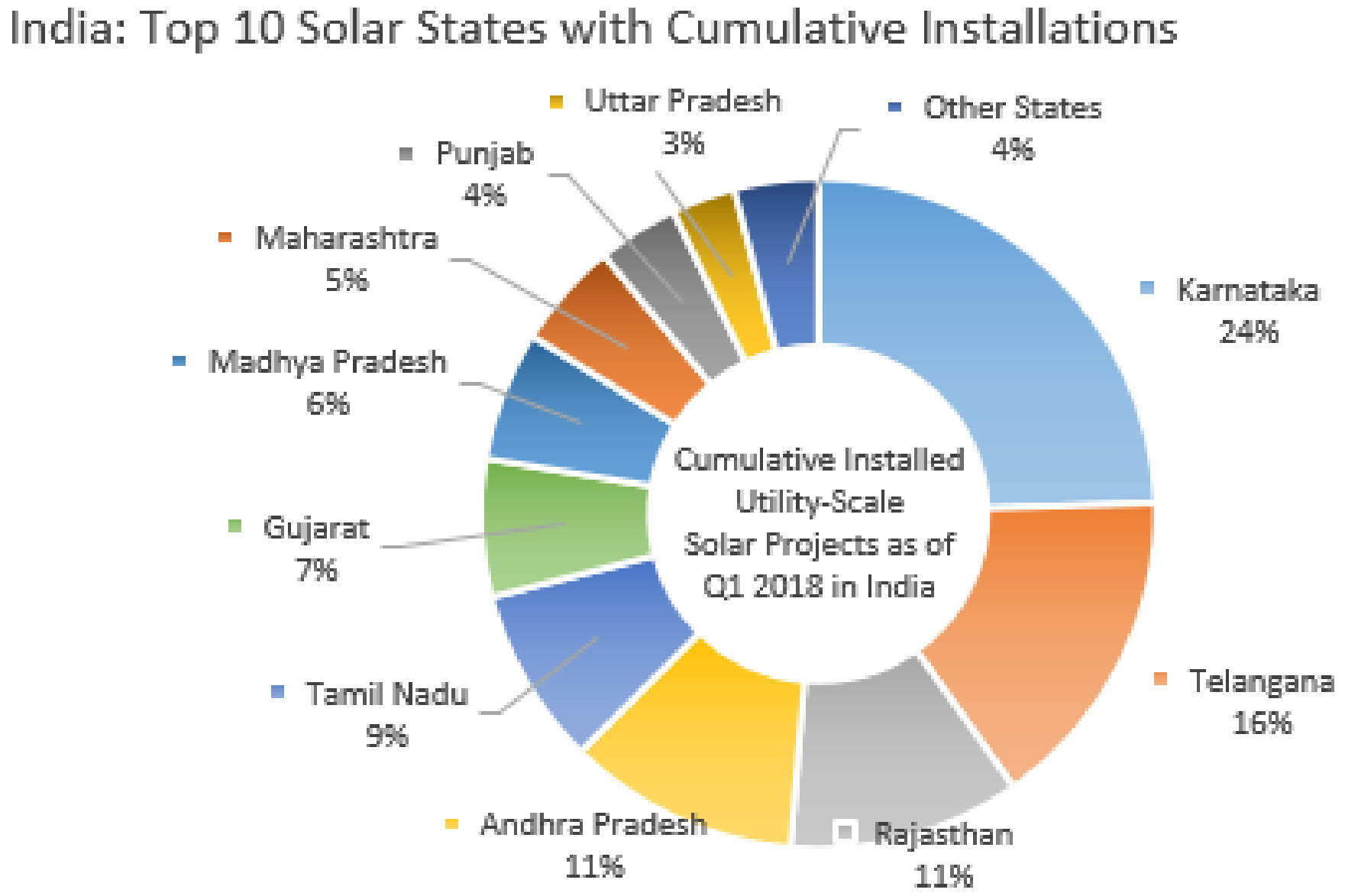
Roof top Solar accounts for 12 % of total solar installation

Installation Forecast - Solar Targets

Indian Accounting year
April-March

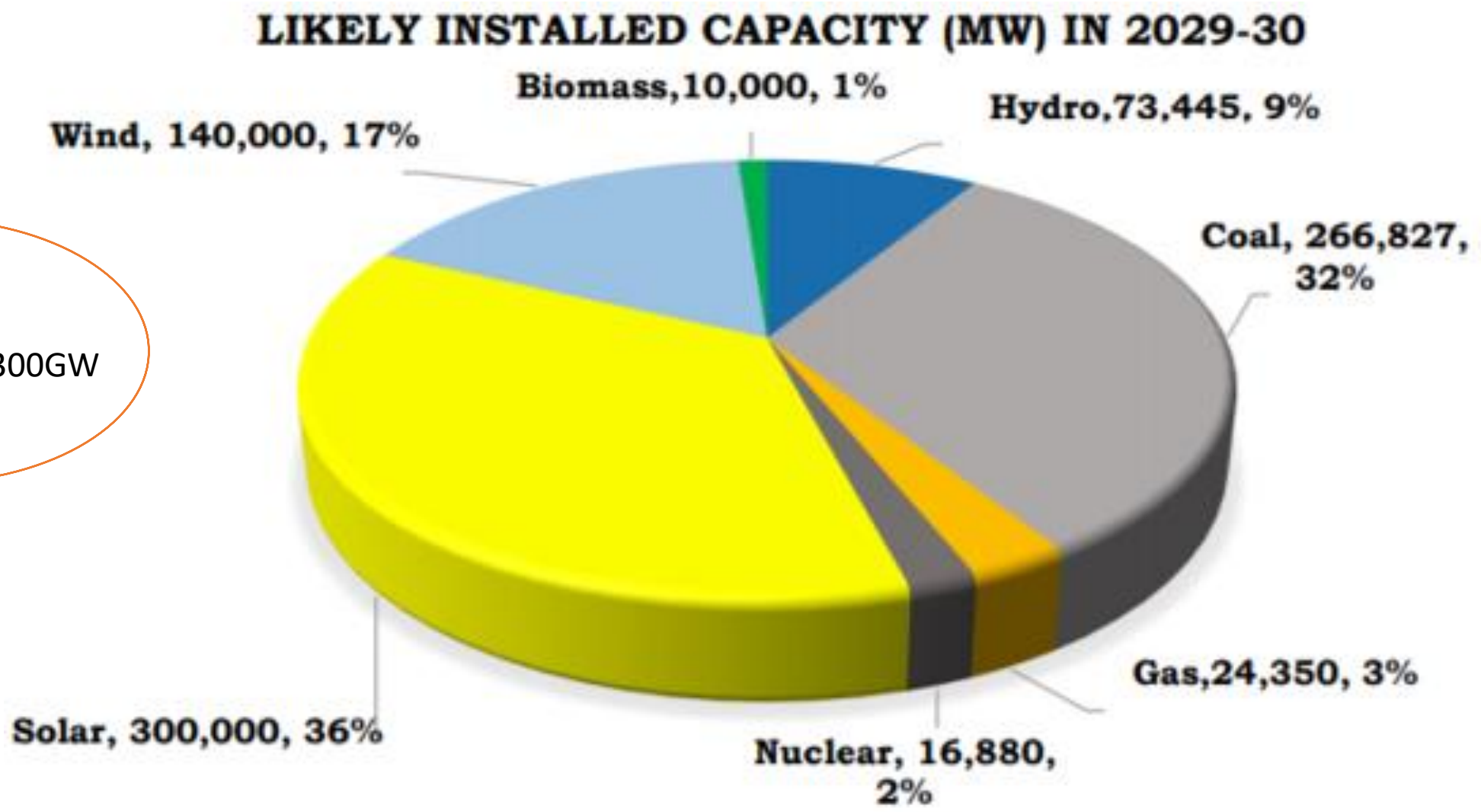


Rooftop Installations State-wise 2018 Q I



RE –Proposed RE Capacity by 2030 : 500 GW

Solar
100 GW. → 300GW



6 Major Program to Support National Solar Mission

- Uday. (4). : meaning Rise, with reference to Sun, or sunrise
  - Financial and revival package for electricity distribution companies of India (DISCOMs) with an indent of starting with the Clean slate.

- Ujala : Meaning Light or lighting
  - 250 Milion LED bulbs distributed under **UJALA scheme under efficiency**

- Saubhagya (5). : Literally meaning Good luck
  - Last mile grid connectivity 91% of rural Indian households have received electricity access till june 2019

- Urja : Means Energy with reference to Power (6)
  - **Integrated Power Development Scheme " (IPDS)** is a priority programme of Ministry
  - Strengthening of sub-transmission and distribution network,
  - Metering of distribution transformers /feeders / consumers and
  - IT enablement of distribution sector and strengthening of distribution network under R-APDRP (now subsumed under IPDS)

PM KUSUM Program

- The Scheme consists of three components: (7)
  - **Component A:** 10,000 MW of Grid Connected Solar or any other RE Plants (500 KW to 2 MW capacity)
  - **Component B:** 1.75 Million, standalone Solar Agriculture Pumps (upto 7.5 HP)
  - **Component C:** Solarisation of 1.0 million grid-connected Agriculture Pumps (up to 7.5 HP)
- Total 25,750 MW capacity to be created by the year 2022
- Central Financial Support of Rs. 34,422 Cr AUD 7.07 Billion

SRISTI : Sustainable Rooftop Implementation for Solar Transfiguration of India

- The scheme shall **integrate discoms as an implementing agency** in Phase II of rooftop solar scheme.
- The proposed scheme aims **to achieve a national solar rooftop target of 40 GW**
- **Central Financial Assistance** will be provided only for installation of roof top solar plants in residential sector.
- The residential users may install the plant of capacity as per their requirement and the regulations of respective state electricity regulatory commission. subsidy support will be limited up to 5 kW capacity of plant
- Incentive to Distribution companies to support RTS (Monetary)
  - The proposed scheme has set sector wise targets – with commercial and industrial sector to set 20,000 MW and the government, residential , social and institutional sector to set up 5000 MW (8)

Solar Eco-system and Opportunity Gaps

- Solar On-grid Independent Power Producer. (IPP),
  - (Solar Developers concept is yet to develop in India)
- Off-grid project integrators
- Micro Grids (Guestimate India has 63 Microgrids / 1833 kW)
- Solar EPC companies, Project Management Co.,
- Cell / Module production equipment manufacturers,
- Solar cell, module manufacturers,
- Solar devices manufacturers, Solar vendors, Retailers/ Distributors
- Energy Consultants, Energy Management Co.,
- Energy Storage Solution providers, (primary focus on LI/ PB technologies, Flow Batteries is recent addition)
- Promoters, Funding Agencies, PE investors,
- Govt. Agencies – Policy makers, Solar groups /associations
- Power purchasing organizations,
- Solar research bodies, experts, observers, critics, reporters

Assorted Market Leaders

AUTONIC™

Greenenergy@work

A Decade of Solar Experience

A new paradigm

Autonic : greenenergy@work tm

- Incorporated in 1994, Foray in solar business since 2005,
- Solar Roof top EPC focus since 2011.
- Accredited Solar PV System integrator. Focus on adoptive innovation technology.
- Autonic is an MSME, with a team strength of 35+ members to execute solar PV projects.
- Rooftop Installations over 200 for Grid based system
- Installation in over 13 states in India
- 3 International Location : Germany, Uganda and Saudi Arabia.
- Autonic has worked in rural electrification, microgrids and solar water pumps.
- Management systems as per ISO 9001 – 2015. Certified by TUV.
- Autonic Group battery retailing , power electronics and energy storage.
- Autonic Group has experience in manufacturing batteries for Industrial applications.

Innovations Pioneering Efforts

• Banking Industry	-	First Solar ATM in 2009 for **Indusind Bank , with remote monitoring**
• Freezers	-	Solar powered Visi cooler system for Coca Cola
• Retail Segment	-	At India's first retail shopping chain, Shoppers Stop
• Ware-houses	-	100 kW installation at Deccan Warehouse
• Cold Chain	-	First solar solution for Bhoruka's Coolex Cold Chain
• Micro Turbine	-	Grid tied micro turbine installed for Infosys
• **Microgrid**	-	2010-11 with Micro Wind Solar Hybrid, in Indore

- Smart Controller for Load and Generation management
- DG controller and DG sync

Our Solar Foray

Component & System since 2005

Power Plants Since 2011

Roof Mounted

Ground Mounted

Residential 1kW up to 50 kW

Commercial 50 kW up to 1MW

Large power plants > 1MW

Autonic – Brief Company Overview

A Unique R&D based Solar EPC Company

EPC
- Installation and execution support
- Net-metering
- AC Yard and Grid connection

Design
- Engineering and design
- Design + Site assessment
- Implementation schedule
- BOM preparation

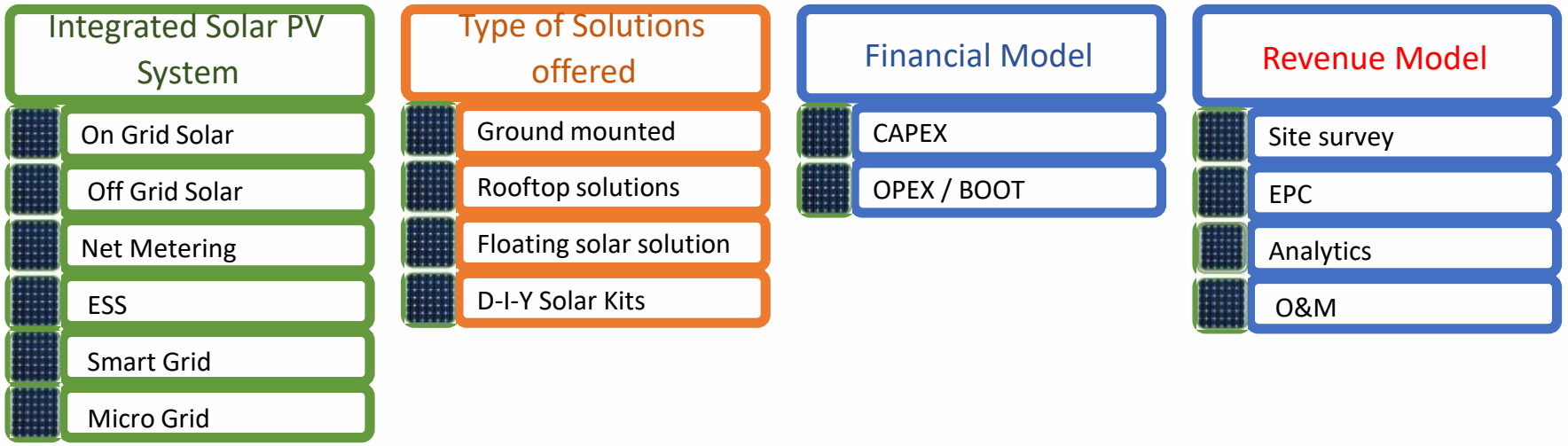
Operation and Maintenance
- Special vertical for management of the installed System

Financial
- OPEX /BOOT
- Financing Model
- EMI model (recent addition)

Key Facts

- Location: Mumbai
- Shareholders: Privately Held
- Employees: 35
- Management Style : Professional Board

Autonic and wide spectrum



Scale of our operations

- 120 years of Cumulative management experience
- Fully fledged Design team
- Electrical Contractors License
- Registered vendor for solar projects
- 14 years of solar experience
- Inhouse O&M team
- Solar energy monitoring team
- Strong tie-up with Vendors
- International work experience
- Design focused operation
- Unique Mentoring and Training Program

Decentralised and Empowered Structure

- Independent operations with Business Unit Head
- Engineering Design focused approach
- Special attention to Residential and retails customers
- The Corporate Office focused in capital allocation, performance goal setting and leadership planning.
- Culture built around Customer Centricity, Employee Engagement and Speed & Agility of Action

Business Model

C&I Target : Non Consumption

- Industry + Utility focus
- Innovation
- Enveloping eco system
- Hub and spoke model with growth focus
- Regional team for O&M

Integrated Opportunity

- Win-Win
- Partners training program
- Non Consumption requires working with new lenses

Strategy at a glance

Our association and Value addition working on following

- Focus markets
- Operations Back ending or front ending
- Tenders focus markets
- Total turn key solution , with best in class design and material / BOS support
- Procurement and design support project base
- Creating a Commercial viable solution

Technical

Design the project based on the need
Load Management and power module
Modular connectivity for convenience and future proof for variation load
O&M, Automation of services

Solar Home Lighting System, Kaldari Village, Near Mumbai 2006

Mr. Ravi Paradkar, Mahindra Automotive- distributing Autonic Solar Lanterns to villagers in 2006

UNICEF Project
Solar Street Light, 11Watt CFL, in Central India 2007

TATA INNOVISTA
Celebrating Innovation

TATA

Congratulations!

In appreciation of the efforts of

Sachin Rele

from Tata Capital

who, as a member of the team, showcased the spirit of innovation

In the project Surya Aranya - Forest of the Sun

in the category of Design Honour

at Tata InnoVista 2014.

R. Gopalakrishnan
Chairman
Tata Group Innovation Forum

TATA QUALITY MANAGEMENT SERVICES

Date: **April 23, 2014**

Solar Forest: Surya Aranya, Art Deco

India’s first Solar ATM at InduSind Bank

INDUSIND GOES GREEN, STARTS SOLAR ATM

IN A bid to go green, **IndusInd Bank Ltd** has launched its first solar energy-powered automatic teller machine (ATM) in Mumbai.

The bank will see how the new facility works till the end of this month and then extend it to over 400 ATMs it has across the country.

Interestingly, the ATMs will be able to run even at night. The solar panel is capable of absorbing and storing enough energy during the day to power the ATM even after daytime.

A solar ATM can help conserve up to 8 hours of energy every day. Romesh Sobti, CEO, IndusInd, says: "We will save up to 1,980KW every year through a single solar ATM."

A single solar ATM can help save Rs25,000 per year as compared with a normal ATM and Rs45,000 per year against a generator-operated ATM.

The bank has converted an existing normal ATM into a solar ATM instead of installing a new one. **BINDISHA SARANG**

INDUSIND BANK LAUNCHES SOLAR-POWERED ATM

MUMBAI: IndusInd Bank on Tuesday inaugurated Mumbai’s first solar-powered automated teller machine (ATM) as part of its Green Office Project campaign “Hum aur Hariyali”. It also unveiled a “Green Office Manual - A Guide to Sustainable Practices,” prepared in association with the Centre for Environmental Research and Education (CARE). IndusInd Bank has a comprehensive plan to reduce its carbon footprint. Some of the initiatives being undertaken under this plan are solar powered ATMs, thin computing, e-archiving, e-learning, e-waste management, paperless fax, energy conservation, CNG cars and also supporting finance programs with incentives to go green. **BS REPORTER**

Module Placement in Germany

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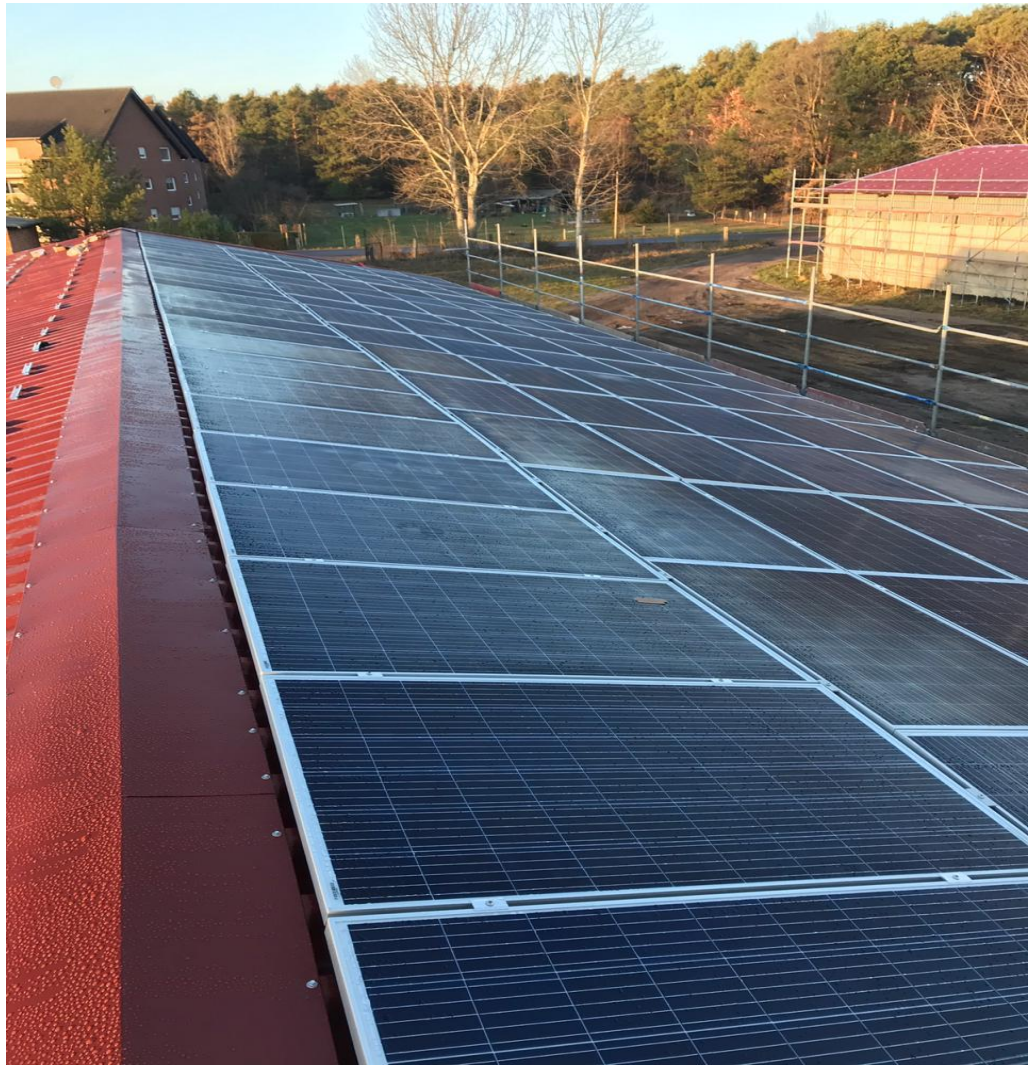


Installations

Mercedes
Chakan

RenewSys
Bengaluru

Clover
Talegaon

CIDCO
Navi Mumbai

Our Select Marquee Customers

I n n o v a t i o n

G A P S

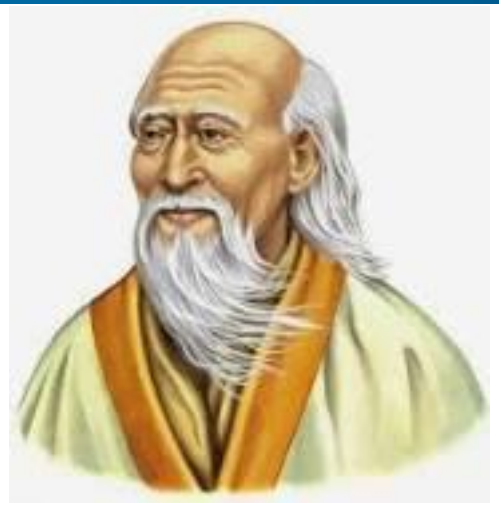
P R O J E C T S

&

S O L U T I O N S

Special Projects and Applications

Trinity of Technology



The objective of clay in making of vessel is to

create space

Lao Tzu

- New technology / disruption
- Implementation with commercial viable solutions
- Innovation or improvisation and application

PIONEERS IN

FLOATING SOLAR SYSTEMS

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Technology Enablers

Opportunities for floating solar:

- Utilization of land for alternative usage , helps in food security
- Floating solar eliminates the lengthy process of land acquisition
- Exiting transmission line and grid infrastructure can be utilized
- Near consumption center and/or on reservoirs of hydro-electric dams
- can utilize existing transmission infrastructure;
- Optimum generation performance due to cooling effect of water, 5 degree lower as per SERIS finding 2017
- Estimated 15 % more output panels over roof top installation as per SERIS report
- Water conservation
- Prevention of algae in fresh water and water bodies

Evaporation Losses in Australia

AU $ 2/ sq mts /Year

Land rental for Solar Plants

AU 1 $/ Sq mts/ year

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Floating solar Project, inclusive growth : work in progress paper

- Solar mission in India
  - 60 GW of utility scale project
  - Area required for installation : 300,000 Acres or 1214 Sq Kms
  - Size of Singapore is **721.5 sq Km (source Wikipedia)**

- The primary study aims to identify the gaps in feasibility and deployment of floating solar.
  - Maharashtra (India) is selected as geographic area,
  - Maharashtra has water bodies covering surface area of over 90,000 sq Km, (9) Source water bodies of Maharashtra
- Availability of grid network and penetration of power, ideal for power evacuation
- Socio political environment conducive for industry and power
- Power Generation Opportunities considering 2 % water used for Floating solar **84 GW**

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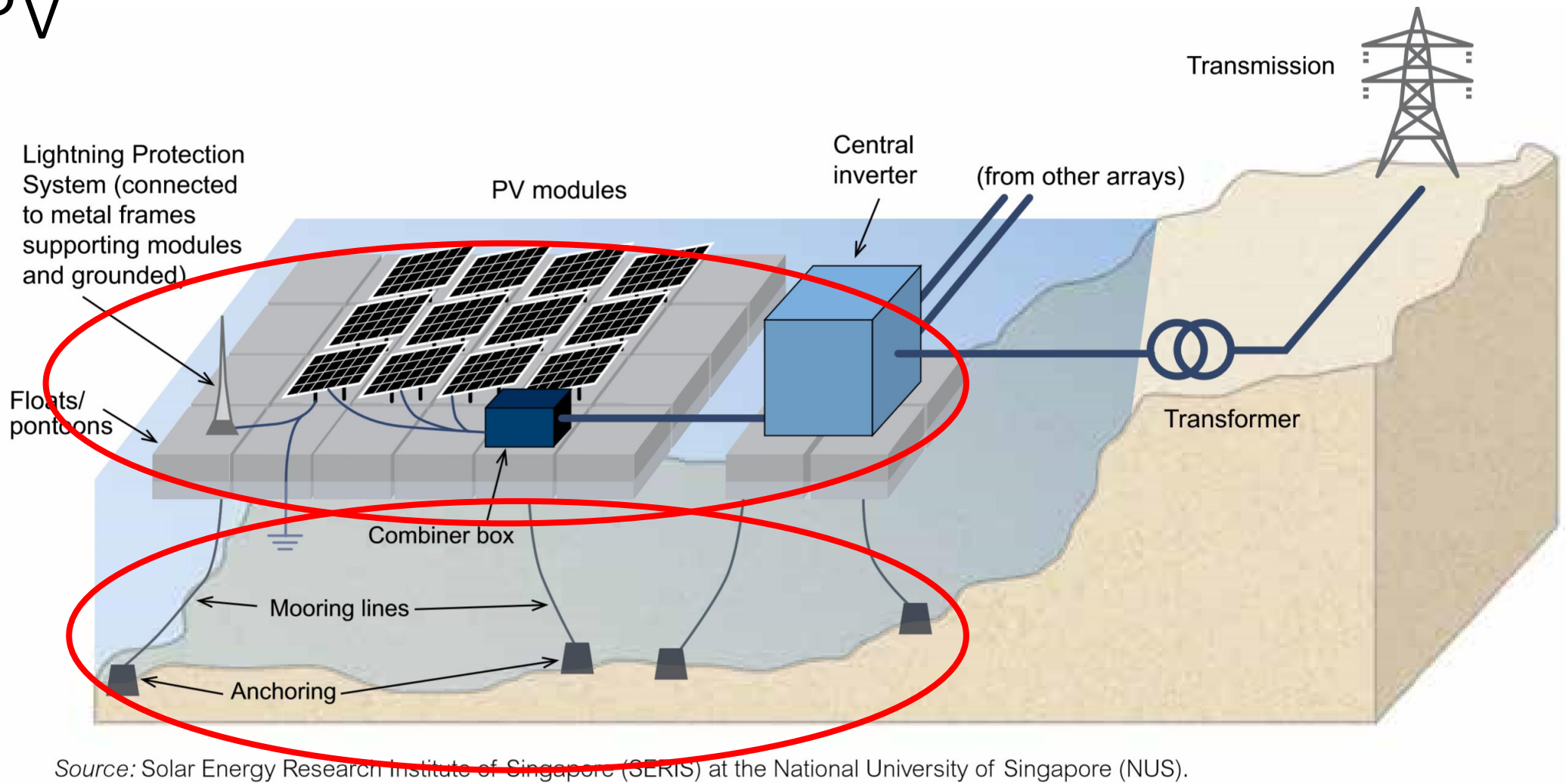
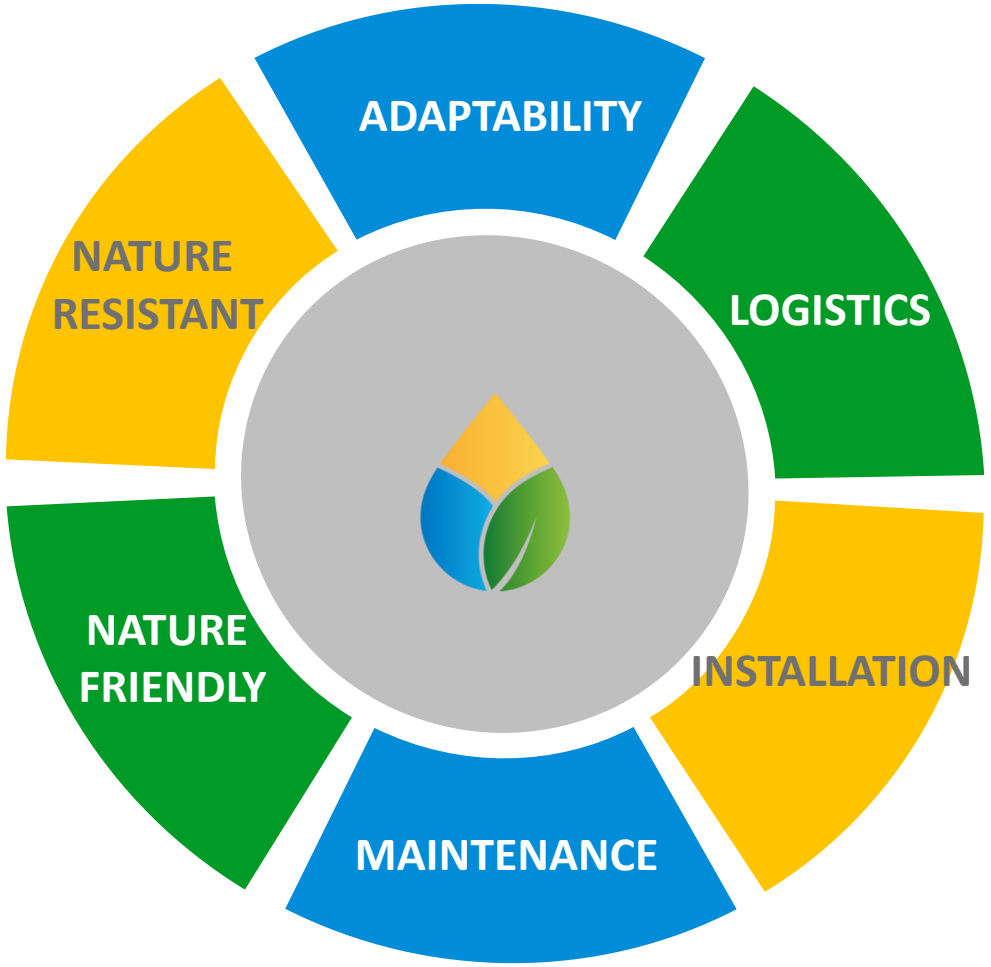
FLOATING SOLAR SYSTEM

Schematic representation of a typical large-scale floating PV



Source: Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore (NUS).

Key challenges to solve in a floating solar system



- **ADAPTABILITY:** adaptation to the concave profile of the water surface as **water levels go up or down** through the year
- **LOGISTICS**: Any project takes thousands of floats. **Don't pay for air being transported** or devote significant space to stock material
- **INSTALLATION:** No need of specialized and expensive technical teams. Setting up your project **should take weeks, not months**.
- **MAINTENANCE: easy and safe access** for O&M crews. **Components should be resistant** and exhibit partial flexible behavior.
- **NATURE FRIENDLY:** The system must integrate and **preserve nature** in places where wildlife exists including the bottom surface
- **NATURE RESISTANT:** Installation should **stand mother nature**. Combination of **sun, wind, waves**, snow, animals, saline water, algae and fungus are elements the technology **must cope with for 25+ years.**

isifloating 4.0 system is the result of continuous improvement since 2008

Isifloating 1.0 (2008)

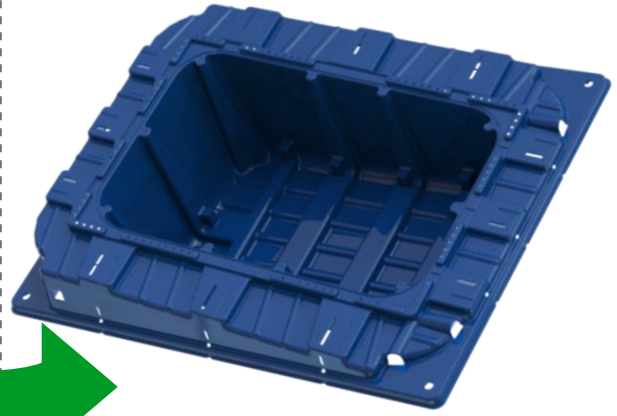
- Rotomoulding manufacturing
- Plastic float and metal structure
- 10° tilt
- Closed float
- Floats directly connected between them

Isifloating 2.0

- Thermoforming manufacturing
- Only plastic structure
- Fixed 5° tilt to improve aerodynamic performance and reduce mechanical stress
- Introduction of float connection to increase mechanical resistance and reduce problems in float

Isifloating 3.0

- Support for 60 and 72 cells solar panels
- Nestable float to reduce logistics costs
- Optimized for standard logistics and transport
- Use of plastic screws and nuts and connection



Isifloating 4.0 – (2019)

- Injection molding manufacturing
- Thickness distribution improvement along the float in critical areas
- Increased width of hall between floats for easiness of O&M
- Labels in floats to assist and speed up installation
- Mixed use of HDPE and fiber in certain components

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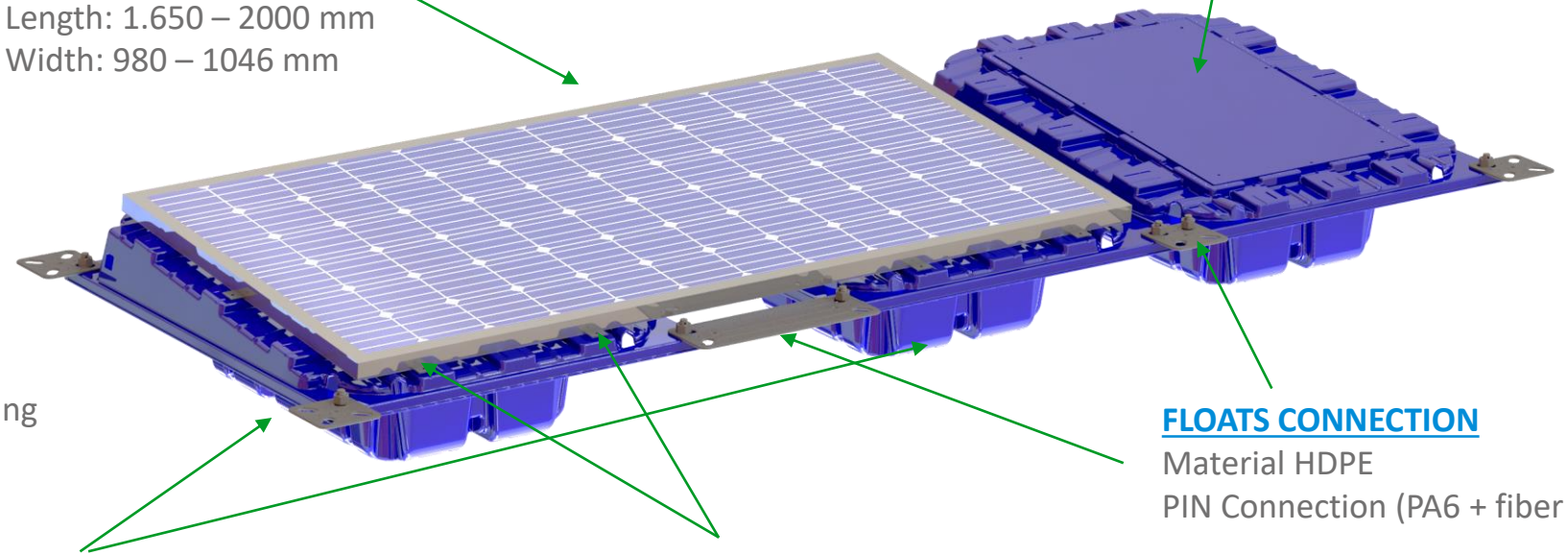
Key components of Isifloating 4.0

PHOTOVOLTAIC PANEL (NOT INCLUDED)
Power range: 250-400 Wp
60-72 power cells
Length: 1.650 – 2000 mm
Width: 980 – 1046 mm

MAINTENANCE PLATFORM
Same modular float covered with plastic top
HDPE Material
Non slipping surface



MODULAR FLOAT
Injection plastic manufacturing
Blue HDPE Material
UV Stabilized + antioxidant
Inclination 5º
Size: 1160x935x370 mm
Buoyancy: 2,4 kN (240kg) per each PV module
Max wind speed: 180 km/h

FLOATS CONNECTION
Material HDPE
PIN Connection (PA6 + fiber reinforced)

QUICK CLIP FIXING
Material ALUMINUM 6063 T6
Universal Fasteners AISI 306

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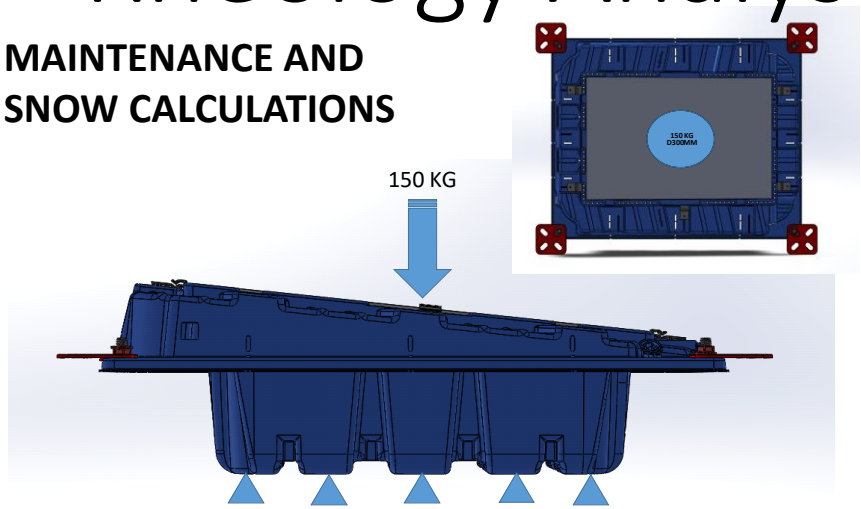
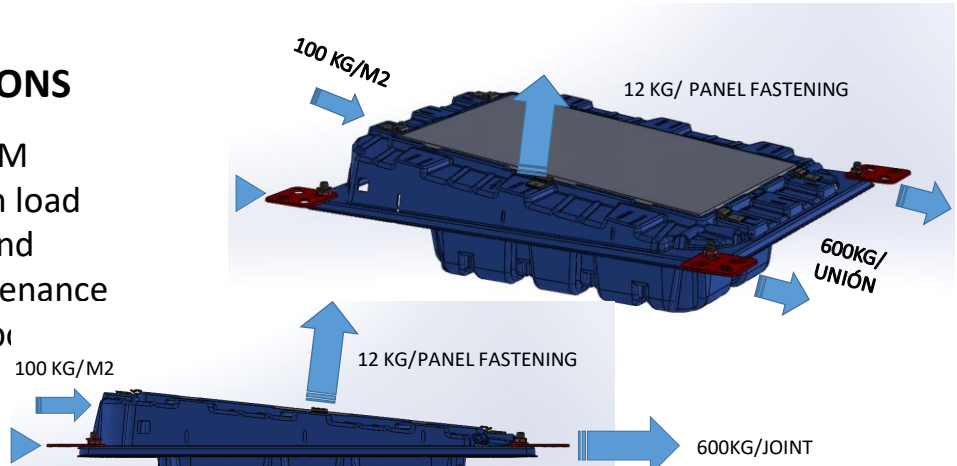
Quality design - Structural analysis and Rheology Analysis

MAINTENANCE AND SNOW CALCULATIONS

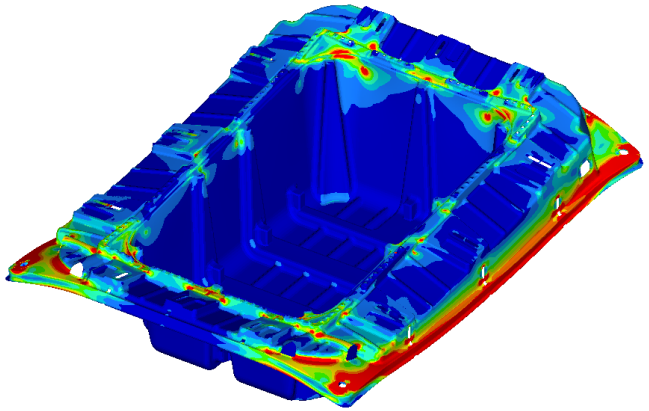


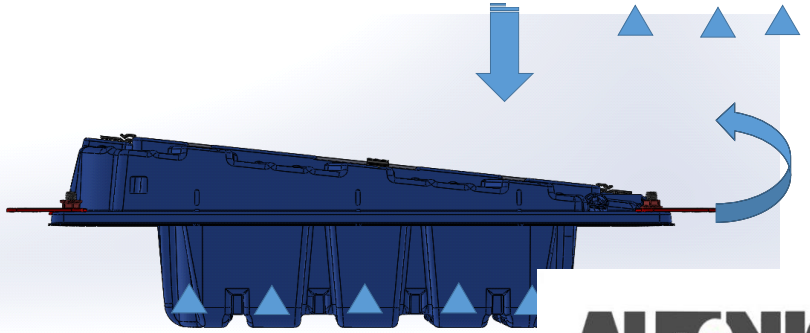
WIND CALCULATIONS

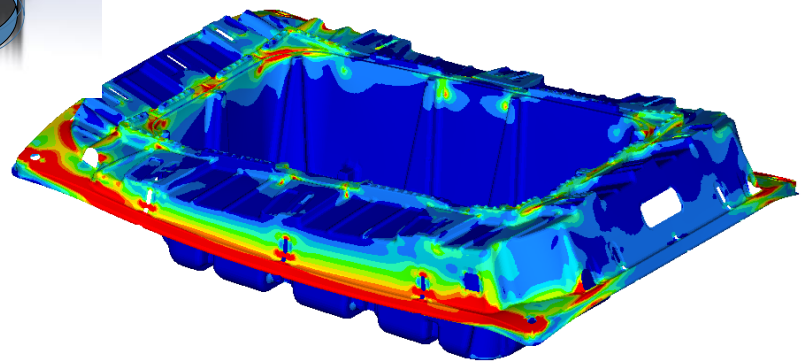
- ✓ Structural analysis by means of FEM (Finite Element Method) – Tension load applied in both side directions: wind actions, snow and live load (maintenance action), rotational performance ab corners side (Secondary moment applied)
- ✓ Rheology Analysis (Manufacture



ROTATION CALCULATIONS







Connected to grid
C.R. Virgen de la Paz (Agost)

ENERGY PRODUCTION FOR SALE
CONNECTED TO THE GRID

SITE	Irrigation water reservoir
LOCATION	Agost. Alicante. Spain
APPLICATION	Sale of energy. Financed by Caja Rural
PEAK POWER	320 Kw
FLOATS	760 units
YEAR	2009

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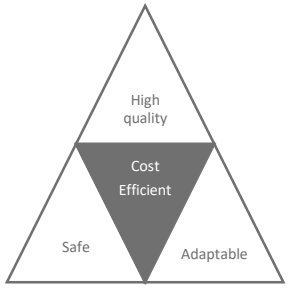
Key differentiators – Cost Efficient



- In logistics and storage:
  - Compact, nestable and stackable (1MW only takes 7 – 40’ containers, 3-4 times less space than other systems) reducing total CO2 emissions
  - Less surface area for stock and installation on site
- In installation:
  - Few parts, no specialized personnel required, only basic IKEA-like tools
  - High speed of installation (1MW only takes 17 days per 4 person crew 1,5 kW/worker/hour)
- In maintenance:
  - Basic personnel and conventional cleaning tools without additional resources (e.g. no boats)

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Commercialization Opportunity

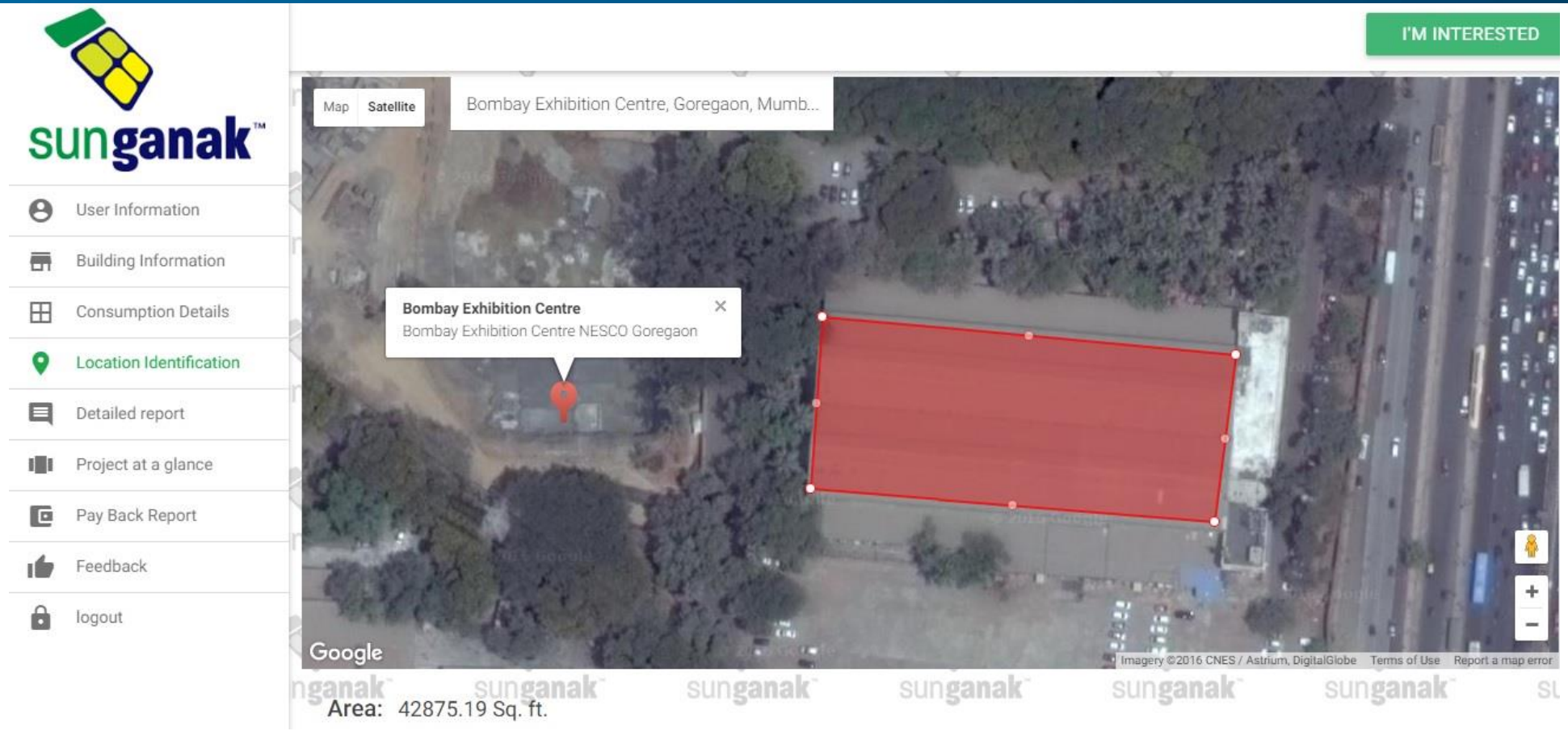
"Build the right product and introduce it to those who need it. The forces at the bottom of the pyramid are stronger than any policy."

C.K. Prahalad, Management Guru

Opportunity and Innovation

- Sunganak : Solar Calculator a 360° Degree approach from design to Monitoring, Not For Profit project
- Solar Cooker : Health cooking with modern technology
- ARIST : Ariel: Reporting, Information and solar tracking
- Dust management , module cleaning, technology agonist solutions
- PV Modules, optimised costs for Floating PV
- Improvised models for Floating Solar Solutions
- Solar Art Deco

Solar Calculator : A tool
Location Identification



Detailed Report

sunganak
Solar Electric Potential Report

ADDRESS

Bombay Exhibition Centre, NESCO, Goregaon, Mumbai, Maharashtra 400063

Residential: Yes

Generation

Installed capacity	36 kW
Estimated generation / year	60,350.4 kWh
Estimated Generation / day	159.11 kWh
Estimated life of project	25 years
Total generation in 25 years	1,312,621.25 kWh

INVESTMENT

Payback Period	5 years
Estimated cost / unit paid to utility	₹ 10
Generation annum	52504.85 kWh
Utility bill for KW power	25 years
Consumption for 1 year at above rates	525,048.5 kWh
Estimated escalation on utility unit charge per year 3 %	
Net Asset Block	₹25,92,000.00

TECHNICAL

Total Roof Area	4320 sqft
PV System Area	2592 sq ft
System Size	36 kW
Number of Panels	144
Electricity Output	525,048.5 kWh
PV System Roof Usage	60 %

ENVIRONMENT

Carbon Footprint	36.75 tonns / year
Trees Planted	856 Trees

YOUR CUSTOMIZED SYSTEM

₹25.92 Lacs
Cost to Owner

₹1.86 Lacs
Yearly Revenue

36 KW
System Size

856 Trees
No. of equivalent trees planted

5 years
Payback Period

DISCLAIMER:

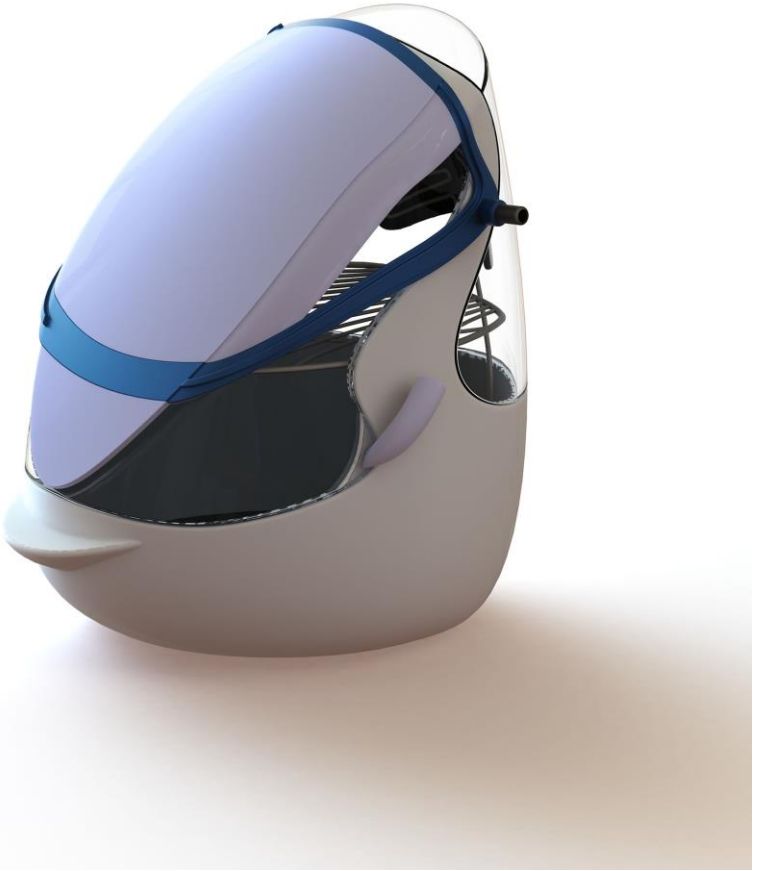
Please note that SunGanak is not a substitute for an on-site assessment by a solar installer, as some specific features, site conditions, Technical limitations, and financial factors might not be accounted for in this tool.

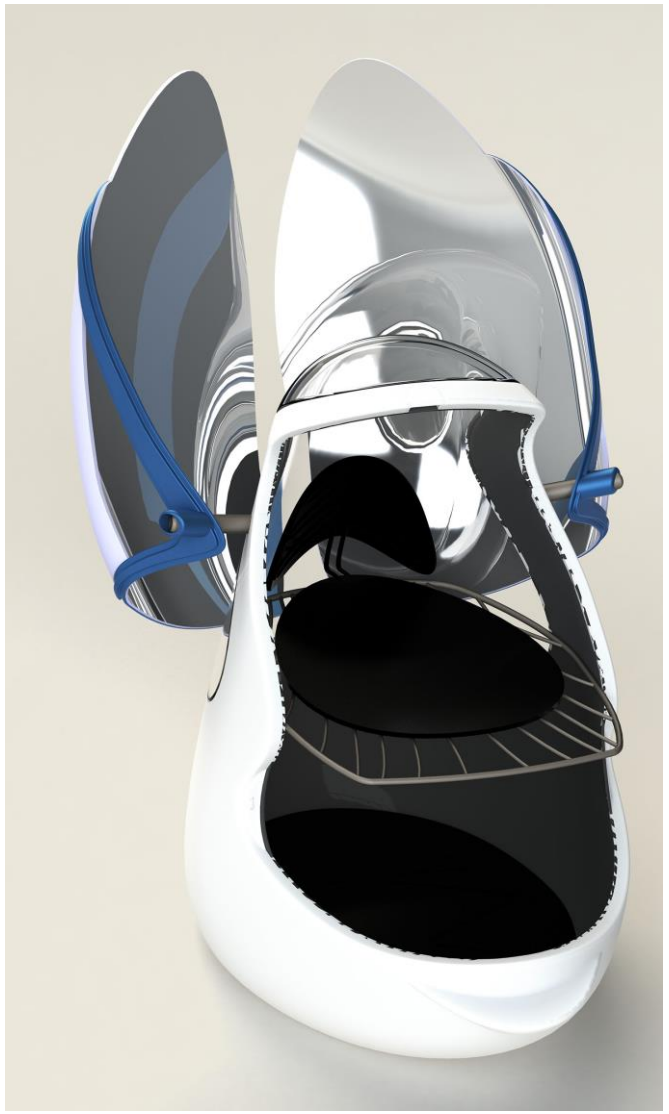
Payback Report

FINANCIAL ANALYSIS AND PAYBACK TABLE

Financial Analysis on ROI Basis		
Estimated cost/ Unit paid to Utility company for commercial tarrif		₹ 10
Generation / annum		42,192.22 kWh
Utility bill for kWh energy Consumption for I year at above rates	28.93 kW	421,922.2 ₹
Estimated escalation on utility unit charge per year (%)	%	-
Net Investment		₹ 20,82,960.00

Year I	Effective Cost/Unit	Solar Power Loss Factor	Savings / Annum	Net Investment
1st Year	₹ 10	42,192 kWh	₹ 4,21,922.20	₹ 16,61,037.80
2nd Year	₹ 10.3	41,770 kWh	₹ 4,30,234.07	₹ 12,30,803.73
3rd Year	₹ 10.61	41,353 kWh	₹ 4,38,709.68	₹ 7,92,094.05
4th Year	₹ 10.93	40,939 kWh	₹ 4,47,352.26	₹ 3,44,741.80
5th Year	₹ 11.26	40,530 kWh	₹ 4,56,165.10	₹ -1,11,424.30
6th Year	₹ 11.59	40,124 kWh	₹ 4,65,151.55	₹ -5,76,575.85
7th Year	₹ 11.94	39,723 kWh	₹ 4,74,315.04	₹ -10,50,890.89
8th Year	₹ 12.3	39,326 kWh	₹ 4,83,659.04	₹ -15,34,549.93
9th Year	₹ 12.67	38,933 kWh	₹ 4,93,187.13	₹ -20,27,737.06
10th Year	₹ 13.05	38,543 kWh	₹ 5,02,902.91	₹ -25,30,639.97





Solar Cooker: Idea and Opportunities

ARIST : Ariel Reporting, Information with Solar Tracking. **The Satellite Solution**

- Right design
- Monitoring of Project, estimated hourly projection
- Performance Ratio
- Sub-station management and communication
- Diagnostic and Alert protocols
  - to ensure energy production reaches the goals
  - sell electricity at the feed-in-tariff so as to pay back the debt contracted to finance the PV system.

Solar Forest: Art Deco

Green dot Award Project : 2013

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New Milestones and renewed Aspiration

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