

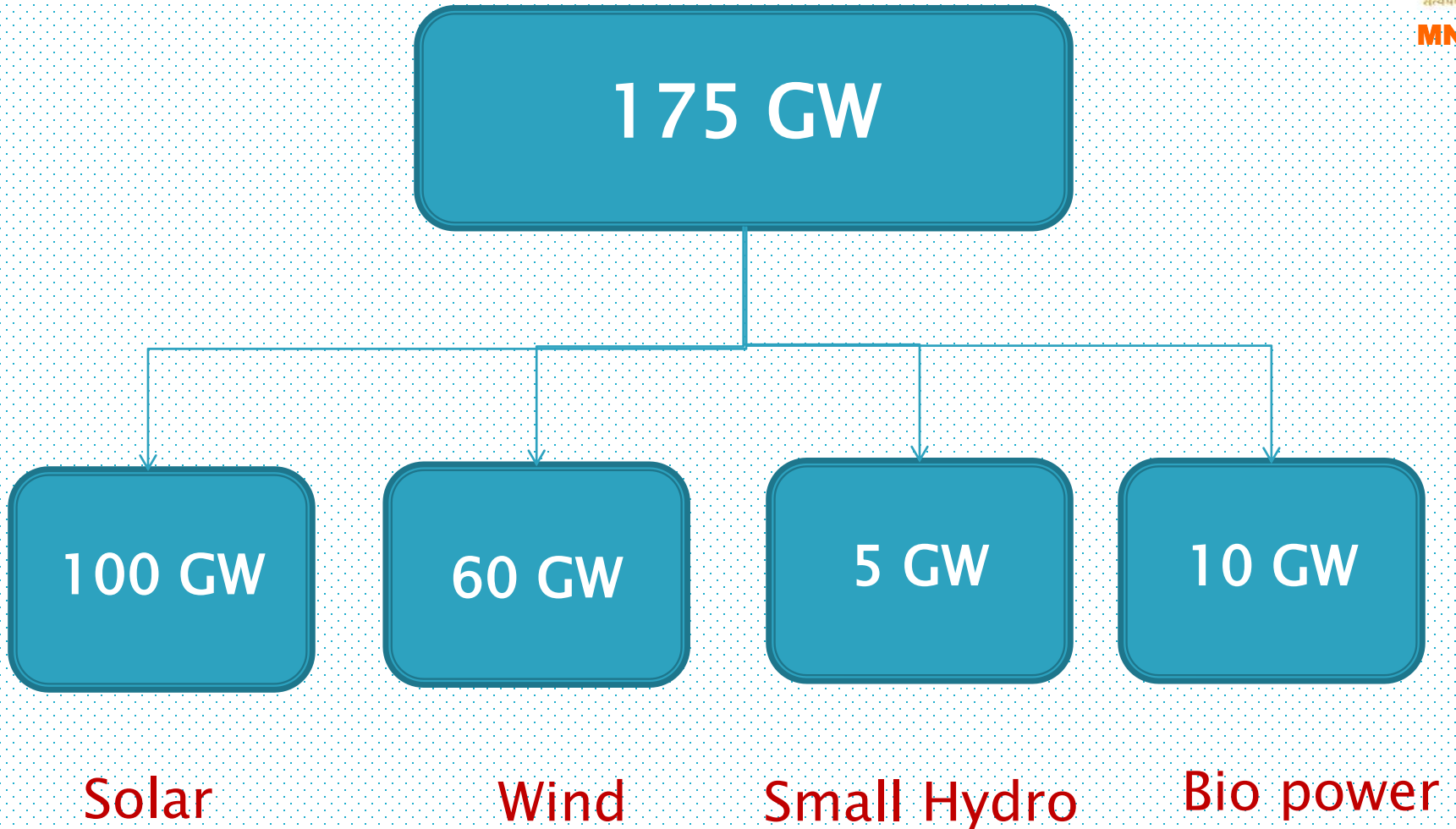


# Workshop on Smart Cities Mission

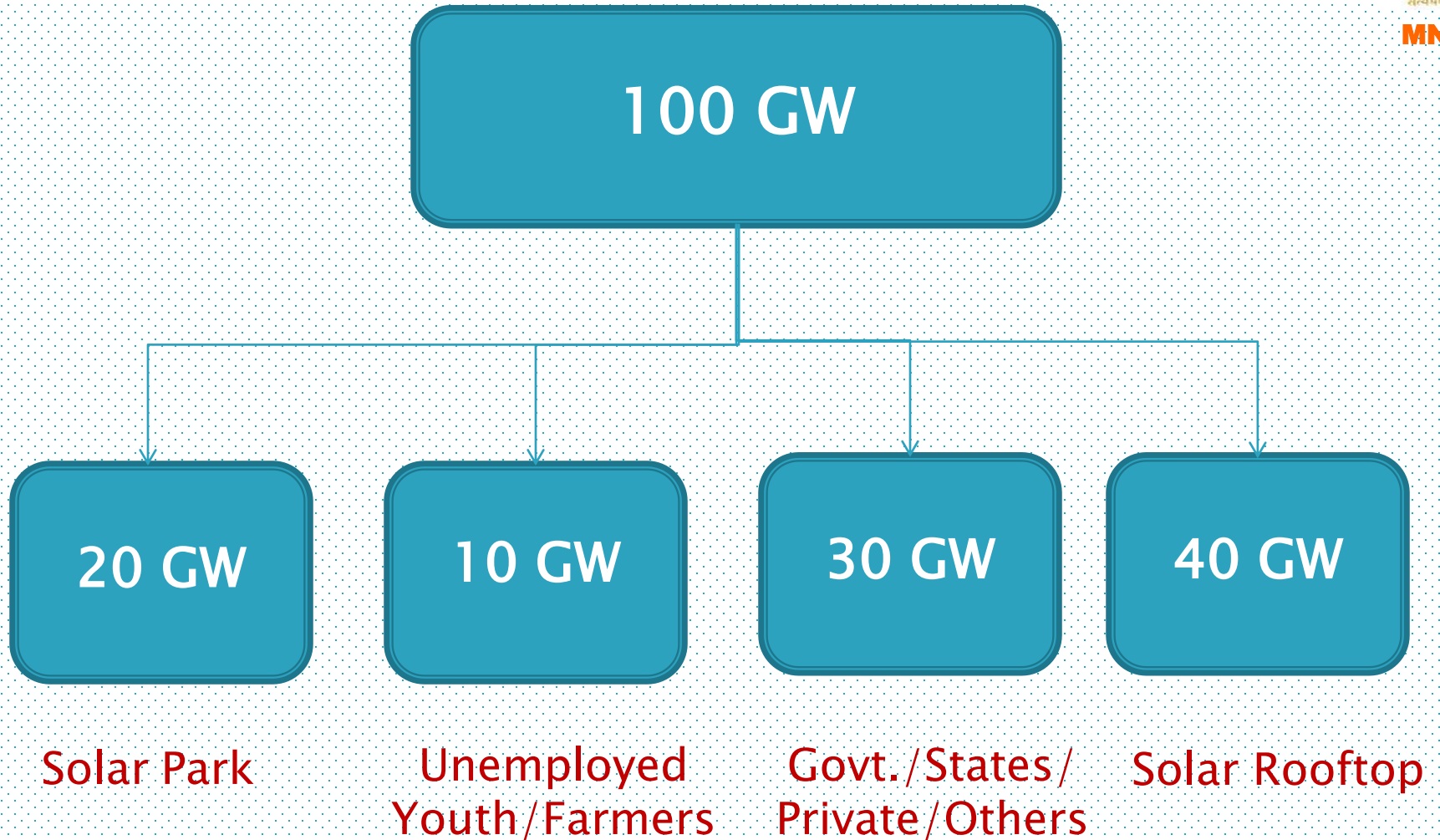
22<sup>nd</sup> February, 2016

Government of India  
Ministry of New and Renewable Energy

# Road Map for Renewable Power by 2022



# Road Map for Solar Power by 2022



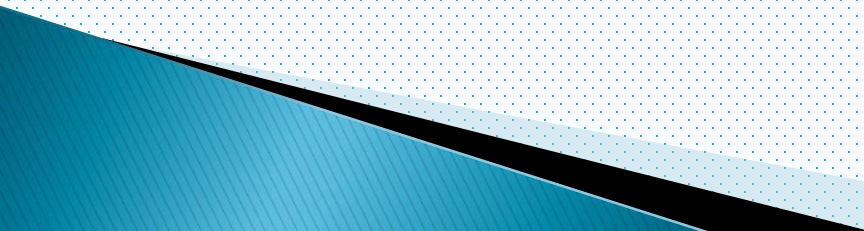
# Renewable Energy in Smart Cities

- ▶ Hon'ble Prime Minister's vision of making 100 Smart Cities with emphasis on–
  - **Smart Energy**
    - Co-generation & **Renewable Energy Generation**
    - Smart Meters, demand response
    - Assured electricity supply
  - **Smart Waste Management**
    - **Treatment using waste to energy technologies**
  - **Smart Building**
    - Green buildings with application of **renewables**
  - **Sustainable Environment**

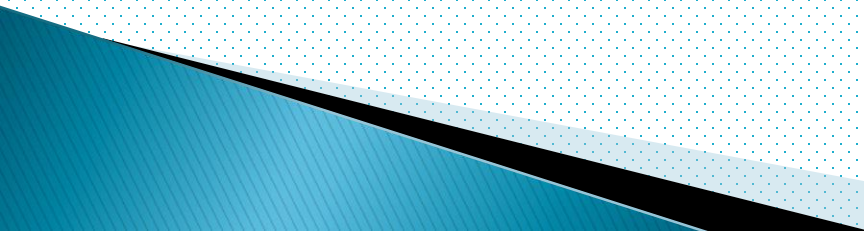
# Renewable Energy for Smart Cities

- ▶ The Smart City guidelines provide that **10% of the Smart City's energy requirement is to come from solar**
- ▶ India imports nearly 80% of its crude oil consumption, 15% of its coal consumption and 35% of its natural gas consumption
- ▶ 75% of Greenhouse gas emissions are produced in Cities & Communities
- ▶ Potential Answer to above challenge–
  - **Dovetail Renewable Energy with Conventional Energy in a big way for all Smart Cities**

# Renewable Energy Applications for Smart Cities –I

- ▶ Renewable power supply to Smart Cities through installation of solar and wind power plants within or outside cities
  - ▶ Solar rooftops in residential, industrial, commercial, institutional buildings including Airports, Ports, Railways stations, Metro Rails, Stadia etc.
  - ▶ Solar water heaters
  - ▶ Solar concentrators for process heat/cooking applications
- 

# Renewable Energy Applications for Smart Cities-II

- ▶ Methane recovery based sewage treatment plants
  - ▶ Solar pumps for water pumping applications
  - ▶ Street lights through solar power plants
  - ▶ Development of green campuses
  - ▶ Solar traffic signals, road studs, blinkers
  - ▶ Solar based advertisement hoardings
  - ▶ Waste to energy technology for treatment for municipal solid waste
  - ▶ Construction of green buildings
  - ▶ Solar Parking shed
- 

# Grid-connected SPV Rooftop systems

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- Grid-Connected SPV Rooftop systems are installed on rooftops of residential, commercial or industrial premises.
- Electricity generated could be fed into the grid or used for self consumption through net-metering/feed-in-tariff. 26 States have already notified regulations for net-metering.
- 40,000 MWp planned by 2022 of which 10,000 MWp during 2015-16, to 2017-18.
- The CFA to be provided through direct subsidy (30%) or equivalent interest subvention through banks.



# Advantages of solar rooftops

- ▶ Savings in transmission and distribution losses
- ▶ Low gestation time
- ▶ No requirement of additional land
- ▶ Improvement of tail-end grid voltages and reduction in system congestion with higher self-consumption of solar electricity
- ▶ Local employment generation
- ▶ Reduction of power bill by supplying surplus electricity to local electricity supplier
- ▶ Battery elimination makes easy installation and reduced cost of system



# Requirements for solar rooftops

- ▶ About 10 sq.m area per kWp capacity
- ▶ Cost about Rs.75,000 per kWp
- ▶ The roof should be shadow free and south facing
- ▶ Can be installed in slanting, plain and curved roofs
- ▶ Regulation of SERC, State policy and DISCOMs cooperation for grid connectivity
- ▶ Smart meters in the distribution network

# Economics of rooftop system

- ▶ Initial cost Rs.75,000 per kWp
- ▶ Cost of electricity generation Rs.6.00 per kWh
- ▶ Cost of generation with 30% subsidy of MNRE is about Rs.4.50 to Rs.5.00 per kWh
- ▶ Most of commercial, industrial and Government establishments pay about Rs.8–10 per kWh
- ▶ Hence the solar rooftop is economically viable

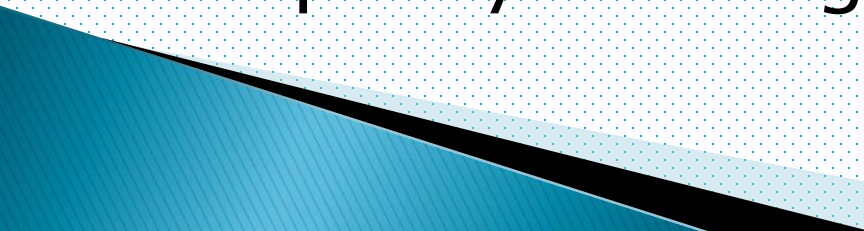
# Urban Local Bodies need to help by

- ▶ Promoting green buildings
- ▶ **Issuing Governments orders to make solar rooftop mandatory in building bye-laws.**
- ▶ Buildings owned by ULBs/Government must have solar rooftops
- ▶ Provide rebate on property tax.
- ▶ Publicity and motivation
- ▶ Discourage diesel based power generation
- ▶ Use waste to energy technologies for treatment of MSW and methane generation based sewage treatment

# Waste to Energy Technologies

- ▶ MoUD is providing 20 % VGF on waste to energy projects
- ▶ MNRE provides Rs. 2.0Crore /MW VGF upto Rs. 5.0 Crore
- ▶ Existing technology options include
  - Incineration of MSW
  - Conversion of MSW to RDF
  - Bio-methanation of segregated / concentrated organic waste to produce
    - Power/coking fuel
    - Organic manure /PROM
- ▶ MNRE is willing to assist pilots of new technologies
- ▶ Creation of model bidding documents in association with MoUD/MoEFCC

# What MNRE can do?

- ▶ Potential assessment for rooftop installations using GIS techniques
  - ▶ Preparation of Master Plans for renewable applications in cities
  - ▶ Remaining Smart Cities can be covered under solar city programme
  - ▶ Central Financial Assistance of RE projects
  - ▶ Consultants / hand holding
  - ▶ Publicity / awareness / workshops
  - ▶ Capacity building
- 



# 1.0 MW Rooftop plant at Punjab Engineering College, Chandigarh





# 495 kW Rooftop plant at Govt. College for Girls, Sector – 11, Chandigarh





# Largest rooftop plant in the world on single roof\*



- 12.40 MW plant installed by Larsen & Toubro and Tata Power on a single roof.
- Power from the plant being fed to the local grid through a PPA signed with the state distribution company
- Total installed capacity in the campus is 19.5 MW
- \* Claims L&T



# 150 kWp solar rooftop on a Curved Roof in a Metro Station in Faridabad





# Solar Parking Sheds



Module	India Make
Plant Capacity	500 kWp
Rooftop Owner	Medanta Hospital
City	Gurgaon
State	Haryana
Project Cost	Rs. 4.15 Cr
CFA through SECI	Rs. 1.24 Cr





**COCHIN INTERNATIONAL AIRPORT LTD.**

## **12 MW<sub>p</sub> SOLAR PV PLANT**





# Solar Water Heaters

Park Sheraton, Chennai(40,000 liter/day)



Sheraton Chola, Chennai (10,000 liter/day)



The Taj Ambassador, Delhi (7000 LPD)





# Solar Steam Based cooking sytem at Shridi





# Solar Steam Generation System at ITC Hotel, New Delhi





Module	India Make
Aggregate Plant Capacity	404 kWp
Rooftop Owner	Manipal University
City	Jaipur
State	Rajasthan
Project Cost	Rs. 2.86 Cr
CFA through SECI	Rs. 86 Lakh





Module	India Make
Plant Capacity	115 kWp/85 kWp
Rooftop Owner	DMRC
Project Site	Anand Vihar/Pragati Maidan
City	Delhi





Module	India Make
Plant Capacity	130 kWp
Rooftop Owner	ISBT Kashmere Gate
City	Delhi
State	Delhi
Project Cost	Rs. 114.3 Lakhs
CFA through SECI	Rs. 30.3 Lakhs







Module	India Make
Plant Capacity	360 kWp
Rooftop Owner	Super Auto Forge Pvt., Ltd.,
City	Chennai
State	Tamilnadu
Project Cost	Rs. 3.06 Cr
CFA through SECI	Rs. 92 lacs

