AMARAVATI
DEEP DIVE WORKSHOP

14, 15 DECEMBER 2017
THE GATEWAY HOTEL, VIJAYAWADA

Liveability | Economic Powerhouse
Infrastructure | Governance

Infrastructure – Power and Renewables

Introduction

- Agenda and target discussion
- Panelists
- Background and current status
- Discussion

Agenda and Target Discussion

- Identify how to make energy infrastructure
  - Reliable
  - Smart
  - Sustainable
  - Align with Project Vision and India's international climate commitments

- What works, what do we need to watch for
  - Energy sources: traditional and renewable
  - Energy distribution and resilience
  - New technologies
  - Waste management and impact on energy, environment and flooding
  - Metrics and policies to succeed

The Panel

To reconnoiter the opportunities available in the world for renewable energies to incorporate in the Capital City's plan and to reduce the city's carbon footprint. The government intends to make a conscious effort to contribute towards India's stand on the climate change and support in achieving the national target on the use of renewable energy.

Milan Marinkovic , Power Expert CH2M
Over 30 years of experience working in the power industry sector with extensive experience working in large urban development projects.

Christopher Trott, Head of Sustainability, Foster+Partners
Extensive experience of bringing sustainability to design through highly integrated multidisciplinary collaboration.

Sambasiva Rao, Rtd.SE, APTRANSCO
Government veteran with extensive experience in power sector through his work with APTRANSCO.

Mr. Sethuraman Ganesan, Technology Manager, ABB
Over 30 years experience in powergrid division in the US and Middle East ABB- Leading Electrical systems provider in the world

Background

Main components of Smart Power Supply Infrastructure are:

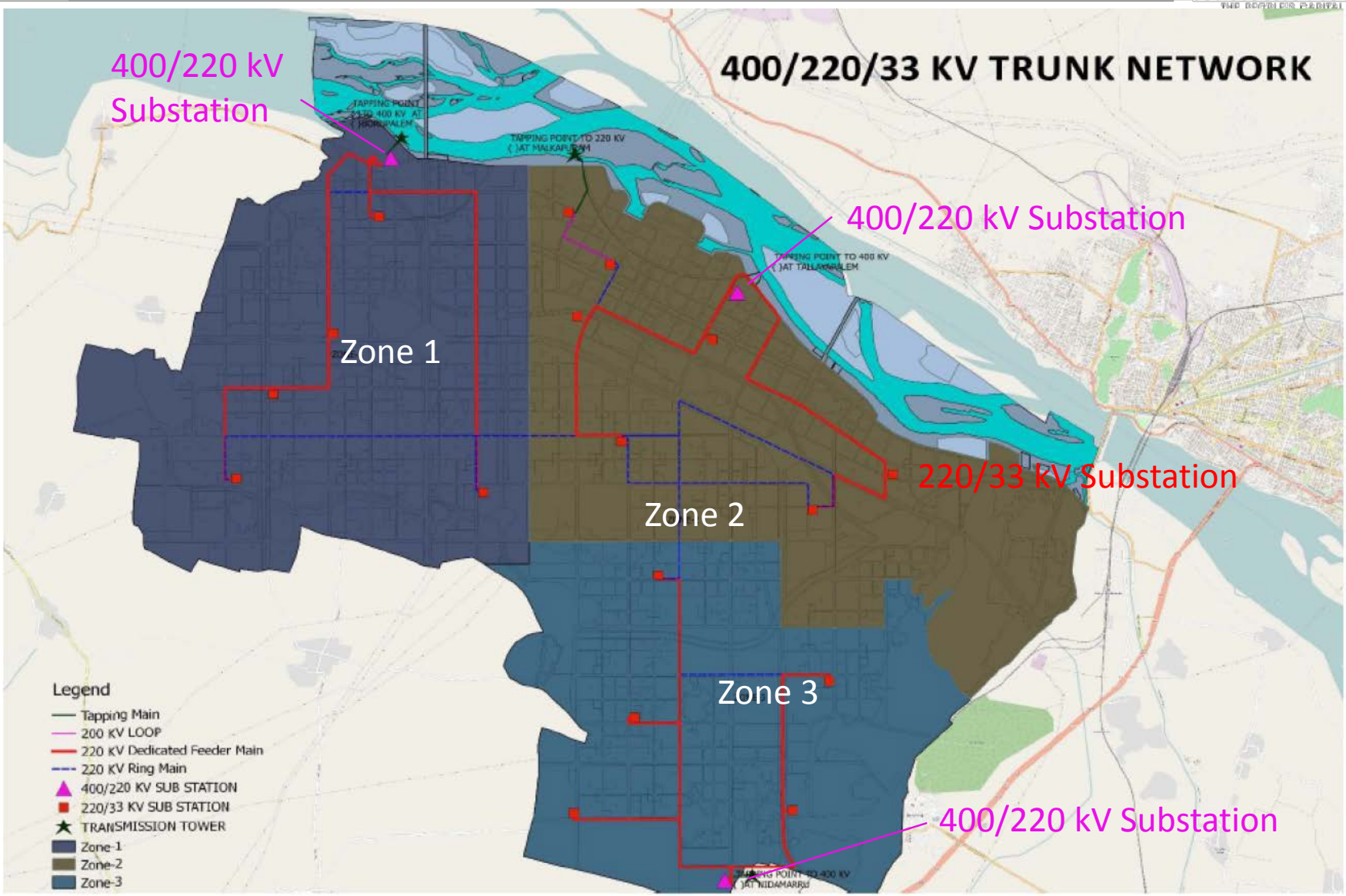
- Transmission & Distribution of power to Amaravati, smart capital city of AP
- 400KV/220KV & 220/33KV Gas Insulated Substations
- 33KV Gas Insulated Switch Gear Distribution centers (33KV Switching Stations)
- Compact Substations
- Smart Grid
- Supervisory Controls and Data Acquisition (SCADA)
- Micro control stations (Micro Grid)
- Transmission of Power through Underground Cables
- Smart Energy efficient street lighting
- Renewable Solar Energy
- Smart Net Energy Metering
- Energy Efficient Street Lighting

Background

Objectives of the project are:

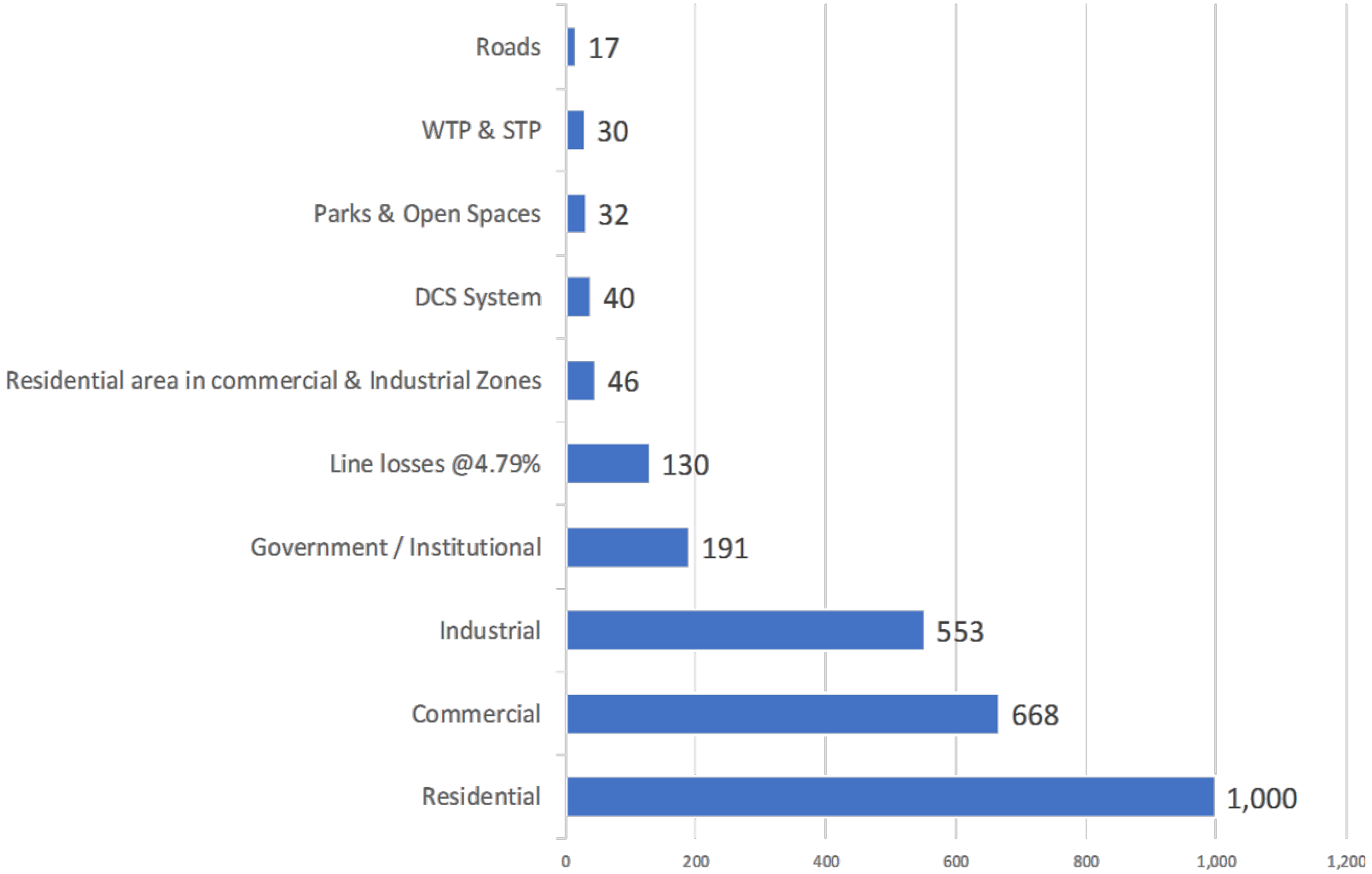
- Real time Energy monitoring and Energy Audit
- Reducing Power losses (AT&C) to most minimum level.
- Uninterrupted 24x7 reliable Power supply with Redundancy at all levels up to end consumer.
- Underground cabling for transmission & Distribution of Power
- Smart Energy Metering Infrastructure
- Distributed Renewable Solar Energy
- Distribution Automation

Background


400/220/33 KV TRUNK NETWORK
400/220 kV Substation
400/220 kV Substation
400/220 kV Substation
220/33 kV Substation
Zone 1
Zone 2
Zone 3
Legend
Tapping Main
200 KV LOOP
220 KV Dedicated Feeder Main
220 KV Ring Main
400/220 KV SUB STATION
220/33 KV SUB STATION
TRANSMISSION TOWER
Zone-1
Zone-2
Zone-3

Background

2,706 MW: Power Demand, 2050



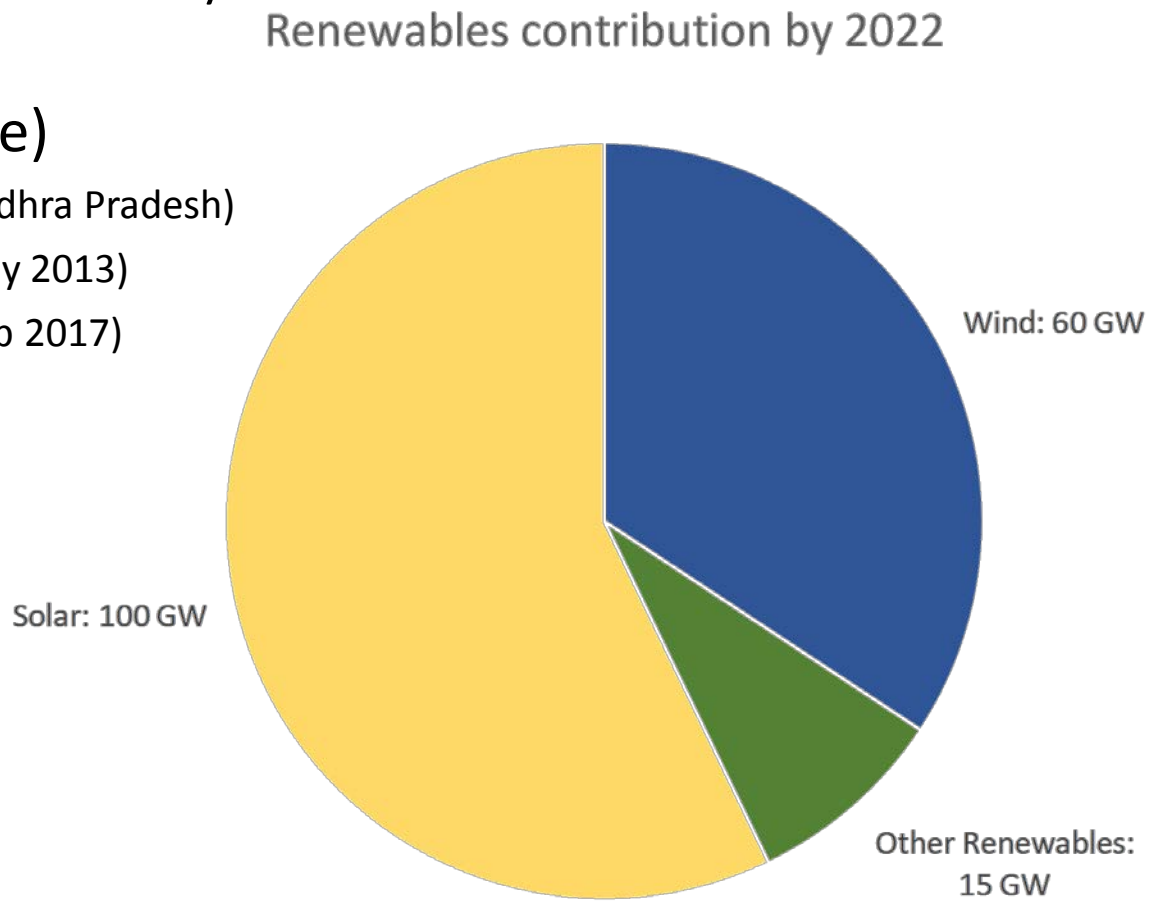
Background

India's Paris Agreement Commitment:

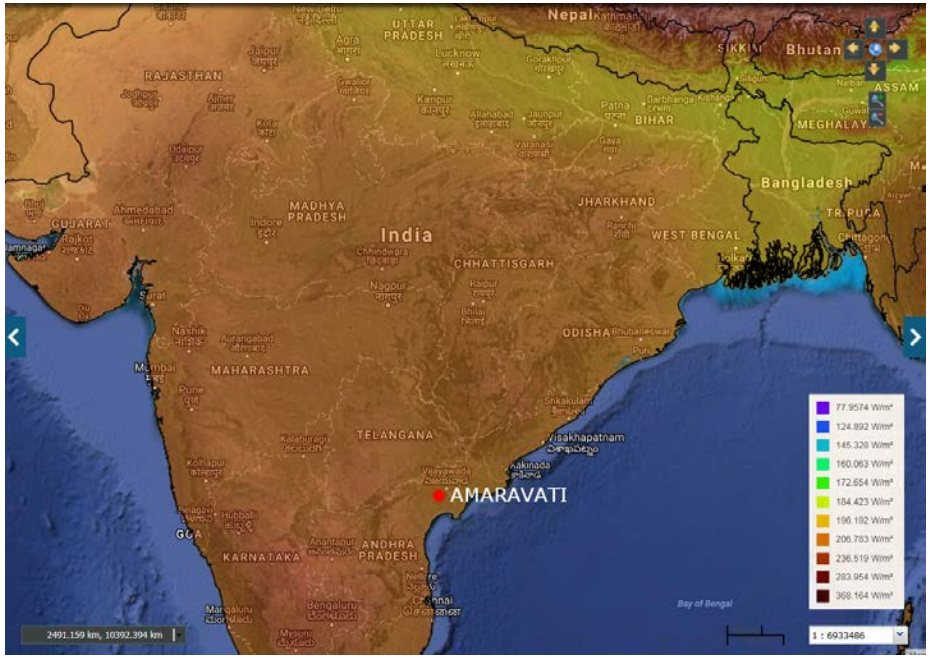
- 40% generation capacity from non-fossil fuel by 2030
- 33-35% reduction in emissions intensity

Cost to produce (utility scale)

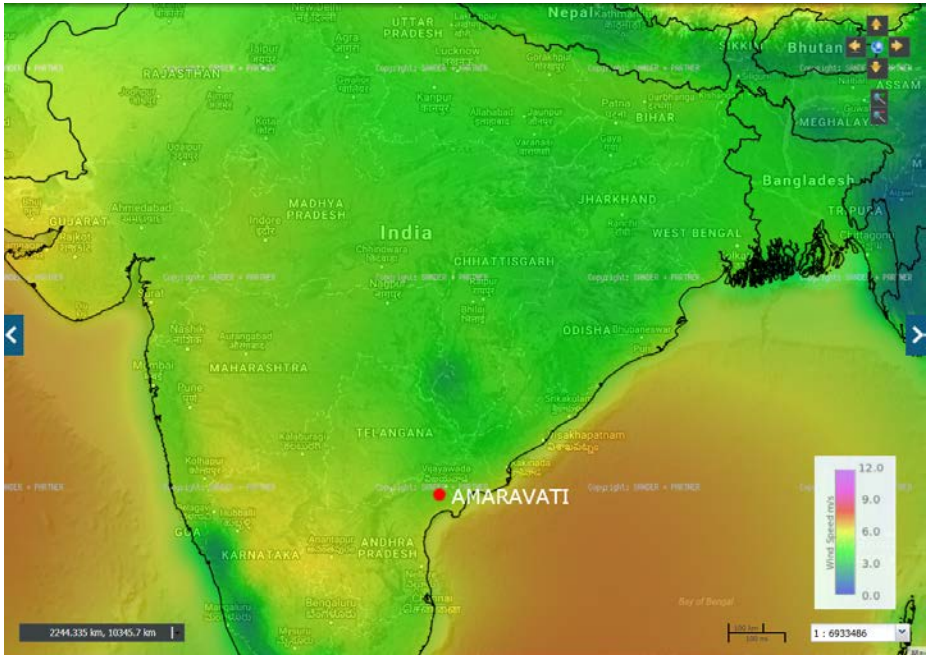
- Coal: Rs 5.57-20.57/kWh (Andhra Pradesh)
- Solar: Rs 2.62/kWh (May 2013)
- Wind: Rs 3.46/kWh (Feb 2017)



Background



Solar: c. 1,100 Wp/m² (excellent)



Wind: c. 5 m/s average (good)

Images courtesy Global Atlas for Renewable Energy, OpenStreetMap, 3-Tier & Sander+Partner

Background

Theoretical Contribution from Rooftop Solar

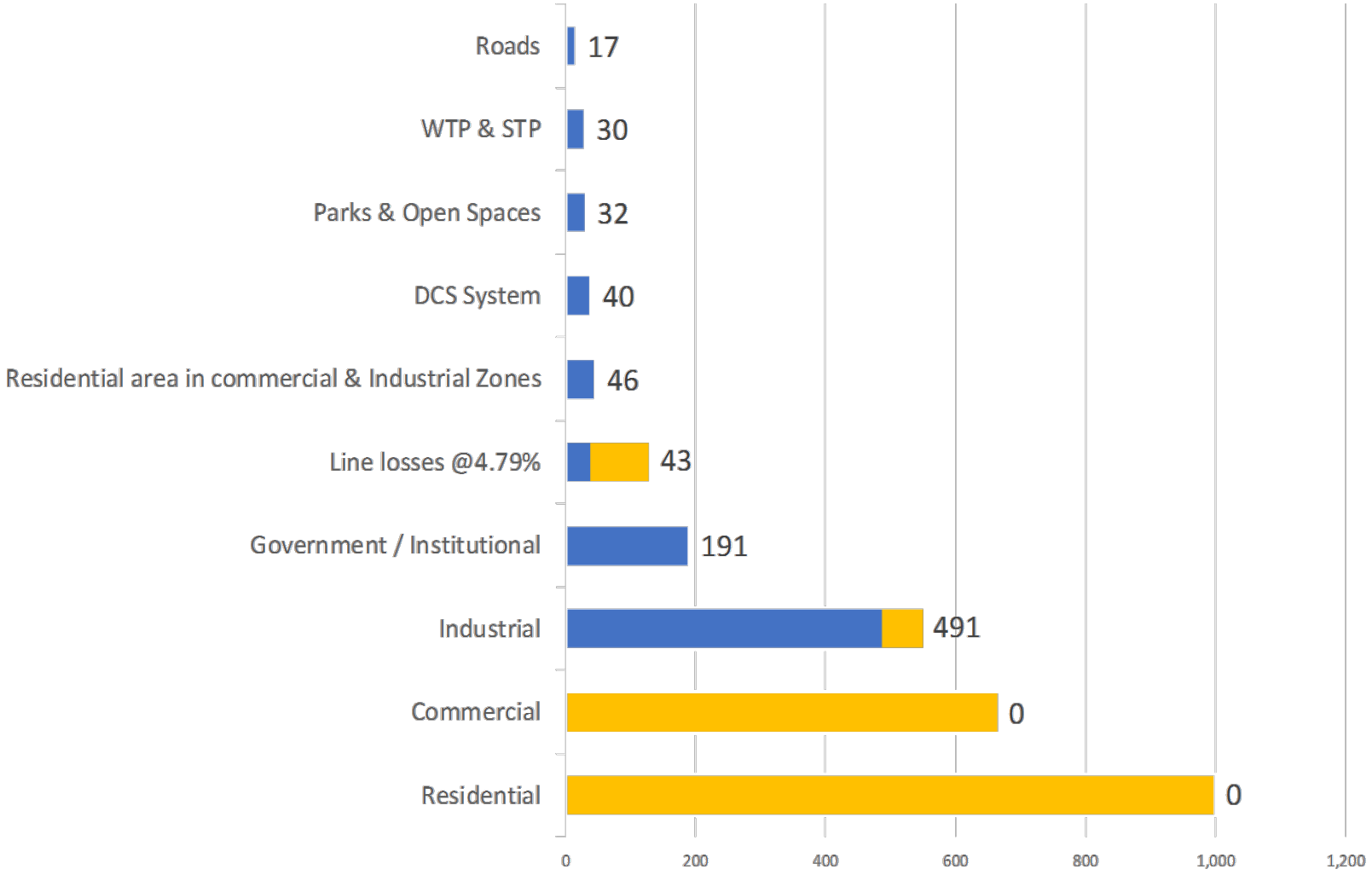
- Assessed potential: 1,800 MWp
- Approximate yield: 2,700 GWh (MU)
- Energy to be distributed: 21,600 – 2,700 = 18,900 GWh (MU)

Benefits

- Help meet national commitments
- Air quality
- Health
- GDP – World Bank estimates India lost 8.5% GDP in 2013 due to air pollution
- Potential infrastructure savings

Background

890 MW: Power Demand with 1,816 MW rooftop solar, 2050



Other Trends

- Sharing economy
- Smart and micro grids
  - power available where you need it
  - resilience
  - load lopping
- Sizing infrastructure
  - Size for efficient consumption
  - Electric vehicles need charging, offer storage
- Waste management – reduces litter reduces flooding

Suggested Key Performance Indicators

Metric	Target	Source
Emissions intensity of the city $kgCO_{2e}$/capita	To be calculated	SDG 9.4.1 Base numerical target on carbon budget for 2°C?
Energy intensity of the city kWh/capita	To be calculated	SDG 7.3.1
Renewable energy as percentage of total consumption (2030 / 2050)	40% / 65%	SDG 7.2.1 India's NDCs Theoretical maximum rooftop solar contribution
Grid reliability	99.5%	44 hours a year without power
Recycling rate	70%	SDG 12.5.1

Panel Discussion