PERSPECTIVE ON RENEWABLE ENERGY TARGETS OF INDIA

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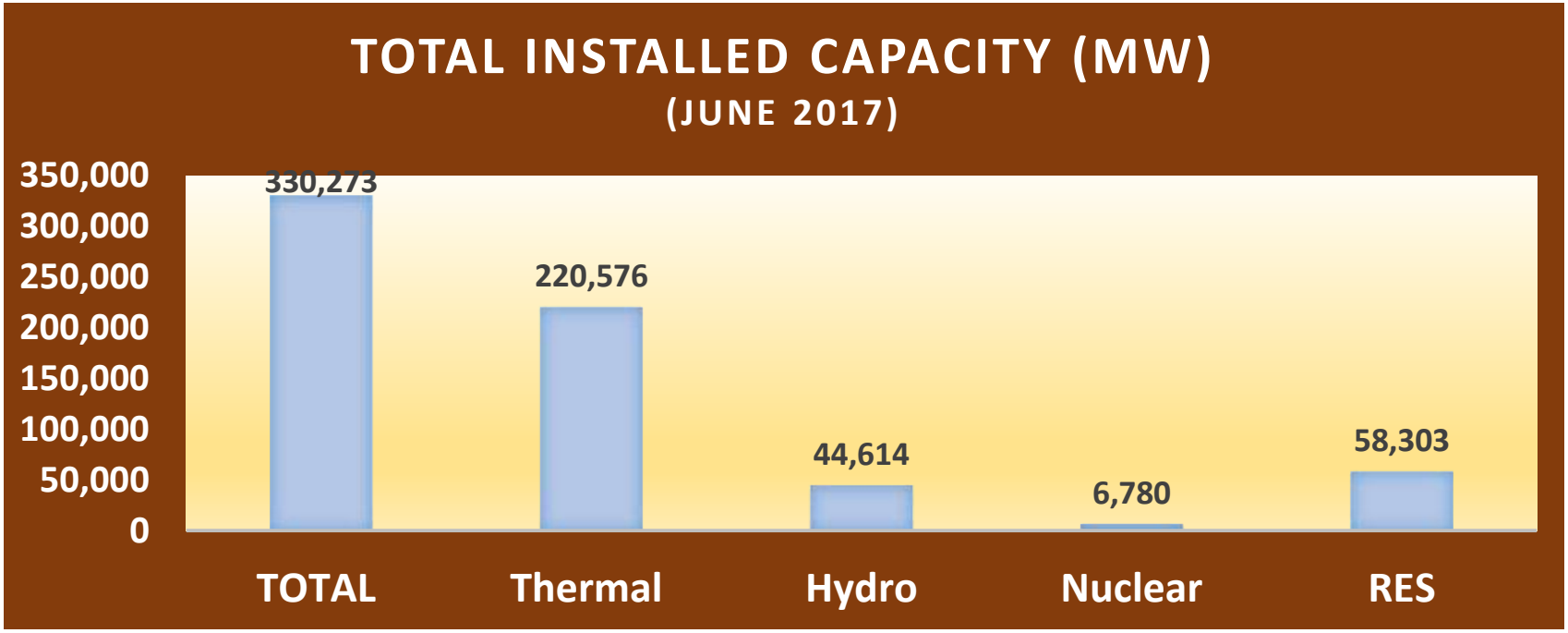
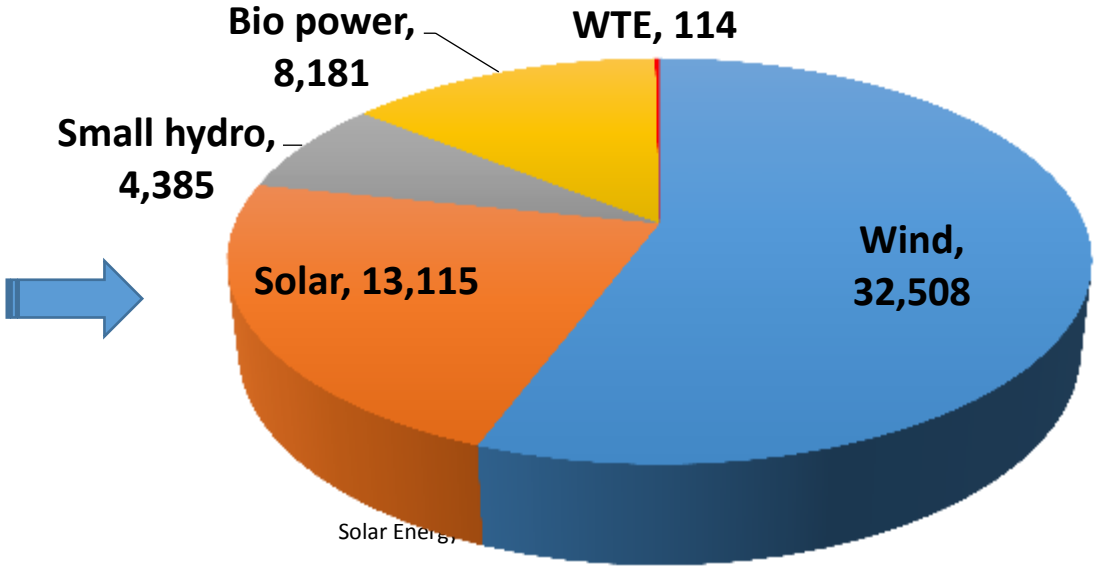
8th WORLD RENEWABLE ENERGY TECHNOLOGY CONGRESS-2017
21 August 2017

POWER GENERATION CAPACITY - INDIA



Renewable Energy Capacity



INDIA:
Scaled up Targets of Renewable Energy

- **Grid connected Renewable Power: 175 GW by 2022, comprising**
  - **Solar Power : 1,00,000 MW**
    (60,000 MW – Ground mounted, 40,000 MW – Roof top)
  - **Wind Power : 60,000 MW**
  - **Biomass Power : 10,000 MW**
  - **Small Hydro Power : 5,000 MW**
- **Total estimated potential is about 900 GW with about 748 GW of Solar and 102 GW of Wind.**
- **Solar capacity is rising exponentially and has crossed 13,500 MW.**

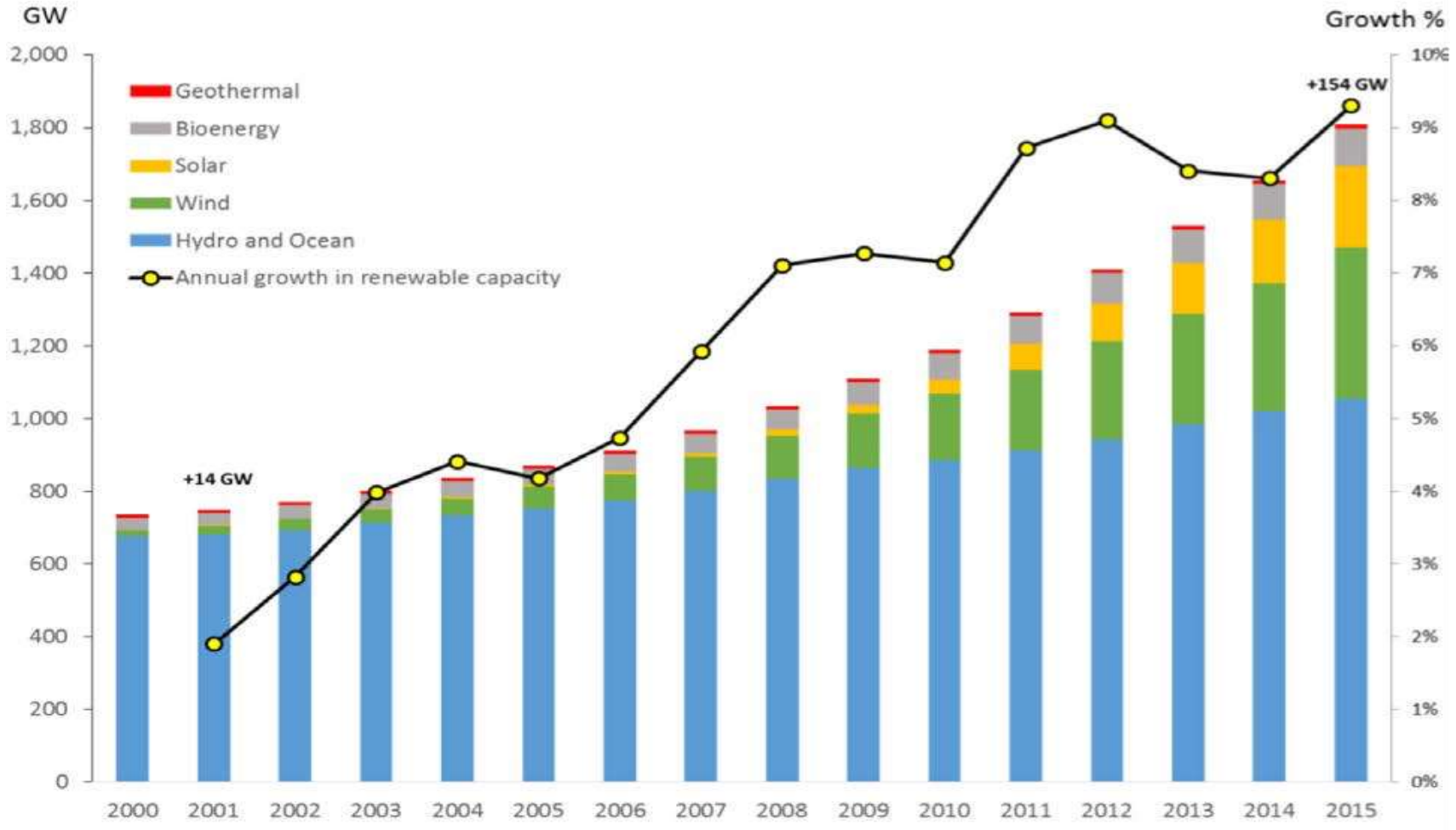
State-wise Targets

State/UTs	Solar Power (MW)	Wind (MW)	SHP (MW)	Biomass Power (MW)	Total
Andhra Pradesh	9834	8100		543	18477
Arunachal Pradesh	39		500		539
Assam	663		25		688
Bihar	2493		25	244	2762
Chandigarh	153				153
Chhattisgarh	1783		25		1808
D. & N. Haveli	449				449
Daman & Diu	199				199
Delhi	2762				2762
Goa	358				358
Gujarat	8020	8800	25	288	17133
Haryana	4142		25	209	4376
Himachal Pradesh	776		1500		2276
Jammu & Kashmir	1155		150		1305
Jharkhand	1995		10		2005
Karnataka	5697	6200	1500	1420	14817
Kerala	1870		100		1970
Madhya Pradesh	5675	6200	25	118	12018

State – wise Targets (CONTD.)

State/UTs	Solar Power (MW)	Wind (MW)	SHP (MW)	Biomass Power (MW)	Total
Maharashtra	11926	7600	50	2469	22045
Manipur	105				105
Meghalaya	161		50		211
Nagaland	61		15		76
Orissa	2377				2377
Puducherry	246				246
Punjab	4772		50	244	5066
Rajasthan	5762	8600			14362
Sikkim	36		50		86
Tamil Nadu	8884	11900	75	649	21508
Telangana		2000			2000
Tripura	105				105
Uttar Pradesh	10697		25	3499	14221
Uttrakhand	900		700	197	1797
West Bengal	5336		50		5386

GLOBAL SCENARIO:
Growth year-on year basis has been ramping up



Contributions from wind and solar are increasing rapidly over last couple of years.

GLOBAL SCENARIO:

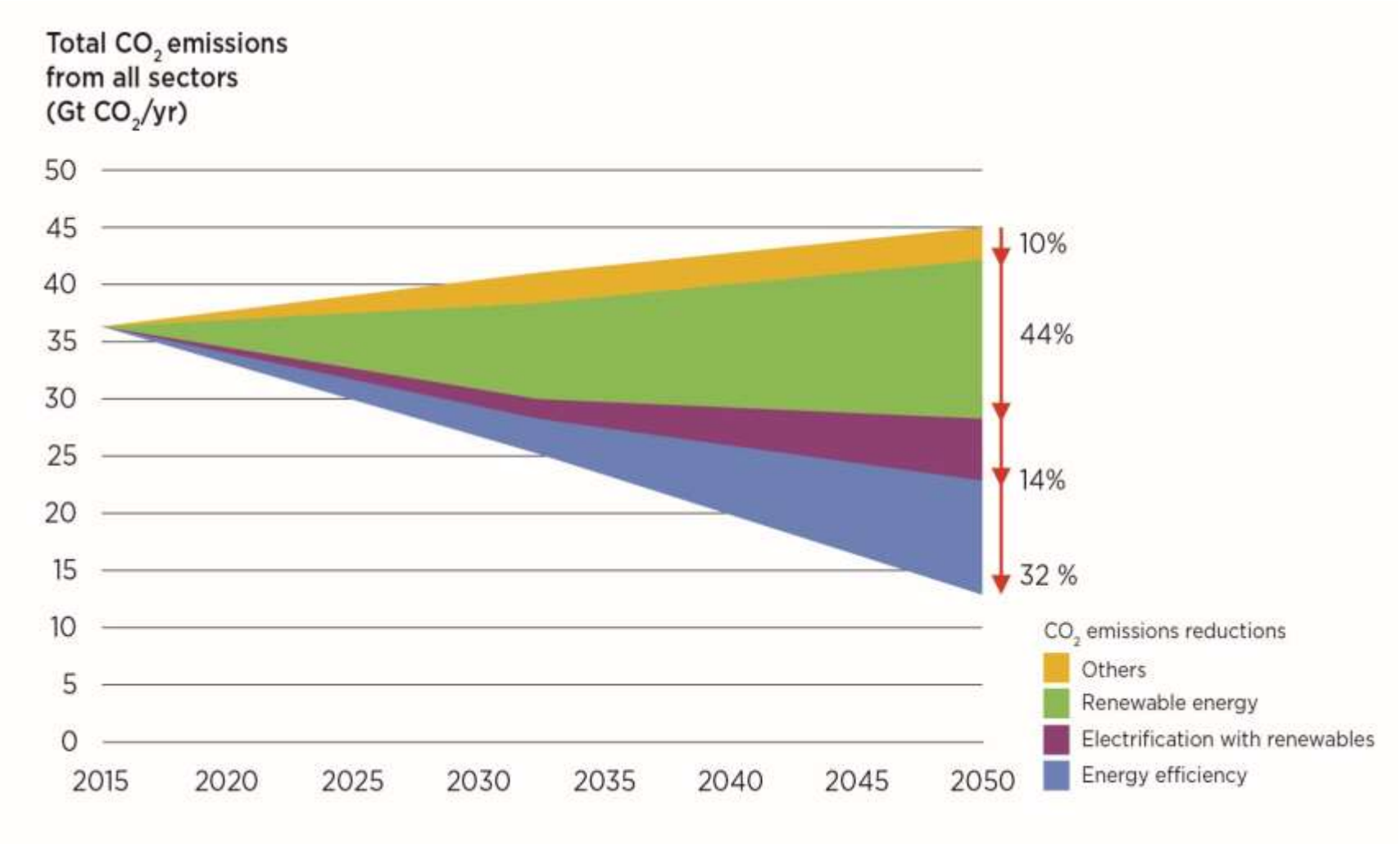
REGION-WISE WIND/SOLAR/BIO ENERGY CAPACITY (MW)

Region	Total	Wind	Solar	Bio Energy
Africa	38,192	3,726	2,920	1,018
Asia	8,11,590	1,84,489	1,39,321	35,249
Central America plus Carib	13,266	1,499	1,076	2,401
Eurasia	91,202	5,427	947	1,803
Europe	4,86,693	1,55,350	1,04,471	36,953
Middle East	16,640	319	1,449	80
North America	3,29,703	96,739	37,824	14,699
Ocenaia	25,998	5,069	5,744	1,025
South America	1,93,118	13,888	1,911	16,504
TOTAL	**20,06,402**	**4,66,506**	**2,95,663**	**1,09,732**

Renewables account for more than half of annual power generation GLOBAL capacity additions since 2012.

IRENA REPORT opines:

Renewables would account for half of total emission reductions in 2050.



State-wise Status of Solar Power installed Capacity: 31-03-2017 (top ten States)

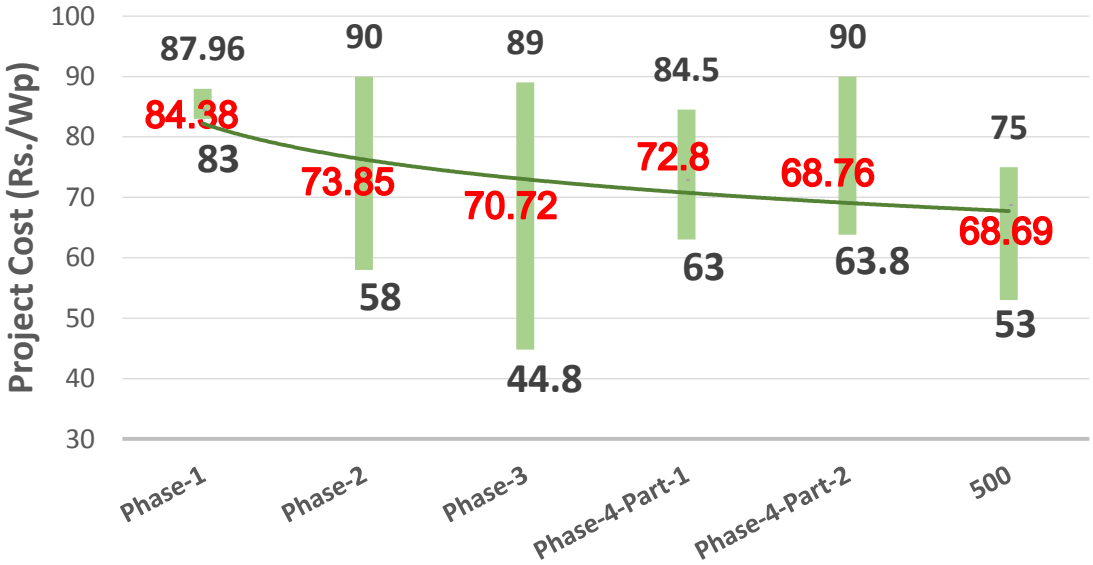
Sr. No.	State/UT	Total cumulative capacity till 31-03-16 (MW)	Capacity commissioned in 2016-17 (MW)	Total cumulative Capacity till 31-03-2017 (MW)
1	Andhra Pradesh	572.97	1294.26	1867.23
2	Rajasthan	1269.93	543.00	1812.93
3	Tamil Nadu	1061.82	630.01	1691.83
4	Telangana	527.84	759.13	1286.98
5	Gujarat	1119.17	130.19	1249.37
6	Karnataka	145.46	882.38	1027.84
7	Madhya Pradesh	776.37	80.67	857.04
8	Punjab	405.06	388.89	793.95
9	Maharashtra	385.76	66.61	452.37
10	Uttar Pradesh	143.50	193.24	336.73

MNRE Schemes

- **VGF Schemes under JNNSM Phase II**
  - **750 MW scheme**: 680 MW commissioned
  - **2000 MW scheme**: RfS for 2425 MW; PPA for 2295 MW. Projects under execution.
  - **5000 MW scheme**: RfS for 2900 MW; PPA for 970 MW. Projects under execution. Record low tariff of Rs. 2.44 per kWh discovered.
  - **Indo-Pak Border Solarization Scheme**: 5 MW commissioned
  - **100 MW Canal-top and Canal-bank Scheme;**
  - **300 MW scheme for Defence /Para military forces;**
  - **1000 MW scheme for CPSUs**
- **Grid connected Rooftop Schemes**: around 2000 MW has been sanctioned
- **20,000 MW Solar Parks Scheme**: 34 solar parks in 21 States; additional 20000 MW solar Parks scheme approved.
- **1000 MW scheme for Wind power plants: R**ecord-low tariff of Rs. 3.46/ kWh discovered. Another NIT for 1000 MW brought out.

Rooftop Solar Systems

- Pilot scheme was implemented in “city specific: mode, through competitive bidding in 2013.
  - 26.6 MWp scheme - Year 2013
  - 50 MWp scheme - Years 2014 & 2015
  - 50 MWp scheme for CPWD - Year 2015-16
  - 500 MWp for residential and not for profit institutions – Year 2016
  - 500 MWp for Government buildings – Year 2017
- About 100 MW capacity installed.

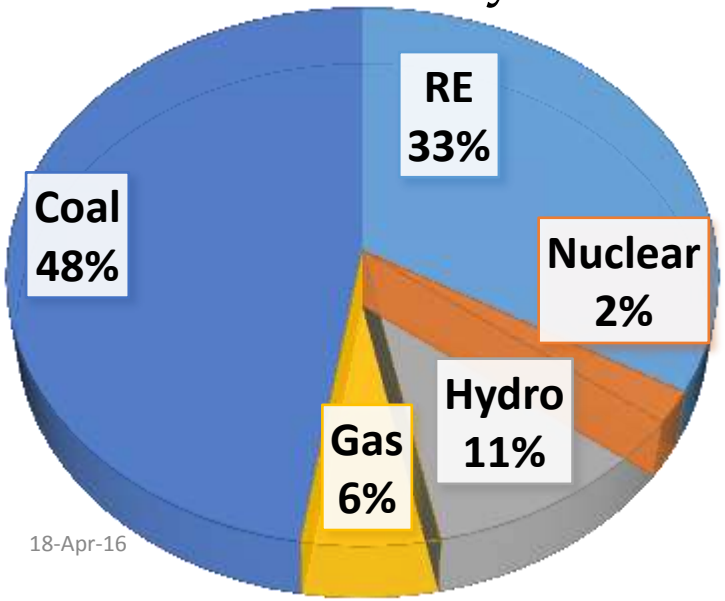


Technological Developments

- SECI is developing 150 MW Solar-wind Hybrid project with WB support.
- In addition, work is underway on to develop
  - Solar power projects with battery storage option, MW scale.
  - Floating solar in MW scale at commercial scale
- This will bring following advantages:
  - Better utilization of land
  - Higher energy generation
  - Optimum use of evacuation network

RE Capacity Addition Scenario

- As a part of its commitment to clean energy, India has declared to have 40% non-fossil fuel electricity by 2030.
- National Electricity Plan 2016 by CEA projects
  - *Annual electricity consumption by 2022= 1611 BU*
  - *Annual Electricity Consumption by 2027=2335 BU*
- Likely Installed Capacity by 2022 = 523 GW with about 24% share of non-fossil fuel energy in generation. (RE – 175 GW and addition of Hydro – 15 GW and Nuclear - 2.8 GW).



- By 2027, RE capacity is estimated to be 275 GW.
- Certainly, emphasis on RE would be even higher to meet national target of non-fossil fuel based electricity by 2030.

Accelerating Transition to Clean Energy

- **Strengthening of transition pathways for Renewable Energy**
  - Improving the enforcement of RPOs;
  - Creating conducive land acquisition policies; and
  - Synergizing development of RE projects with that of transmission infrastructure
- **Conducive business environment**
  - Ensuring transparent bidding processes with broad stakeholders' participation;
  - Establishing risk mitigation instruments and better quality standards
  - Shift towards energy pricing reflecting impact of externalities relating to air pollution and carbon emissions
- **Innovation**
  - R&D focus on system integration and continued cost reduction in Wind, solar and EVs, key technologies to achieve de-carbonization goals:
  - Technology innovation to supplement energy efficiency measures
  - Technological innovation in energy storage and hybridization.

Thank You

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EURASIA	EURASIA
Armenia	Armenia
Azerbaijan	Azerbaijan
Georgia	Georgia
Russian Fed	Russian Federation
Turkey	Turkey

MIDDLE EAST	MIDDLE EAST
Bahrain	Bahrain
Iran IR	Iran (Islamic Republic of)
Iraq	Iraq
Israel	Israel
Jordan	Jordan
Kuwait	Kuwait
Lebanon	Lebanon
Oman	Oman
Qatar	Qatar
Saudi Arabia	Saudi Arabia
Palestine	State of Palestine
Syrian AR	Syrian Arab Republic
United Arab Em	United Arab Emirates
Yemen	Yemen

OCEANIA	OCEANIA
Amer Samoa	American Samoa
Australia	Australia
Christmas Is	Christmas Island
Cocos Is	Cocos (Keeling) Islands
Cook Is	Cook Islands
Fiji	Fiji
Fr Polynesia	French Polynesia
Guam	Guam
Kiribati	Kiribati
Marshall Is	Marshall Islands
Micronesia	Micronesia (Federated States of)
Nauru	Nauru
New Caledon	New Caledonia
New Zealand	New Zealand
Niue	Niue
Norfolk Is	Norfolk Island
Nth Mariana Is	Northern Mariana Islands
Palau	Palau
Papua N Guin	Papua New Guinea
Pitcairn	Pitcairn
Samoa	Samoa
Solomon Is	Solomon Islands
Tokelau	Tokelau
Tonga	Tonga
Tuvalu	Tuvalu
Vanuatu	Vanuatu
Wallis Fut Is	Wallis and Futuna Islands