LONG TERM PLANNING WITH HIGH SHARE OF VRE- INDIA

Rajnath Ram
Joint Adviser (Energy)
NITI Aayog
Government of India
Email: rajnath-pc@nic.in

Current status of energy

- We import about 35% of Primary Energy requirement (oil import- 83%, Gas -49%, Coal-20%)
- Total power generation installed capacity 349 GW as on 31st January, 2019
- Renewable Installed Capacity 75 GW out of which solar 25 GW and Wind 35 GW

- We have abundance of renewable potential

Energy planning in India

- Reduce overall import dependence from 35% to 25% by 2030.
- Government commitment to meet SDG Goals – *Goal 7 (Ensuring access to affordable, reliable, sustainable and modern energy for all)*

  (Power for All, Clean Cooking Energy for All- Clean Cooking Roadmap)
- Address the concern on air quality and climate change
- Harness potential as Rapid declining price of RE
- Change in energy mix: *increase share of renewables & gas*

Broad Framework

Economic Growth

Improved Energy Security

Greater Sustainability

Energy Access at Rational Prices

India Energy Modeling capacity

- Government was dependent on think-tanks/academic institutions
- The long term estimation was outsourced
- In 2014, the Planning Commission developed in-house model India Energy Security Scenario (IESS-2047)- with three team members
- In 2015, Planning Commission changed to NITI Aayog
- Currently we have started various activities:
  - Creation of energy dashboard
  - Strengthening of Energy data Management
  - Updated and revision India Energy Security Scenario-2047
  - Set up MESSAGE Model with the support of IIASA, Austria
  - Started India Energy Modeling Forum

Other Government Organizations

- Central Electricity Authority – under Ministry of Power do long term Installed capacity planning
- POSOCO (Power System Operation Corporation Limited , under Ministry of Power- dispatch planning
- Ministry of New & Renewable Energy – gearing up to gather online data of RE generation

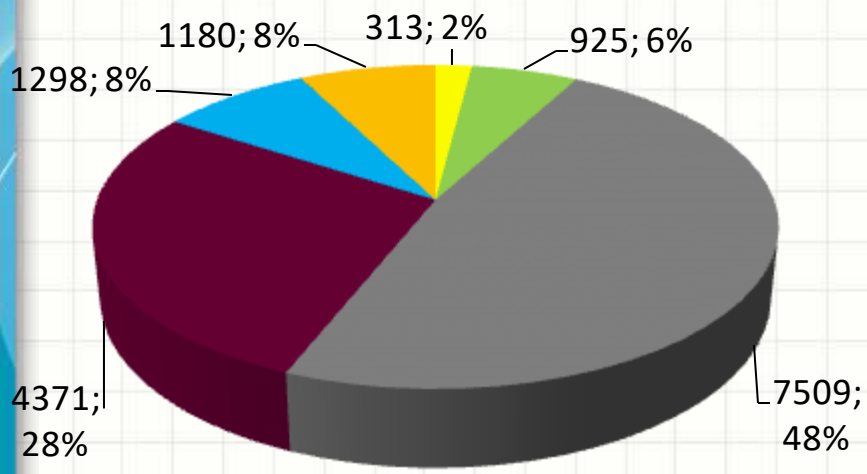
Assessment for energy in 2030- key assumptions

GDP Growth Rate

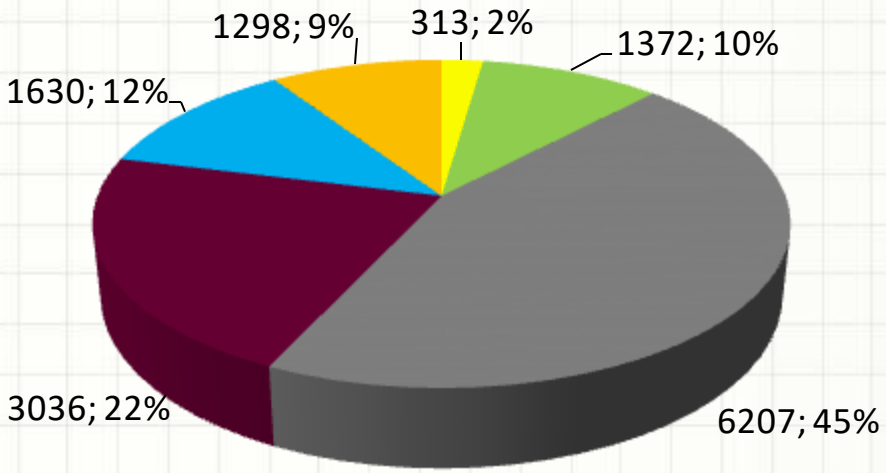
2017-22	2022-27	2027-30
8.00%	8.22%	8.34%

		2017	2022	2027	2030
GDP	Trillion US $	1.82	2.67	3.96	5.14
Population	Billion	1.294	1.384	1.453	1.501
Urbanization	%	33%	36%	39%	41%
Household Size	People/household	4.8	4.6	4.4	4.3

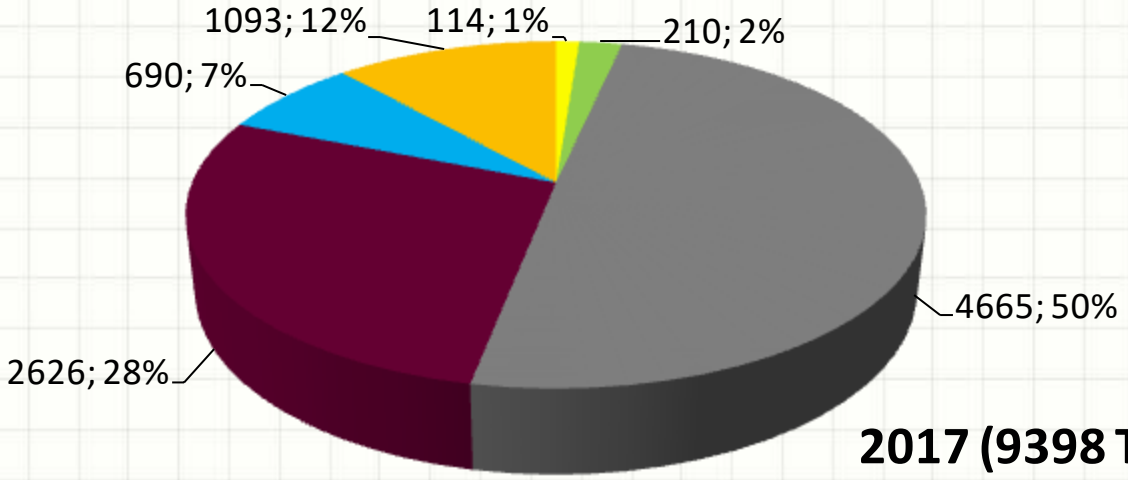
Primary Energy Supply Mix (Twh)



2030 – BAU (15596 TwH)



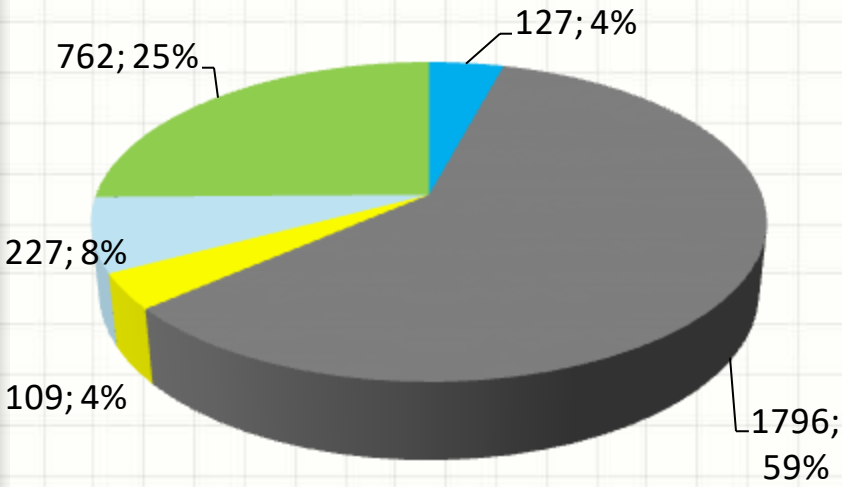
2030 – Ambitious (13856 TwH)



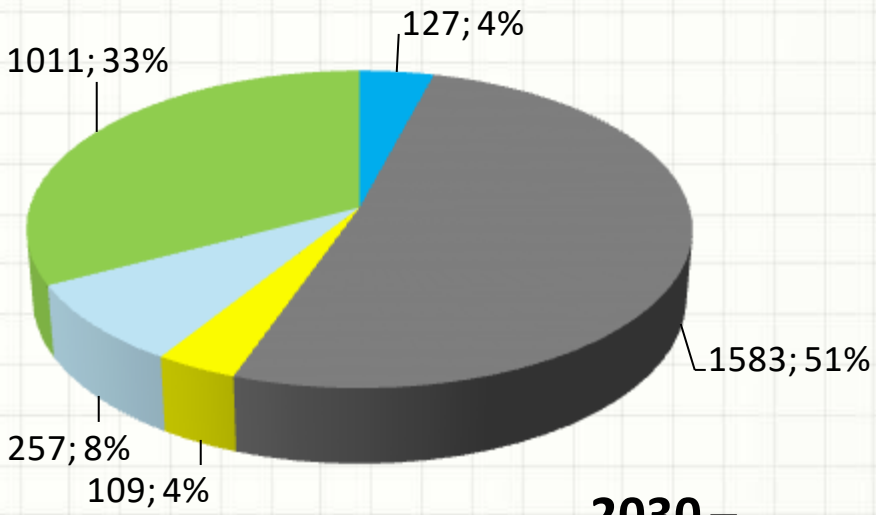
2017 (9398 TwH)

Nuclear | Renewable & Clean Energy | Coal | Oil | Natural gas | Bioenergy

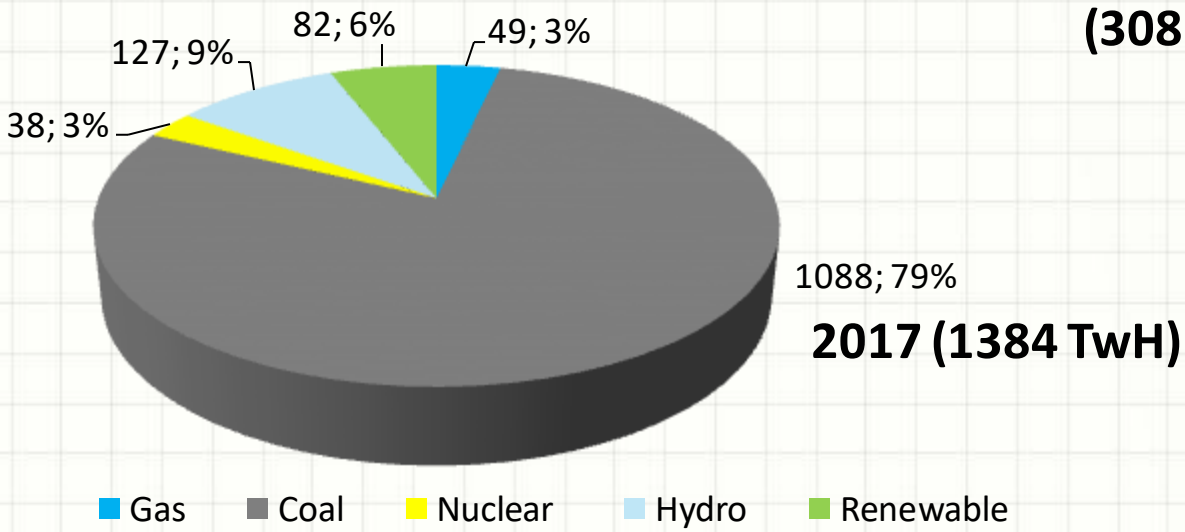
Electricity Generation Mix (Twh)



2030 – BAU (3021 TwH)

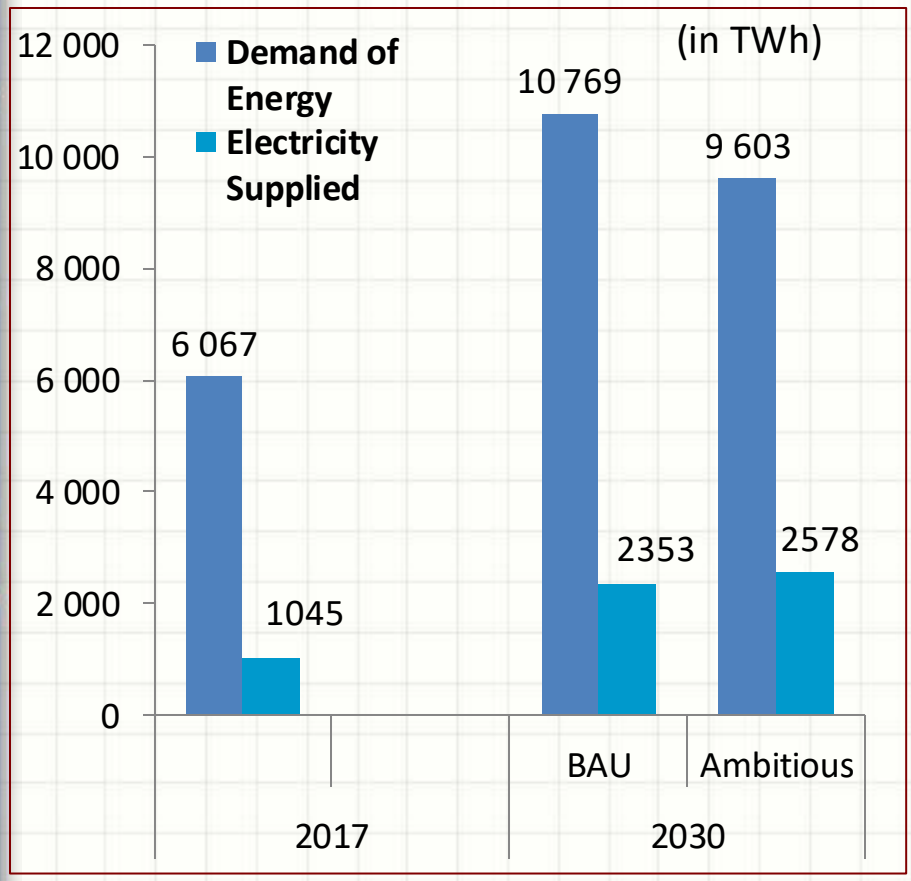


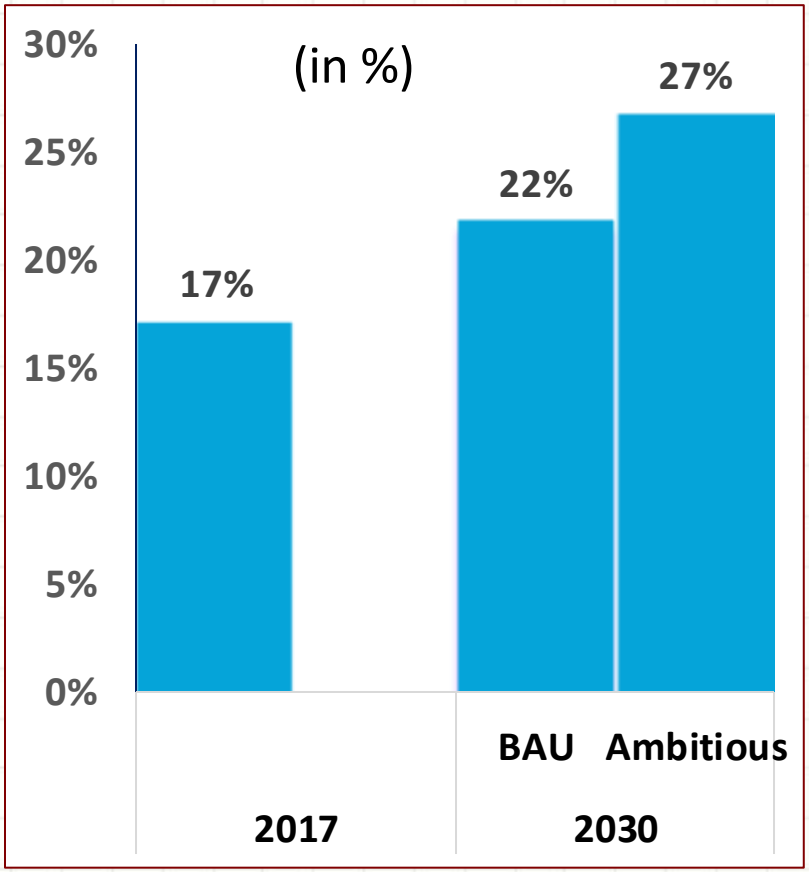
2030 – Ambitious (3087 TwH)



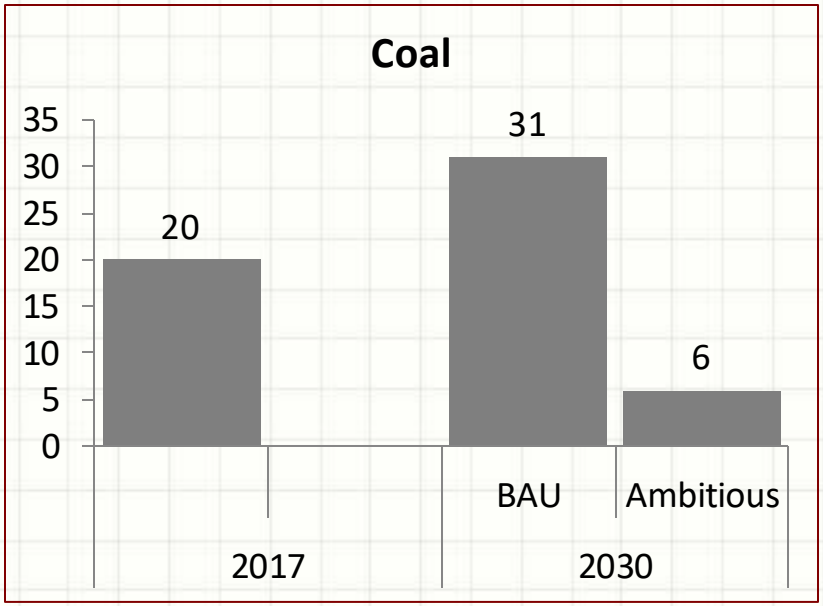
2017 (1384 TwH)

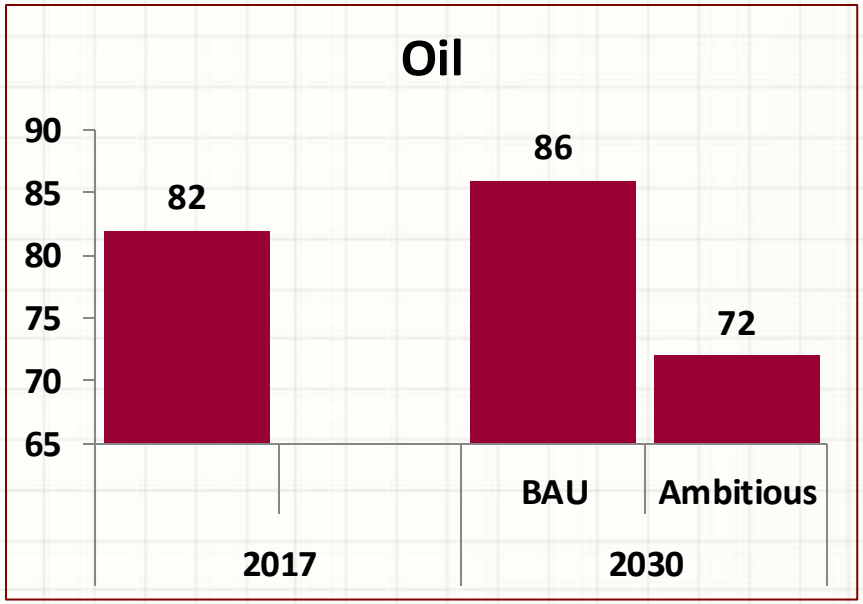
Share of Electricity in Demand

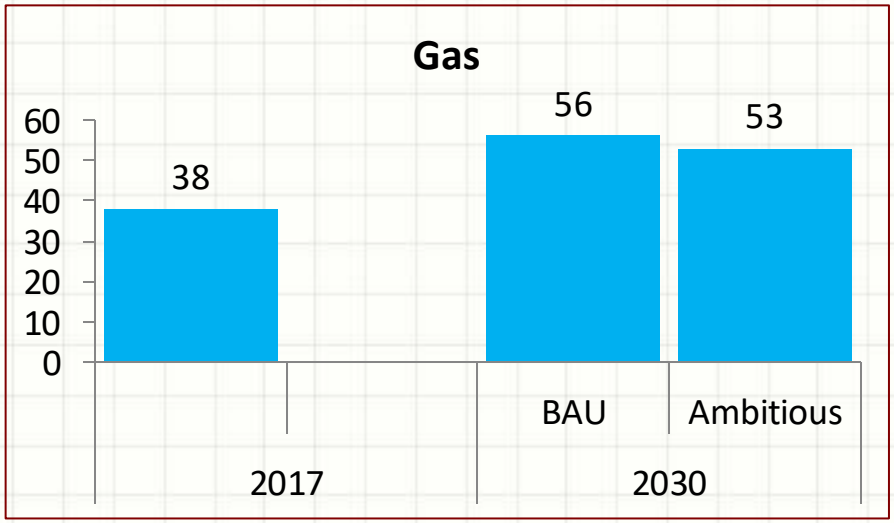




Import Dependence of Fossil Fuels (in %)







Challenges in integrating VRE

Effectiveness of market	• Sharp decline of prices • How to trade surplus power • Some renewables (SHP, Biomass) -costlier
Economic issues	• Incremental growth in both conventional and renewable capacities • Longstanding PPAs with conventional power developers • Decline in growth rate of power consumption • Some of old PPAs of renewables are not being honored by Discoms
Regulatory issues	• Lack of a regulatory framework and financial mechanisms to support and incentivise DISCOMs to prioritise uptake of renewables • Lack of long-term regulations to support renewables • Low demand in the RECs
Balancing reserves	• Absence of regional or national balancing markets • SLDCs have limited visibility on real-time renewables generation • Accurate forecasting by renewable energy generator is not available • Slow pace of development of intrastate transmission networks

Planning for VRE

- NITI Aayog carried out stakeholders consultation(250), and based on the discussions finalized report "India Renewable Electricity Roadmap-2030".
- Developed RE Action Plan with Renewable rich States.
- Regional workshop with IEA to assess the issues/challenges with respect to RE Integration into grid (stakeholders: Discoms, Genco, SLDC, RLDCs, MoP, MNRE, Industry, CERC).
- Now National Energy Storage Mission- under finalization
  - GW scale manufacturing of battery storage
  - Pilot scale plants

The intervention under considerations

Grid technology upgradation

- Ensuring visibility and controllability of small /large scale VRE assets
- effective scheduling and dispatch at the state level and enhance power exchanges
- Deploy sensors for real-time data on grid conditions coupled with sophisticated analytical tools to provide necessary information for grid operations
- Renewable generators to provide grid services such as AGC and operational data.

Upgrade grid operational protocols

- Upgrade scheduling and dispatch (5 minutes instead of current 15-minute)
- State regulators to upgrade grid code to ensure renewable energy addition .

Improved market design and renewable energy procurement

- Creation of model PPAs for renewables -moving away from must-run status .
  Efficient operation of power exchange .
- Flexible price for flexible resource providers.

Expand balancing areas

- Larger balancing areas can help reduce variability
- CERC could be empowered to manage the entire national grid as one, with appropriate markets and regulatory frameworks in place.

Promote flexible demand and balancing resources

- Address integration issues on the distribution grid, including rooftop PV and utility-scale wind and solar that are connected to low-voltage lines
- demand-side response enabled by smart grid technologies
- Improve the flexibility associated with conventional generating units to accommodate the variability and uncertainty of generation from renewables
- create / widen the scope of applicability of an ancillary services market
- Solar based microgrid with storage

Thank you