



***Global Ministerial Conference
on
System Integration of Renewables,
Berlin, 1 October 2019***

***Innovation in policy, market design and
regulation***

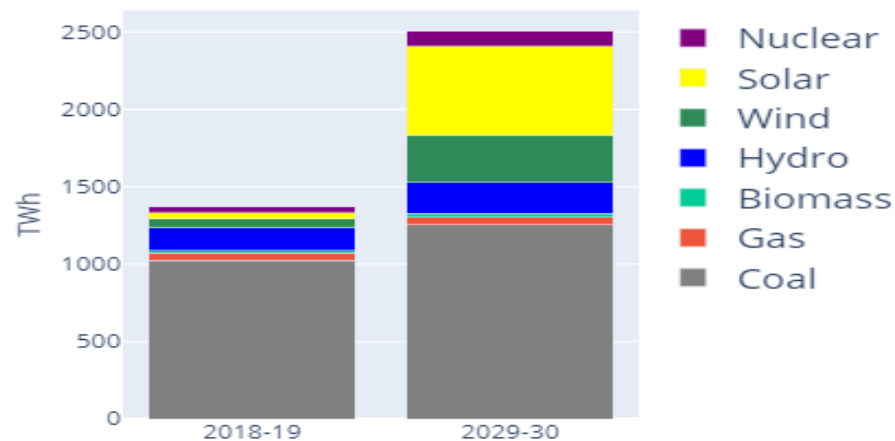
**AK Saxena,
Senior Director, Electricity and Fuels Division, TERI**

1. The Structure of Electricity Generation is expected to change significantly as a result of Targets, Policy Framework and Price Competitiveness of Renewables

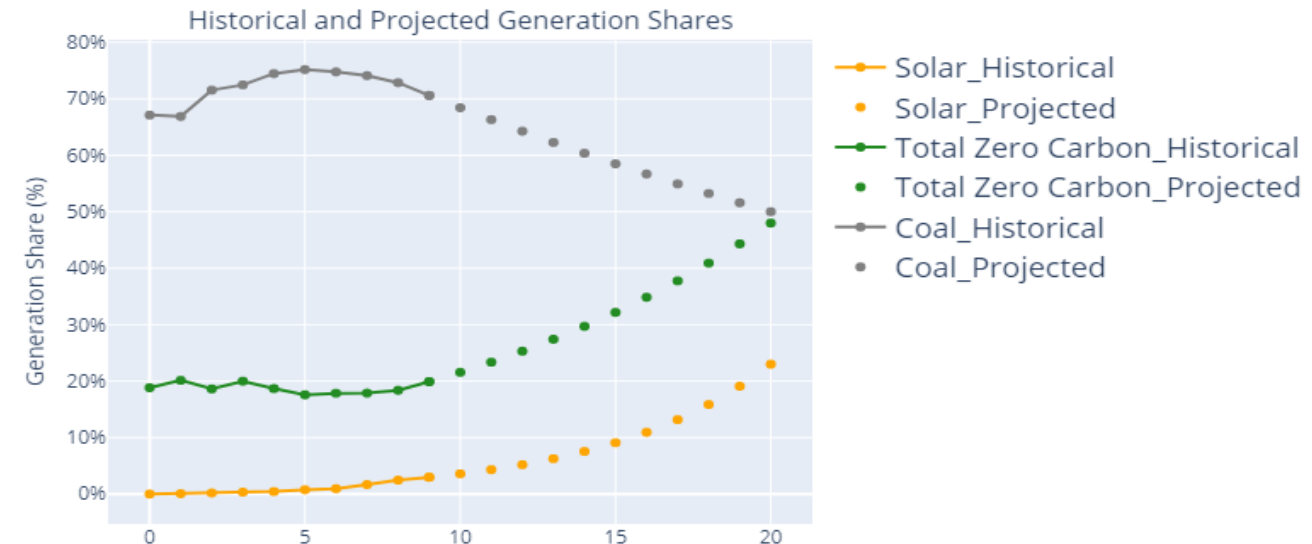
- Auction prices for renewables have consistently come in the range of Rs. 2.50 – 3.00 /kWh, compared to new coal of Rs. 3.50-4.50/kWh
- Currently at about 22%, a number of studies released have shown feasibility and cost-effectiveness of power system transitions towards zero-carbon generation of the order of 45% by 2030.
- Under such a scenario, the share of coal would decline rapidly from today's level to about 50%.
- Hon. PM Modi's recent announcement of 450 GW of RE capacity affirms the same.

Power Generation by Source FY2018-19 and FY2029-30

Growth in Generation by Source 2018-19 to 2029-30, Projected



Share in Total Generation, Coal, Zero-Carbon and Solar



2. As a result of the changing Structure of Electricity Generation, Operation and Investment Requirements of the Indian Power System are set to Change Significantly

- Meeting high RE deployment targets will require rapid and profound flexibilization of the Indian power system:
 - Demand response, coal flexing, storage
 - Inter-state and cross-border energy transactions
 - Market signals and regulation
- Challenge exists particularly in regard to meeting ~ 40-60 GW of peaking requirement by 2030, for which cost effective storage could be crucial.

Power System Operation Under High Share of Renewables, one Week in June 2030

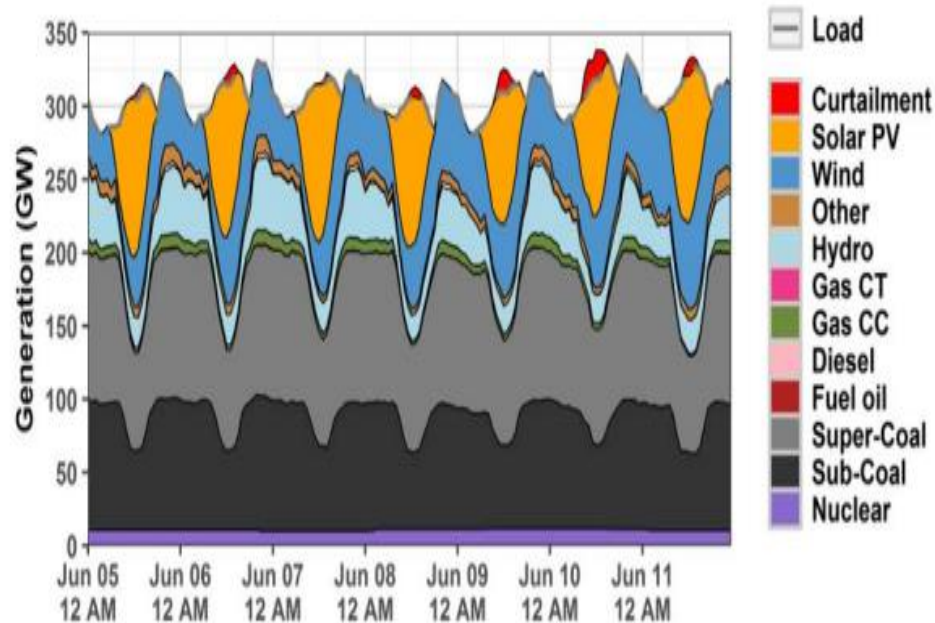
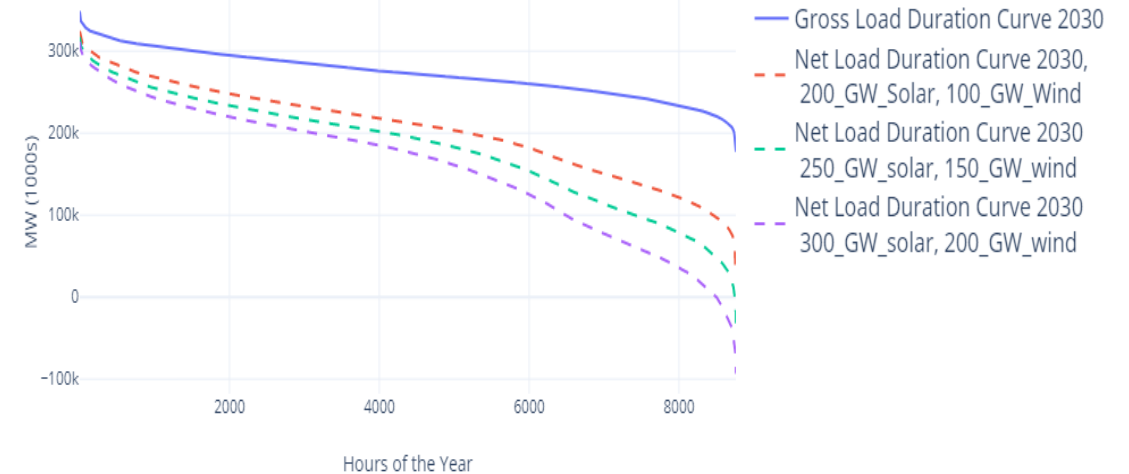


Illustration with Load Duration Curves of the Challenge of Meeting 2030 Peak

Load Duration Curves as a Function of RE Penetration



3. The Changing Operational and Investment Requirements will require Substantial Changes in Regulations and Market Frameworks

Figure 8: Percentage Distribution of Contracts in the Market



- Currently the market framework in India is relatively immature:
 - 90% of generation is tied up in long-term, fixed cost contracts.
 - Power exchanges account for only 3% of generation, with about 6% of generation being traded bilaterally.
- The government is undertaking a significant program of market reform and redesign:
 - Introduction of an ancillary services market to replace the current regulatory mechanisms (RRAS[#] and DSM^{\$})
 - Introduction of a real time energy market
 - Plans to eventually introduce a single pool, day-ahead market to replace the current framework of decentralized scheduling and dispatch.
 - Other regulations and initiatives : forecasting and scheduling, transmission planning, Smart Grid, etc.

RRAS : Regulation Reserve Ancillary Services

\$ DSM : Deviation Settlement Mechanism

OTC : Over-the-Counter



Thank You

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Contact : ak.saxena@teri.res.in