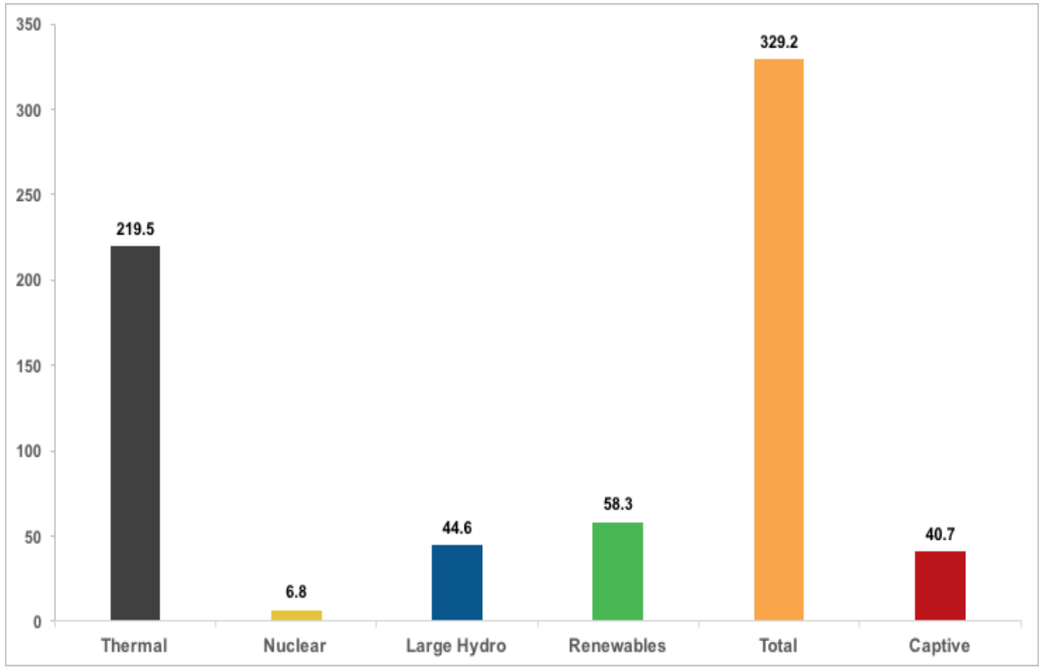
Overview of Indian Power Sector & Opportunities for for promoting Social Inclusion in Indian power sector

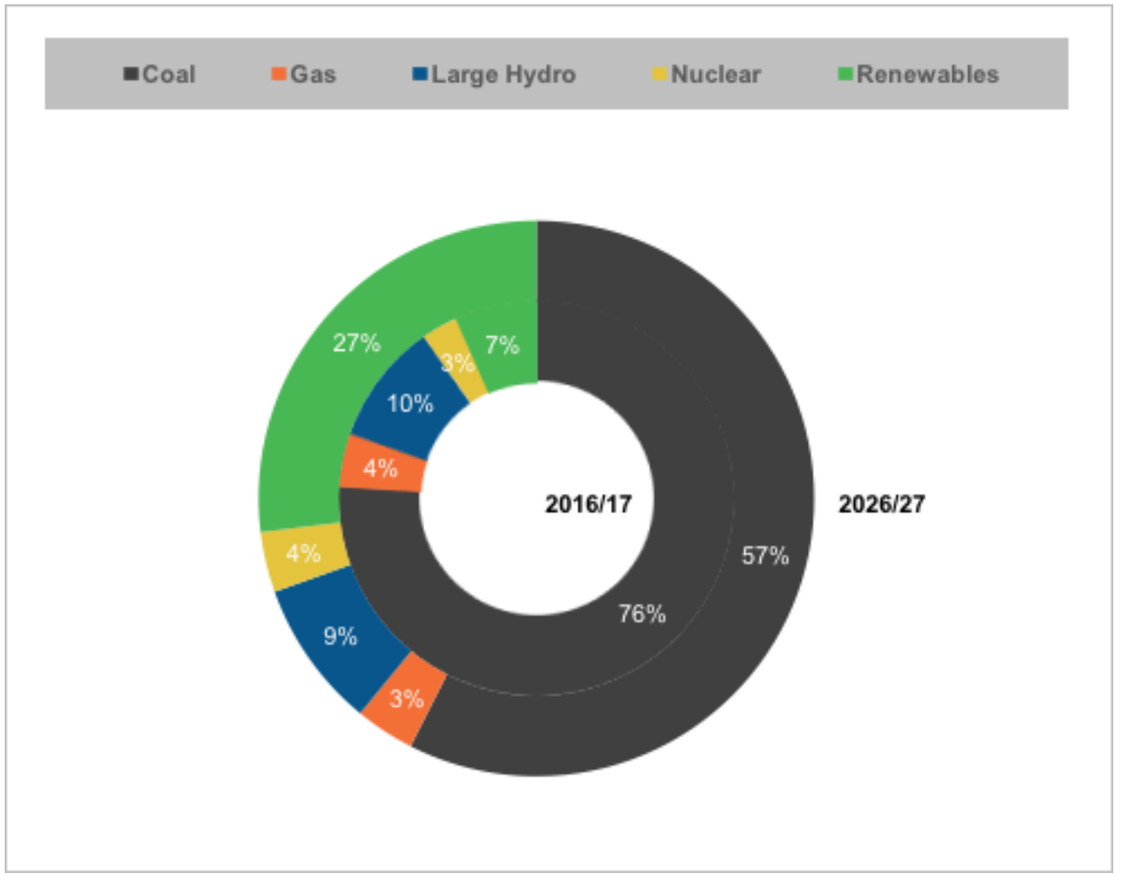
Dr. Pradeep Perera
Head Energy (India)
Principal Energy Specialist
Asian Development Bank

Generation

Overview of Power Generation



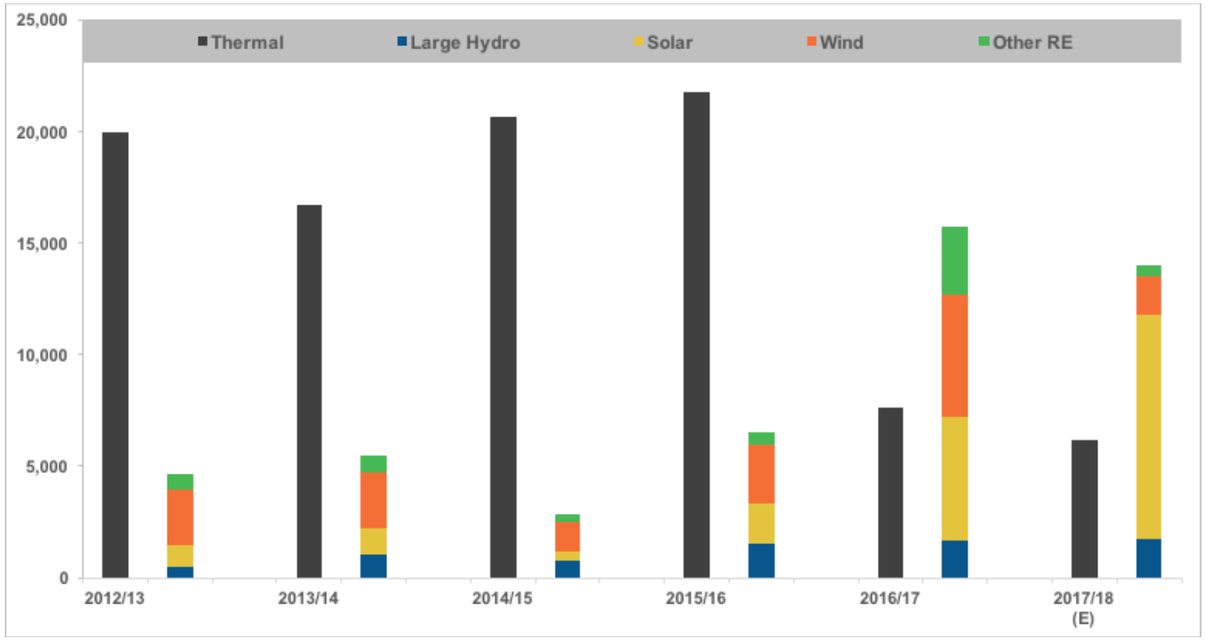
India’s power generation capacity has been dominated by thermal mainly coal.

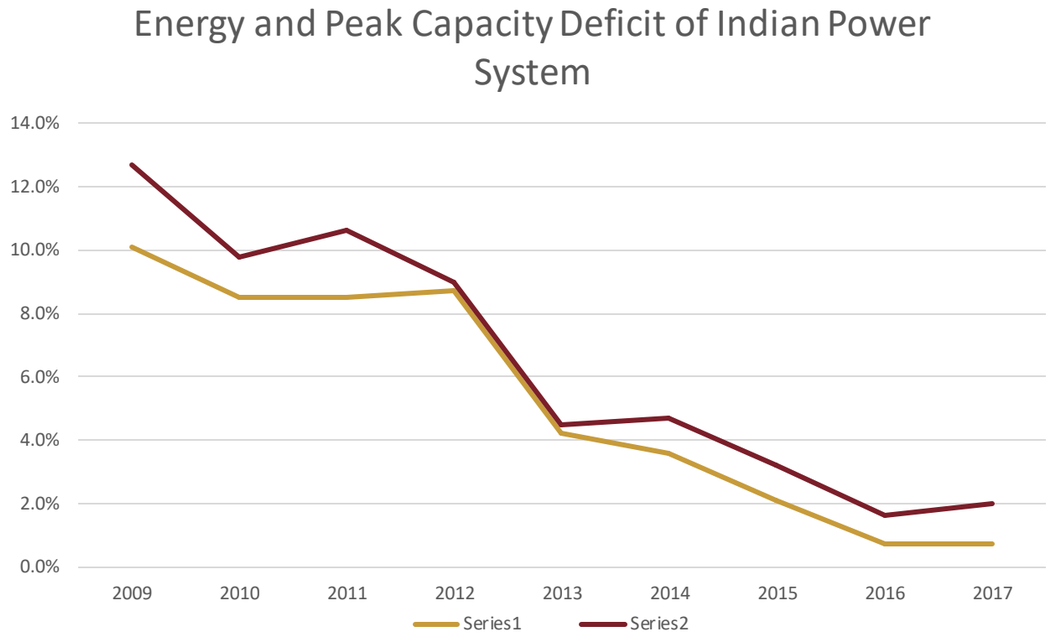


Coal contributes to 57% of installed capacity and 76% of generation.

Renewables contributes to 17% of installed capacity but only 7% of generation.

Improving Generation Capacity Deficit



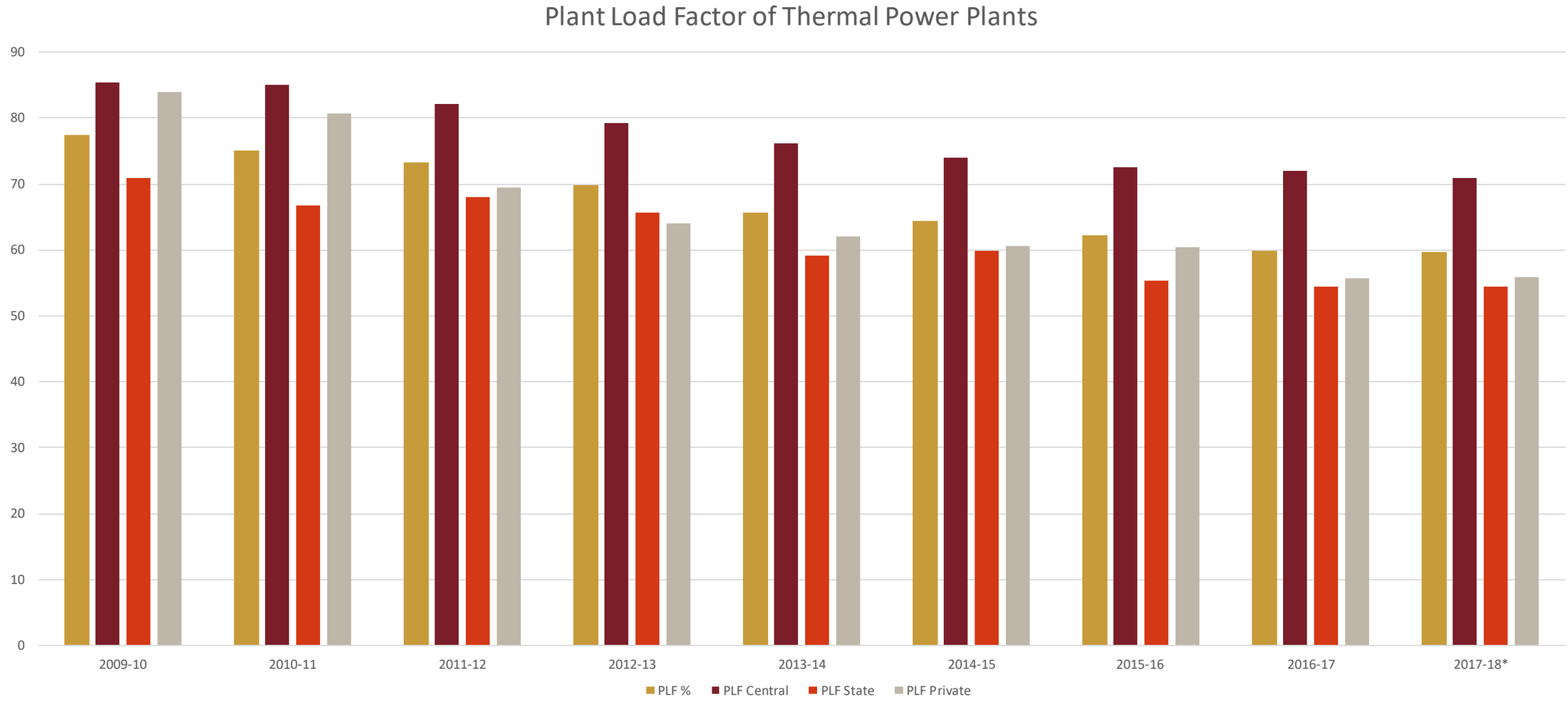


However, there has been rapid take up of energy capacity.

During FY 2016/17 renewable energy capacty additions exceeded thermal capacity additions.

The energy and peak capacity deficit of Indian power system has been largely eliminated.

Declining Plant Load factor

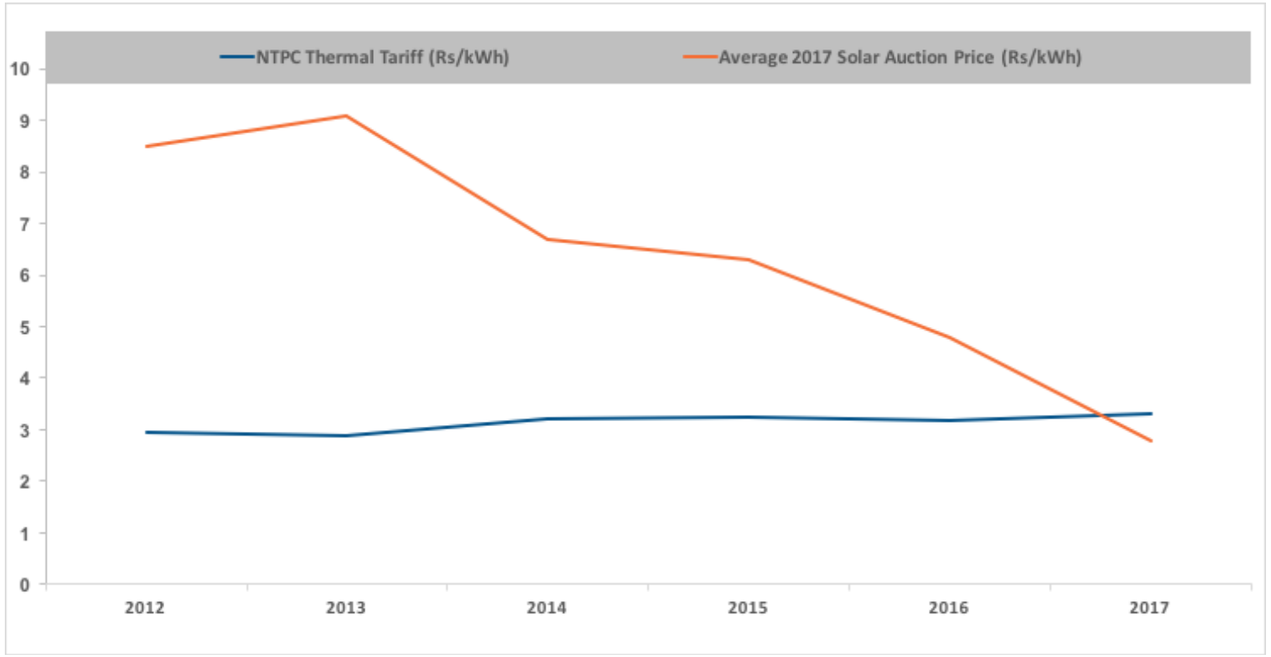


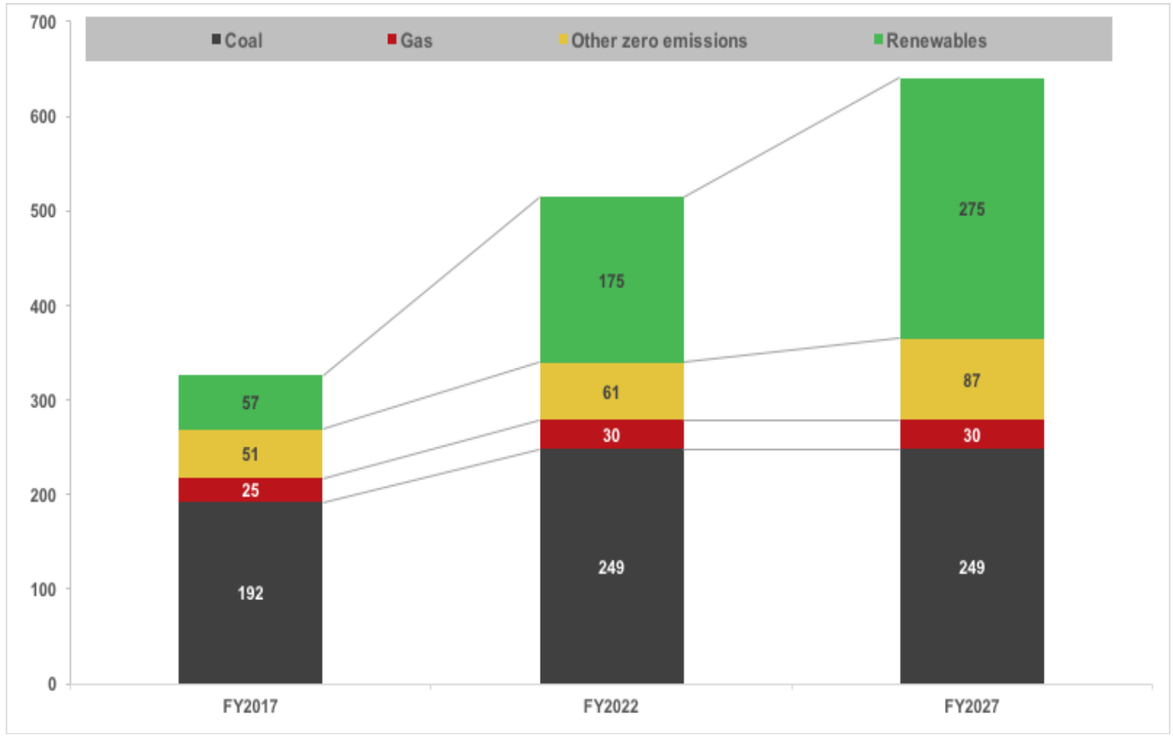
The overall PLF has dropped to 60% in 2017 from 77% in 2010. Private sector plants have experienced a drop from 84% to 56%.

Conventional Generation – Key concern areas

- Consistently decreasing PLFs is major concern
  - *PLFs dipped from 64.5% in fiscal 2015 to 59.88% in fiscal 2017*
  - *Domestic coal production could not keep pace with thermal power capacity addition.*
  - *Other factors include lower off-take by Discoms, increased share of renewables in installed capacity, and financial stress of Discoms*
- Increase in non-performing assets (NPAs) in the thermal segment
  - *~51 GW of stressed assets (thermal and gas)*
  - *Another ~23 GW of under-construction projects may become stressed, endangering ~Rs 1.3 lakh crore investments*
  - *Rs 4 lakh crore of debt is likely to become NPA if prevailing issues are not resolved*
- Fuel non-availability, aggressive bids, lack of fresh PPA, and offtake risk
  - *~13.5 GW of projects with coal source but no PPA*
  - *~ 6 GW of projects with no coal source and no PPA*
- Poor redressal and arbitration framework
- Delay in approvals

Increasing Share of Renewable Capacity in Indian Power System





Large Utility scale solar projects have achieved cost parity with coal power in 2017.

However, there are system wide costs that need to be taken into account. These includes, cost of additional reserve, energy storage and higher O&M cost of thermal plants due to rapid ramping up and down.

However, India will add more renewable capacity (175 GW by 2022 and 275 GW by 2027).

Renewable Generation – Current Status & key Issues

- Grid-connected renewable energy capacity has witnessed a CAGR of 27% between fiscals 2015 and 2017 i.e. from 35.8 GW to 57.3 GW.
- Centralised procurement is expected to continue to push the growth of renewable energy in India.
  - Curtailment of renewables generation and renegotiation of PPA. *A large quantum of solar and wind capacity is at risk of negotiation as a result:*
    - *7 GW of solar projects (tendered/ awarded between fiscals 2015 and 2017)*
    - *2-3 GW wind projects (PPAs allotted/ signed in Q3-Q4 of fiscal 2017 at feed-in tariffs)*
    - *~Rs 48,000 crore at high risk*
  - Developers, which had bid at lower tariffs in the solar and wind segments, are looking to exit
- Lack of integrated policy
  - *The actual cost of renewable energy is higher considering loss of cross subsidy (solar rooftop), fixed cost for backing down thermal power, and purchase of additional peak power.*
- Land acquisition is another concern for such a huge RE target.
- Issues in quality of solar modules available in India have also been reported recently.

Opportunities for Social Inclusion in Power Generation

- Distributed generation and open access to the grid is allowed in India.
- Captive power and distributed generation is traditionally used by industries.
- 40 GW out of 175 GW renewable target is allocated for distributed generation and mainly solar roof top.
- Solar roof top programs can encourage “prosumer” concept Indian context subject to availability of “net metering” and grid back up.
- Demand response with active participation of “prosumer” and appropriate aggregation can provide grid services such to enable variable renewable energy integration.
  - In response to price / control signals demand can be changed to restore demand supply balance.
  - Automated demand response can provide frequency response and system reserve.
- The residential consumers and especially females can actively participate in power system operation through appropriate smart grid technologies.

Transmission

Power Transmission– Current Status and Key issues

- The five regions of India are inter-connected at 800 kV HVDC and 765 kV AC transmission system and fully synchronized.
- Transmission capacity has witnessed a CAGR of 9.1% between fiscals 2015 and 2017 i.e. from 22,101 CKM to 26,300 CKM.
- Transformation capacity above 220 KV has reached 800,000 MVA.
- Green corridor project is under implementation in many states

  Green corridors will facilitate evacuation from solar parks and large-scale grid-connected solar and wind projects.
- Open tariff based bidding where private sector can participate is mandatory for inter-state transmission system and encouraged for intra-state sytems.
- Open access to transmission system is allowed for large consumers and generators,
- India has transmission connections with Bangladesh and Bhutan at 400 kV and with Nepal at 220 kV level.

Distribution

Power Distribution – Current Status

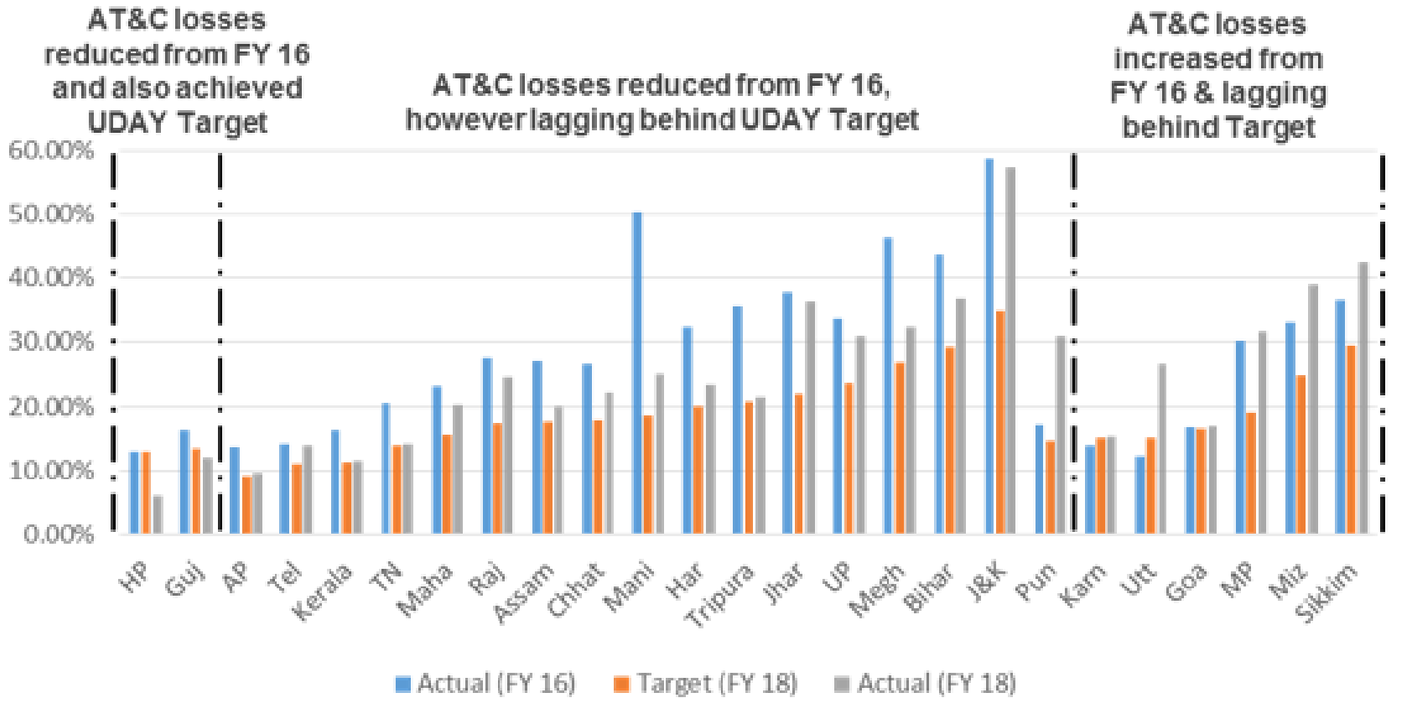
- India is the third largest electricity consumer in the world after China and USA. The electricity consumption is close to 1,400 TWh in 2016.
- However, the power distribution remains the weakest link of power sector
- High level of aggregate technical and commercial losses of close to 21.6%.
- Persistent gap between average cost of supply and average revenue estimated to be Rs. 0.26 /kWh or US $ 6 billion per year in aggregate.
- Heavily subsidized electricity to agricultural consumers and below poverty line residential consumers
- Need for fiscal subsidies from State governments
- Poor quality of supply and intentional load shedding to avoid further financial losses. (average supply in rural areas is 18 – 20 hours).
- Presence of un-metered agricultural and residential consumers.

Government Initiatives to Improve the Distribution Sector

- Government has approved US $ 11 billion in 2014 under IPDS and DDUGJY schemes
  - strengthen urban and rural electricity distribution systems ,
  - install feeder, transformer and consumers meters
  - Separation of agricultural and residential 11 kV feeders
  - provide connections to poor households,
  - IT enabling of DISCOMS (ERP systems, automated billing systems and SCADA systems for urban areas).

- Government has absorb $ 42 billion of accumulated debt of DISCOMs and DISCOMS have agreed to
  - Eliminate the gap between ARR and ACS.
  - Reduce the ATC losses to 15%

AT&C losses – Achievements vs Targets

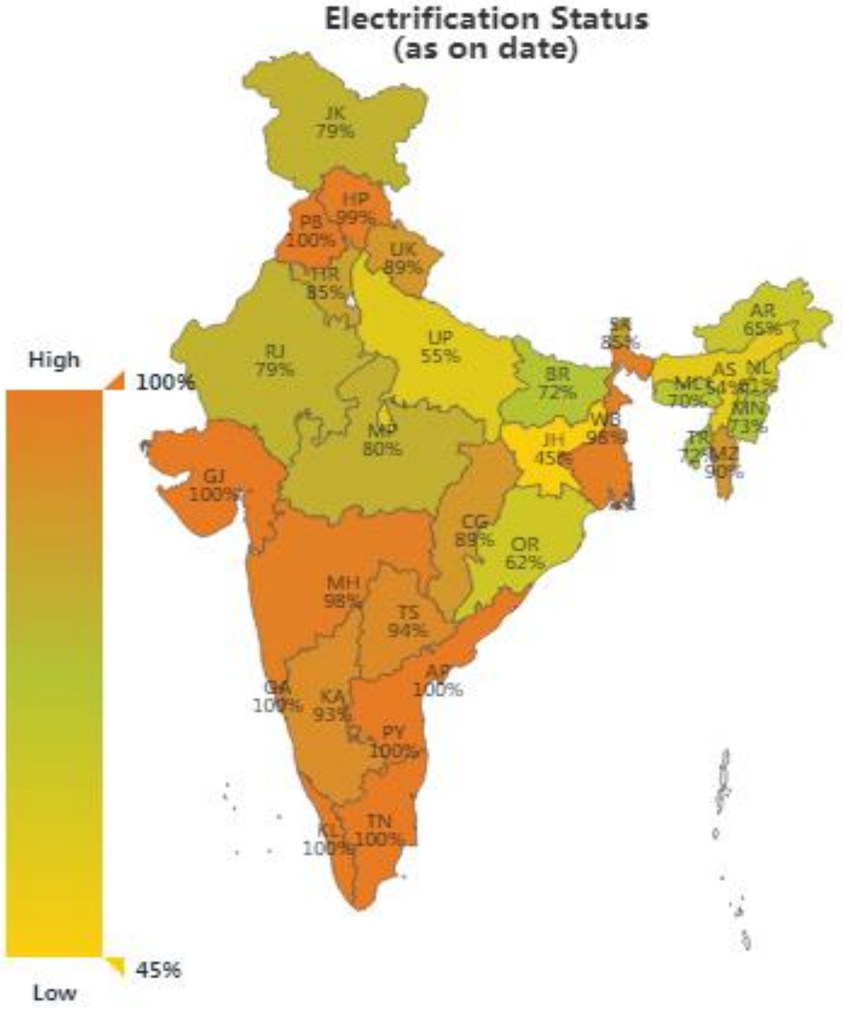


- Despite UDAY scheme, average AT&C loss in the country reduced only marginally from 23.98% in fiscal 2016 to 21.60% in fiscal 2018
- Most states are short of target on AT&C loss reduction due to:
  - Feeder separation for agricultural consumers
  - Network expansion - Addition of rural consumers with lower capacity to pay

Saubhagya Scheme – Last mile connectivity

- **Announced in September 2017 to achieve 100% household electrification by 2019.**
- **Government has allocated $ 4 billion including $ 2.5 billion grant from Central Government.**
- **Envisages electrification of 40 million households in 18 months.**

- Lowest electrification level in Jharkhand (47%), Uttar Pradesh (55%) & Assam (55%)
- At the current rate (6 month average) – targets likely to be missed; will take another 4 years to electrify all households



Government Policy Initiatives to Improve the Distribution Sector

- Stricter regulatory norms should be there to discourage load shedding and ensure longer hours of quality supply
- 100% metering of all existing and new consumers including smart meters and prepaid meters..
- Strict enforcement to eliminate illegal tapping of LT lines and collusion by meter readers.
- Introduction of direct benefit transfer scheme.
- Promoting use of Solar energy for water pumping.
- Tariff increases to eliminate the revenue gap.
- Private sector participation in the form of franchising and management contracts to improve the commercial performance of DISCOMs.

Opportunities for Social Inclusion in Power Sector in India

- The proposed measures to ensure financial sustainability are likely to have adverse social impacts.
- 100% electrification will exacerbate the financial viability of the sector in the absence of tariff reforms and eliminating electricity theft.
- Challenge is to win the public acceptance, political support for proposed reforms by making it socially inclusive.
  - Publicity campaigns to promote efficient electricity consumption.
  - Use of electricity for income generating opportunities.
  - Empowering consumers to act as a Prosumer and active participant in power markets.
  - Undertaking economically efficient electricity tariff reforms that provide correct economic signals to the consumers
  - Improving the quality of supply in return for timely payment for electricity.