



Clean Coal Technology (CCT) Training Program FY2019 under CEA and JCOAL Cooperation

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Ministry of Power



Outline



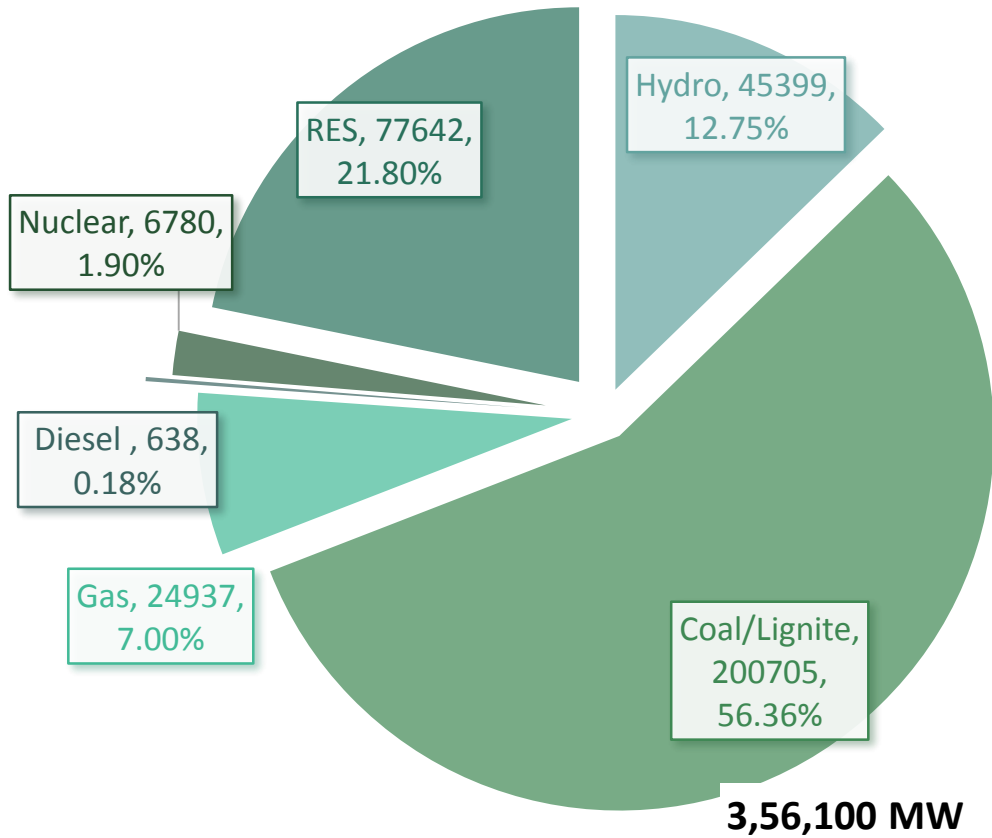
- Generation and demand scenario in the country
- Imperative - Stable, reliable and sustainable electricity
- Policy and regulatory measures
- Technical issues which need to be addressed
- CCT Visit schedule
- Findings from the visit
- Way ahead



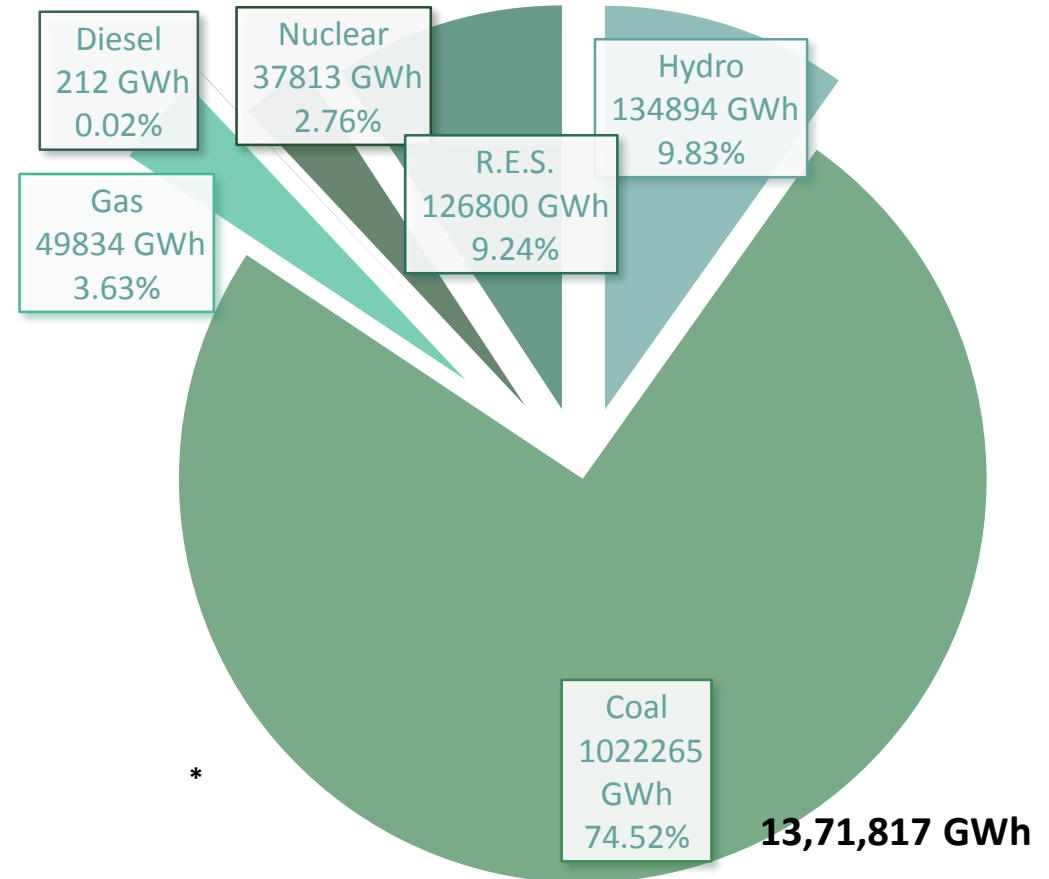
Capacity and Generation in 2018-19



All India Installed Capacity 2018-19



Gross Electricity Generation in India 2018-19





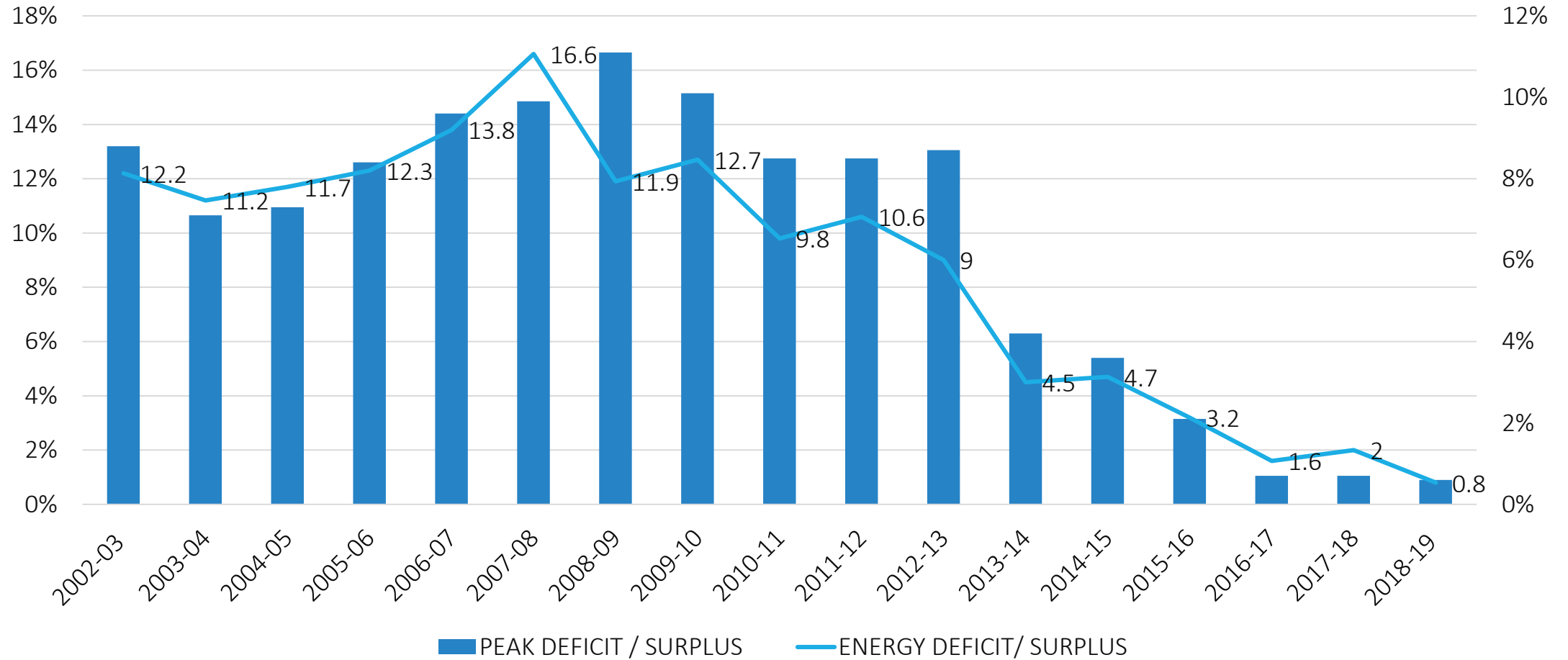
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Demand supply position

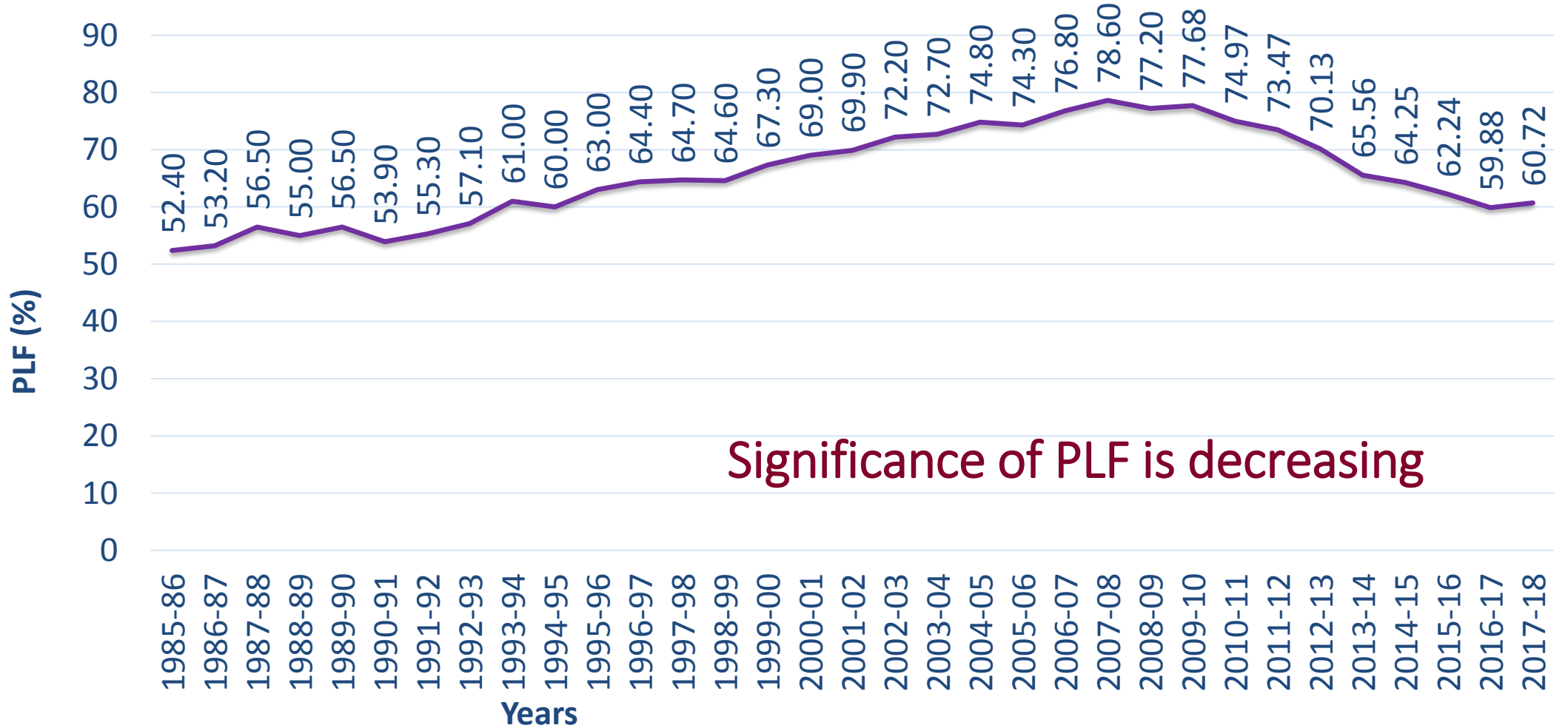
Peak met = 175,528 MW

Energy availability = 1,267,526 MU





Plant Load Factor (Coal and Lignite)



Significance of PLF is decreasing

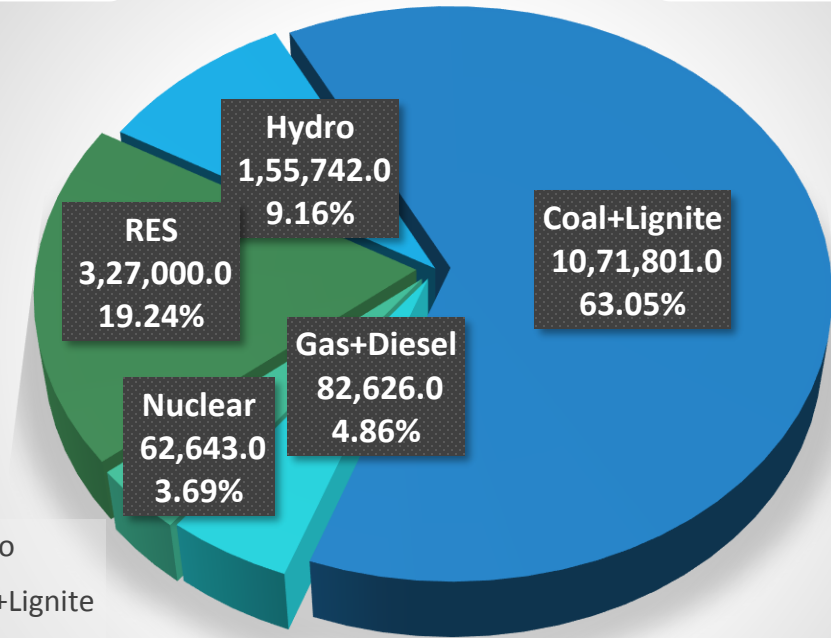


Energy mix in future



March, 2022

IC=4,79,419 MW

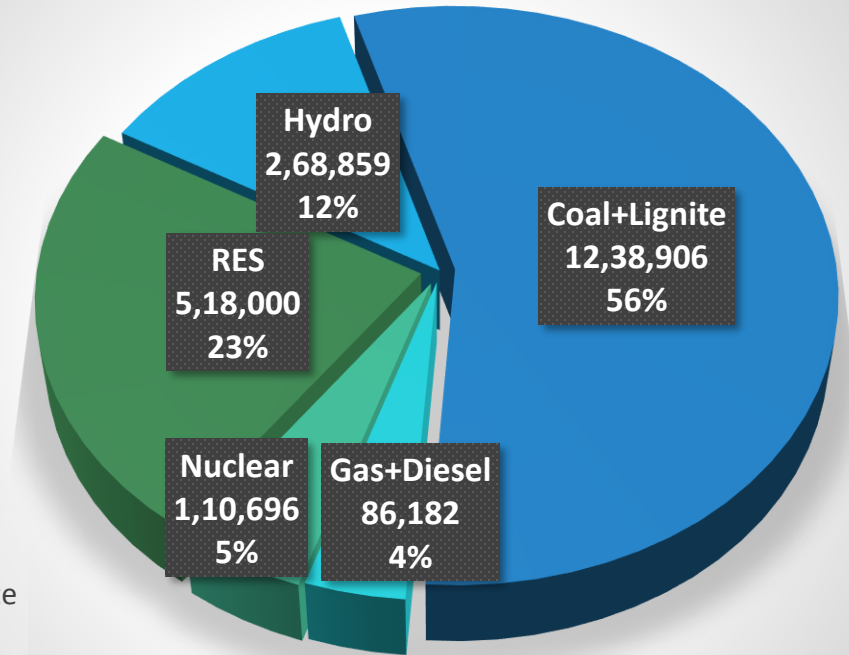


- Hydro
- Coal+Lignite
- Gas+Diesel
- Nuclear
- RES

Gen=16,99,812 GWh

March, 2027

IC=6,19,066 MW



- Hydro
- Coal+Lignite
- Gas+Diesel
- Nuclear
- RES

Gen=22,22,643 GWh



Emerging scenario



Supply side

- Share of installed capacity of RE in energy mix has increased from 9% in 2010 to 20% by 2018. It will constitute 37% and 44% of generation mix in 2022 and 2027, respectively.
- Variability of RE and flexibilization of TPPs.

Demand side

- Growing adoption of distributed energy resources by end customers including roof top solar, RE sources connected at distribution and sub-transmission voltage levels. These resources are largely 'uncontrollable' by system operators even at the state level.
- Novel uses of electricity (e.g., for electric vehicles, battery charging), can also increase demand uncertainty.



Policy and regulatory measures

Thrust areas

Intended Nationally Determined Contribution @ COP21

- India intends to reduce the emissions intensity of its GDP by 33 to 35 % by 2030 from 2005 level.
- To achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based
- Introducing new, more efficient and cleaner technologies in thermal power generation - Future planned projects based on super, ultra supercritical or advanced ultra supercritical technology
- To reduce emissions from Thermal Power Stations new environmental norms in December 2015 regarding Suspended Particulate matter (SPM), SO_x, NO_x, Mercury introduced
- Norms for specific water consumption by Thermal Power Stations have also been notified to conserve water.



Policy and regulatory measures

Thrust areas

- Retirement of old and inefficient units (8,670 MW retired in last 3 years and 10,159 MW identified for retirement by 2022).
- Programme for replacement of old and inefficient units.
- Policy for blending of Biomass (5%).
- Mandatory usage of treated waste water in TPPs located within 50kms of STP.
- ACQ per MW entitlements for all thermal power plants, irrespective of their age or technical parameters, shall be calculated based on Normative Station Heat Rate with upper ceiling of 2600 kcal/kwh.



Policy and regulatory measures

Other areas

- Flexibility in Generation and Scheduling of Thermal Power Stations to reduce emissions.
- Flexibility in utilization of domestic coal for reducing the cost of generation
- Security Constraint Economic Dispatch –under implementation.
- Real Time Market for power dispatch –under consideration of regulator.
- Reserve Regulation Ancillary Services, DSM, DAM, etc.
- All such power plants including private generators which do not have PPAs, shall be allowed Coal linkage for a period of minimum 3 months up to a maximum of 1 year.



Technical issues



- Share of Non-fossil fuel installed capacity to increase to 47% by 2022 which will contribute around 20% of the Total Energy Requirement.
- Coal power plants need to have enhanced ramping capability
- Minimum technical limit for Coal power plants may have to be revised downward.
- Limited availability of Hydro, Pumped Storage & availability of Gas for Gas based Station.
- Total coal requirement may be around 730-800 MT in 2021-22.
- Coal quality issues
- FGD retrofit is difficult in many of the older stations due to space constraint and ongoing R&M
- Sustained supply of Coal for daily generation
- Waste handling - Ash and gypsum disposal



Expectations from coal fired plants

Higher ramping rates during loading/unloading

Faster Startup

Lower stable minimum load

Frequent & increased load cycling

Fast load ramp up and ramp down

Low load operation

Two shift operation

Frequent and increased number of unit startup & shutdown cycles

Reduced effect on life of Equipment

Minimal impact on environment



CCT Visit Schedule



- Kick off meeting with **JCOAL** on 14.10.19 at 1015 hrs at Tokyo
- A presentation on **Isogo Thermal Power Station of J-Power** on 14.10.19 at 1400 hrs at Tokyo
- Visit to **Toshiba Head Office** on 16.10.19 from 0830 hrs to 1030 hrs at Kawasaki
- Visit to **NEDO** on 16.10.19 from 1045 hrs to 1215 hrs at Kawasaki
- Visit to **Hibikinada Biomass Co-fired TPS** on 17.10.19 from 0930 hrs to 1200 hrs at Kitakyushu
- Visit to **Reihoku Coal fired TPS** of Kyushu EPCO on 18.10.19 from 1300 hrs to 1600 hrs at Kumamoto
- Visit to **MHPS Head Office** on 21.10.19 from 0900 hrs to 1045 hrs at Yokohama
- Visit to **Data Analysis Centre** of JERA on 21.10.19 from 0900 hrs to 1045 hrs at Yokohama
- Wrap-Up Meeting on 21.10.2019 at 1500 hrs at TKP Shimbashi Conference Center, Tokyo.



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Some captivating pictures from Japan



Reihoku: Entrance



Reihoku: Turbine Floor



Some captivating pictures from Japan



Reihoku: Coal yard



Hibikinada: BTG



Findings from the visit



- Government policy in Japan for necessary installation of FGD and SCR in all thermal power plants for emission control and reduction.
- Notification of area-wise norms of SO_x and NO_x emissions in consultation with local bodies and limits under the overall ambit of national policy.
- Efforts are being put in further reduction of other emissions (CCS).
- Use of biomass to the extent possible in coal fired plants.
- Insights into coal, ash and gypsum handling – salability and disposability.



Findings from the visit



- Project execution at Isogo TPS serves as a model example for replacement and upgradation projects.
- Novelty in operations – receipt of crushed coal, imported biomass, and erection of coal silos. (Hibiki-nada co-gen plant)
- High standards of quality followed in construction of plants.
- The good practices of O&M were visible in man, material and plant management.
- Stations like Reihoku are able to achieve flexibility in operations by ramping down to 15% of rated capacity on an intraday basis. The station showed ramp rates of 4%.



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Findings from the visit



- Manufacturers like MHPS provide solutions for entire gamut of efficient emission control technologies along with remote monitoring services.
- Digital transformation solutions in the energy field provided by Toshiba help in coal management, optimized load distribution, maintenance planning, fuel optimization, abnormality detection, equipment diagnosis, plant modernization etc.
- Digital transformation solutions are also available in areas as Smart use of renewable energy, virtual power plant, plant maintenance using digital twin and efficient sophisticated maintenance.
- Currently companies in Japan are working on technologies for Energy storage and Hydrogen energy.



Other observations



- Japan has nuclear and thermal plants for base load and Gas plants for peak load. The intermittent RE issue is addressed with ample gas stations and flexible operation.
- Adequate supply of good quality coal and gas.
- High quality plant equipment leading to smooth and comfortable operation.
 - Quality wise class of boiler insulation, valve condition, overall house keeping, CHP conveyor system, coal mill condition is excellent.
- Inventory and supply chain
 - Inventory of coal: 50% of yard capacity i.e. 0.2MT for 2x700 MW.
 - Capacity of OEMs to supply quickly.
 - Minimum no. of spares kept.



Other observations



- Unit overhaul of BTG is for a period of 100 days at intervals of 3 years.
- Plant maintenance is once in two years.
- Plant safety aspect
 - Non dependence on SAP/MAXIMA and usage of manual systems.
 - OSHA and ANSI compliant safety aspects like gratings, zebra painting, fire system followed.



Resourceful CCT interventions

- Coal Resources Exploration and Development
 - Exploration, mining, safety and preparation
- Coal handling and processing
 - Crushing, transportation and storage
 - Coal Gasification and Liquefaction, De-ashing and Reforming Technologies
- Coal utilization
 - Coal fired power generation technologies
 - Combustion Technologies
 - Gasification Technologies
 - Co-production Systems
- Environment countermeasures
 - Flue Gas Treatment and Gas Cleaning Technologies
 - Technologies to Effectively Use Coal Ash
 - CO₂ Recovery Technologies



Way ahead



- Planning for flexibilisation issue at boiler design stage.
- Revisiting and revamping existing O&M practices.
- Integration and differentiation – ownership, responsibility, supply, operation and maintenance, disposal.
- Address realization gap from concept to creation.

Thank you