



SEMINAR ON

# FLEXIBILISATION OF THERMAL POWER PLANTS

Learning from The German Experiences

India Habitat Centre  
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EEC MEMBERS



# Flexibilisation of Thermal Power Plants

## Learning from The German Experiences



### Introduction

The world energy scenario is undergoing a major transformation especially post COP21, which has set the pace for various economies to redefine their strategies towards energy security, sustainability and energy mix. The Indian economy with its high growth potential will guide the corresponding energy demand growth. In synonyms with its ambitious target at COP21, India has set for itself a renewable energy target of 175 GW by 2022 and gradual reduction in contribution of thermal power, particularly coal based power in its energy mix. At present coal accounts for 59% of total capacity of 330 GW and the renewables are at 17%. By year 2022 the share of coal will reduce to 41%, while the renewables will increase to 36%. This roadmap for moving to low carbon economy ushers well with India's overall commitment of meeting more than 50% demand from renewables by year 2030.

### Need for Integration of Large Scale Renewables with Thermal Power

The introduction of large scale renewables in the emerging energy transition brings along with it a new set of challenges to be managed by the power sector. The variability and intermittency of solar power and wind power has to be managed and supplemented by other sources of energy in order to ensure the system stability and security. With limited pump storage & with overall hydro potential of the country limited to 150 GW and gas sources being insufficient the coal based generation is the major option to meet and match the fluctuating requirements of the grid. In the absence of credible & affordable technologies for renewable energy storage and demand side response to pick up, the coal based power generation is likely to be the main stay in the foreseeable future and accordingly it has to adapt to the fluctuating load requirements as demanded by the system for its proper balancing and stability.

The process of integration of renewables with the thermal generation as per fluctuating renewables will become more and more crucial with further growth of renewables in the coming years. A recent study has projected that the differ-

ence between off peak demand and peak demand after discounting renewables will be 80GW. This implies that the available capacities (other than renewables) should be able to ramp up at rates exceeding 25 GW/hour.

### Adaption of Thermal Power Plants to Fluctuating Renewables

The adaption of coal based power plants to fluctuating renewables throws a new set of challenges for both existing and new thermal power plants. There is a pressing need for a total relook in the design and operational philosophies of the thermal power plants.

The PLF and efficiency are no more the key drivers and these are overruled by better flexibility of the power plants. This new requirement calls upon thermal power plant to be subjected to frequent load changes, cycling and two shift operation leading to higher fatigue and creep induced stresses. Apart from the need for higher maintenance, these additional stresses can further lead to possible failures and reduced equipment & plant life. Some of the equipments & components which are adversely affected include boiler thick walled components, turbine rotor & blades, copper components of electrical equipment etc. The various plant performance parameters too get adversely impacted. For enhancing the flexibility of existing power plants, retrofitting and upgrading of boiler, turbine, control & instrumentation and certain auxiliary systems will be necessary to meet the new requirements.

This calls upon the existing power plants which hitherto have been operating mainly on base load to under take specific studies and undertake required modifications and as well redefine the operation and maintenance practices. This in turn calls upon the need of having new set of expertise among the various power sector stakeholders.

This task of rejuvenating most of existing fleet of power plants is gigantic and the success of energy transition to renewables will also depend on the success of how effectively and efficiently the existing thermal power plants can be transformed into their new adaptation.

### EEC Members

SIEMENS



## German Experiences in Flexibilisation of Thermal Power Plants

The German power industry has much earlier witnessed the era of adaptation to renewable energy by flexibilisation of its thermal power plants and other measures like grid strengthening, demand side response, battery storage etc. Germany has already reached 50% of its total capacity from renewables. Also, the net consumption of renewable power has reached 33% of total annual power consumption. The flexibilisation of the thermal power plants has been under great focus with the intended aim of balancing and achieving stability of the power system. The potential measures have been implemented by most of the German utilities. These measures are dependent on class of technology, units size, type of fuel etc. The units are able to achieve, high technical and operational flexibility, achieving stable load as low as 20%, high operational gradients, short ramp up time, high number of start ups and load cycles, high efficiency at wide load range. The fuel flexibility has been also implemented as potential modifications to have better overall flexibility.

The collaborative efforts of utilities, research institutes and manufacturers have defined and established the systematic approach in achieving flexibilisation of German steam power plant on various measurable parameters. The new power plant designs have been developed for better flexibilisation and certain new concepts having been introduced and implemented.

The German power industry has gained extensive experience in enhancing flexibilisation of their thermal power plants. This experience is very relevant to the transformation of our thermal power plants to meet the new emerging scenario in the Indian Power Sector.

## Indo – German Joint initiatives at Government Level and Role of EEC

The Ministry of Power, Government of India has given very high priority to the emerging requirement of Enhancing Flexibility of Thermal Power Plants. This is why in May, 2016 Ministry of Power, Government of India and Ministry for Economic Affairs and Energy, Government of Federal Republic of Germany decided that the Flexibilisation of coal fired power plants to adapt to fluctuating renewable energy generation is a priority issue for the ongoing energy dialogue between both countries. Immediately, a task force Chaired by Director (Operations) from NTPC Ltd, Mr. K K Sharma was established with members from CEA, EEC, POSOCO, BHEL on Indian side and members from VGB, and IGEF on German side. The task force decided to concentrate on the following three aspects:-

1. Study on the technical feasibility of flexibilisation measures in the Indian power sector.

2. To identify requirements for capacity building
3. Analyse the present framework conditions for a flexible operation of conventional power plants. The task force has been actively engaged on these tasks and has made noticeable progress on the above initiatives.

## Study on Flexibilisation of Thermal Power Plants by German Experts

The Indo-German task force set up for Enhancing Flexibility of existing thermal power plants to adapt to fluctuating renewable energies' prioritised their focus on the aspect of "Studying the feasibility of flexible operation of coal fired plants" in the country. For this study two plants of NTPC namely Dadri & Simhadri were identified as reference plants. The German Expert team visited these power plants in December, 2016 and March, 2017. A number of interactive meetings between the German and Indian Power experts helped in identifying and addressing the key concern area. The German experts have completed their findings and the report is under the process of its finalisation.

## Study Tour to Germany

Under the aegis of Ministry of Power, Government of India a study tour on "Enhancing the flexibility of steam power plants to adapt to fluctuating renewable energies" was organized jointly by the Excellence Enhancement Center (EEC) for the Indian Power Sector, the European Technical Association For Heat and Power Generation (VGB) and the Indo-German Energy Forum (IGEF). A 21 members team representing 12 organizations from Indian Power Sector participated in the week long program at Berlin and Leipzig, Germany from September 18 - 25, 2016.

A similar study tour of the power sector stakeholders on the subject has been programmed for this year beginning 29 October, 2017 to 5 November, 2017.

## Present Seminar

The present seminar on "Flexibilisation of Thermal Power Plants to Fluctuating Renewable Energies - The German Experiences" has been jointly organized by Excellence Enhancement Center (EEC) and Indo –German Energy Forum (IGEF) with the technical support of the European Technical Association for Heat and Power Generation (VGB) to bring before Indian Power Sector the state of the art in this field.

The seminar will draw upon the experiences of German Power Industry in this field for almost two decades and will cover the various aspects related to technology, implementation process, difficulties and lesson learnt and current best practices. The seminar will also show-case the study carried out at the Indian reference plants along with key findings and recommendations by the German Experts.

### EEC Members





German Expert Team at NTPC Dadri & Simhadri Power Stations during Flexibilisation Study

## Methodology & Faculty

The program will be delivered through presentations by various German Experts, interactive discussions and case studies. The German Experts will be drawn from VGB and its member organization with their rich and long experiences in this field who will share their experiences.

## Registration

Details of participants may be sent preferably three weeks in advance of commencement of the program in the attached registration form along with the requisite program fee to the EEC Office address.

## About EEC

Excellence Enhancement Centre (EEC) for Indian Power Sector was conceptualized as part of bilateral cooperation between Govt. of India and Govt. of Federal Republic of Germany and was set up through an Implementation Agreement between BEE & CEA, Ministry of Power, GOI and GIZ, Germany under the Indo German Energy Programme (Phase II), to promote dialogue in the area of Energy Efficiency and Energy Security. It was registered as a non-profit society under the Indian Societies Registration Act 1860 and started functioning from February 2012.

## Who Should Attend

The program is designed for Senior & Middle level executives, all those involved in the power plant design & engineering, operation & maintenance, renovation & modernization, erection & commissioning, commercial management, system operators, discoms, technology provider, product and solution providers, policy makers, regulators and others.

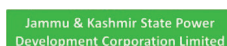
**Venue:** India Habitat Centre, New Delhi.

**Date:** 1st December, 2017

**Duration:** 9.00 am to 6 pm

**Seminar Fee:** Rs 10,000/-+Applicable GST per participant.

- Seminar Fee to be paid by Cheques / Demand Draft drawn in favour of "Excellence Enhancement Centre for Indian Power Sector" payable at New Delhi.
- EEC Member Organisations-Two Delegates Free and Subsequent Delegates are entitled for 20% Discount.



## EEC MEMBERS

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