



SEMINAR ON

Adaptation of Thermal Power Plants to Fluctuating Renewable Energies

THE GERMAN EXPERIENCES

Hotel Hyatt Regency, New Delhi
16th December, 2016

EEC Members





Adaptation of Thermal Power Plants to Fluctuating Renewable Energies

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 and energy mix. The Indian economy with 7% growth is currently the fastest growing economy in the world with its corresponding energy demand growth. In synonims with its ambitious target at COP21, India has set for itself a renewable energy target of 175GW by 2022 and gradual reduction in contribution of thermal power, particularly coal based power in its energy mix. At present coal accounts for 62% of total capacity of 300 GW and the renewables are at 14%. 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.



Fluctuations in off peak & peak demand after discounting solar energy
80GW

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 100 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 and affordable technologies for renewable energy storage, 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 indicated that the difference between off peak demand and peak demand after discounting solar energy will be 80GW. This implies that the existing capacities (other than renewables) should be able to ramp up or ramp down the generation by 80GW in a span of less than three hours.

Adaptation 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. These can further lead to possible failures and reduced equipment and 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, retro-

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fitting 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 mainly depend on the success of how effectively and efficiently the existing thermal power plants can be transformed into their new adaptation.

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. 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 on Indian side and members from VGB, and IGEF on German side. The task force decided to concentrate on the following three aspects :-

- i. Study on the technical feasibility of flexibilisation measures in the Indian power sector.
- ii. To identify requirements for capacity building
- iii. Analyse the present framework conditions for a flexible operation of conventional power plants.

While the task force is actively engaged on these tasks, the following initiatives are also in progress.



Germany has already reached **50%** of its total capacity from renewables





Members of Indian Delegation at Lippendorf Power Plant, Germany- Sept., 2016

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.

Present Seminar

As a further initiative under the aegis of Ministry of Power, Government of India the present seminar on “Adaptation 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.

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 will share their experiences.



21
members
team
representing 12
organizations
from Indian
Power Sector
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the week long
program

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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 : Hotel Hyatt Regency, New Delhi.

Date : 16th December, 2016

Duration : 9.30 am to 6 pm

Seminar Fee : Rs 10,000/- + Applicable Service Tax 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.

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 bi-lateral 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.

Aims & Objectives of EEC

- To promote Peer to Peer cooperation between Indian Power Sector Stakeholders.
- To provide a platform for the top Experts in Power Sector
- To share best practices in all areas of power sector and provide broad based expertise.
- To identify challenges for power sector.
- To create a "Technical Discussion Forum"
- To promote policy initiatives of MOP, GOI
- To facilitate bilateral cooperation in the Indian Power Sector.
- To engage pro-actively with foreign organizations such as VGB Germany, for Technical know-how, Expertise, Consultancy, Studies and Reviews.
- To raise awareness for the need of excellence in Power Sector

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About VGB

VGB Power Tech e.V. is the European technical association for power and heat generation. The association is based on a voluntary membership of companies active in the field of power and heat generation. Currently 488 companies (operators, manufacturers and other power related institutions) from 35 countries are members of the VGB. They represent an installed capacity of 4, 61,000 MW. The objective of the VGB is to promote and optimize the operational safety and environmental compatibility as well as the availability and economy of existing and new build power plants. These plants comprise the complete energy conversion chain: thermal, renewable and nuclear power generation. Visit VGB at www.vgb.org

35 countries are members of the VGB represent an installed capacity of **4,61,000 MW**

VGB Support to EEC

VGB has supported the vision of an expert platform in the Indian Power Sector since it was created under the Indo-German Energy Forum. VGB is the part of the core group that developed the concept. Thus VGB supports GIZ with technical experience to bring the EEC into a lively platform for the Indian Power Sector. A Memorandum of Understanding between VGB and CEA was signed in 2010 for the successful Indo-German cooperation in EEC project. VGB acts as the point of contact for EEC to access the German power generation industry and provides detailed A to Z information about the energy supply in Germany, which also comprises the coordination of the exchange of experiences from the German side

About Indo-German Energy FORUM

To enhance and deepen the dialogue about relevant energy issues, the German Chancellor and the Indian Prime Minister established the Indo-German Energy FORUM (IGEF) at the Hannover Fair in April 2006. The IGEF, in its tenth year of operation, aims at initiating strategic cooperation projects between German and Indian governments, institutions and the private sector.

The high level steering committee of the IGEF, the so called FORUM, takes place annually and provides a platform for high-level policy makers and representatives from industry associations, financial institutions and research organizations from both India and Germany. A Support Office (SO) for the FORUM has been established to provide liaison services for all stakeholders. It serves as a first point of contact for both the Indian and German governments as well as for the companies seeking to get involved in the process.

Within different sub groups, several task forces have been set up to devise and implement specific cooperation projects such as the flexibilisation of coal fired power plants.

List of the major projects undertaken by the IGEF-Support Office:-

- Harmonisation of the tender documents for the rehabilitation and modernization of the thermal power plants in India
- Repowering of the old wind power projects in India
- Overview study of the renewable energy market in India
- Preparation of the Trigen Map to show the potential of the trigeneration technology across various India cities
- Overview study of the promotional schemes for demand side energy efficiency
- Market potential study for the Organic Rankine Cycle technology in India
- Overview study of the Technology and Service opportunities in the off-grid renewable energy sector in India
- Creation of the Excellence Enhancement Centre to promote energy efficiency and energy security in the Indian Power Sector

Excellence Enhancement Centre for Indian Power Sector

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