



GOVERNMENT OF INDIA
MINISTRY OF POWER



Tour Report



Study Tour including a visit of the VGB Congress “Power Plants 2016”

Adaptation of thermal power plants to fluctuating renewable energies

Flexibility Study Tour, September 18–25, 2016, Berlin and Leipzig, Germany

Supported by:



Introduction

The study tour on “Enhancing the flexibility of steam power plants to adapt to fluctuating renewable energies” was organised by the Excellence Enhancement Centre (EEC) for the Indian Power Sector, the European Technical Association for Heat and Power Generation (VGB), and the Indo-German Energy Forum.

Around the globe, centralised, fossil-based energy systems are being transformed into decentralised ones with a strong focus on renewables. In Germany, the success of the energy transition, in which renewable energies will account for a larger share of the energy mix, hinges upon system stability being achieved. A flexible conventional power plant fleet is an essential part of that equation. Indeed, given that more than 30 percent of Germany’s electricity consumption is already covered by renewable energy sources – mainly wind and solar – flexibility now overrules efficiency in power plants.

The study tour program provided participants with both an insider view of the German energy market and concepts to manage energy systems in which the share of renewables is growing. In particular, the tour program focused on technical measures that give thermal power plants the flexibility to reduce the minimum load, to increase start-up and shut-down times as well as ramp rates and to comply with availability and environmental requirements. Participants also had the opportunity to become acquainted with the challenges and solutions presented by e-mobility, another important pillar of the energy transition process in Germany.

Overview of the study tour

Monday, September 19, 2016

- Flexibility Workshop at the Vattenfall office in Berlin

Tuesday, September 20, 2016

- Visit to the municipal utility of Leipzig
- Visit to the BMW-production-facility of the electric cars i3 and i8
- “India Meet and Greet” event in the course of the VGB Congress
“Power Plants 2016” exhibition

Wednesday, September 21, 2016

- Visit to the VGB-Congress “Power Plants 2016”

Thursday, September 22, 2016

- Visit to the VGB-Congress “Power Plants 2016”

Friday, September 23, 2016

- Visit to the power plant Lippendorf

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Pictures by Michael Setzpfandt

Participants

The delegation was composed of persons from official institutions as well as public and private companies. Delegates from China and South Africa also participated in the study tour as part of the bilateral energy co-operation with the German government.

Name	Designation	Institution or Company	Country
B.K. Sharma	Chief Engineer	Central Electricity Authority (CEA), Thermal Performance Evaluation & Climate Change (TPE&CC)	India
S.K. Kassi	Director	Central Electricity Authority (CEA), TE&TD	India
Shubha Sharma	Secretary	Central Electricity Regulatory Commission (CERC)	India
Ravi Parkash Tripathi	Member Thermal	Damodar Valley Corporation (DVC)	India
Manabrendra Biswas	Additional Secretary	Damodar Valley Corporation (DVC)	India
Jacob Mbele	Chief Director of Electricity	Department of Energy, South Africa	South Africa
Makololo	Acting Deputy Director General for Energy	Department of Public Enterprises, South Africa	South Africa
Xiaojie YANG	Professor level Engineer	Electric Power Planning & Engineering Institute (EPPEI), China	China
Junchun ZHANG	Senior Engineer	Electric Power Planning & Engineering Institute (EPPEI), China	China
Om Parkash Maken	Chief Executive Officer (CEO)	Excellence Enhancement Centre (EEC)	India
Jens Jaspert	Translator	GIZ	Germany
Paul Recknagel	Senior Project Manager	GIZ China	China
Dr. Sascha Thielmann	Director	GIZ South Africa	South Africa
Vipin Bihari Bansal	Chief Engineer	Haryana Power Generation Corporation Ltd.	India
Tobias Winter	Director	Indo-German Energy Forum Support Office	India
Hartbreet Singh Pruthi	Director	Ministry of Power	India
Swaminathan Pandarasivan	Chief Manager	NLC India Limited	India
Vittoba Ramakrishnan	Chief Manager	NLC India Limited	India
Thangapadian Vaithilinganadar	Director	NLC India Limited	India
Yougaraj A. Nadar	Chief Manager	NLC India Limited	India
K.N. Reddy	AGM	NTPC Limited	India
Ashish Agarwal	DGM (O&M / C&I)	NTPC Limited	India
Liladhar Pandey	DGM (O&M / TMD)	NTPC Limited	India
Subhajit Ghosh	General Manager	NTPC Limited	India
Bhaskar Singha	Deputy General Manager	NTPC Limited	India
Debasish Chattopadhyay	General Manager O&M	NTPC-SAIL Power Company Private Ltd.	India
Saurabh Kumar Mehta	Deputy General Manager	Steag Energy Services (India), Pvt. Ltd	India
Ashoke Kumar Lodh	Head Operations	Tata Power Co. Ltd.	India
Dr. Claudia Weise	Project Manager	VGB PowerTech e.V.	Germany
Santanu Basu	Chairman and Managing Director	West Bengal Power Development Co. Limited	India

September 19, 2016 – Flexibility Workshop

Agenda

Session 1: Introduction and Welcome

- 9:00 Welcome
Günter Heimann, Vattenfall Europe Generation AG
- 9:10 Special Address
Wolfdieter Böhler, Federal Ministry for Economic Affairs and Energy
- 9:20 Introduction into the Indian Energy Market
Indian Representative
- 9:50 Introduction into the German Energy Market
Dr. Claudia Weise, VGB PowerTech e.V.
- 10:15 Coffee Break
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Session 2: Experiences in planning and operating flexible thermal power plants

- 10:45 Adapting existing power plants to new market conditions
Günter Heimann, Vattenfall Europe Generation AG
- 11:15 Flexibility of new and optimized fossil fired Power Plants
Dr. Jörg Walter, RWE Technology International GmbH
- 11:45 GKM – Operating a coal fired CHP-power plant in an urban area
Dr. Matthias Meierer, Grosskraftwerk Mannheim AG
- 12:15 Lunch
- 13:15 Flexible operation of fossil assets in response to changing markets
Doug Waters, Uniper Kraftwerke GmbH
- 13:45 Flexibility options – from power plant technology to latest storage solutions
Dr. Dirk Schettler, STEAG Energy Services GmbH
- 14:15 Coffee Break
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Session 3: Training of power plant personnel

- 14:45 Training strategies and concepts for power plant personnel
Horst-Günther Stürenburg, Team Co-ordinator Simulator Training, Kraftwerksschule e.V.
- 15:15 Flexibility: how to adapt to new requirements – training approach and practical insights
Horst-Günther Stürenburg, Team Co-ordinator Simulator Training, Kraftwerksschule e.V.
- 16:00 Closing Remarks



Key learnings:

- The profitability of conventional power plants, even on marginal costs, has deteriorated because of lower prices and reduced operating hours.
- Grid extension should accompany any increase in the share of renewables in the energy mix.
- Many technical measures to enhance the flexibility of thermal power plants have already been applied with success. The focus should turn to:
 - Optimising of site load minimum – dis-connect combustion and milling (e.g. dry lignite burners)
 - Extending of operational load range
 - Increasing load gradients
 - Shortening start- & shut-down times
 - Enhancing part load efficiency
 - Evaluating the impact of flexible operation on a component's lifetime
 - Efficiently managing coal stock and by-products
 - Storage options (e.g. batteries)
- The R&D-focus has been shifted towards:
 - New materials for thin-walled flexible components
 - New measurement methods and IT-based monitoring to assess the life consumption and to prevent highly stressed components being damaged
 - Predictive Maintenance: monitoring of components using big data



1. Stadtwerke Leipzig

Stadtwerke Leipzig GmbH (SW Leipzig) is one of the largest municipal utilities in Germany, measured in terms of turnover. This energy service provider pursues a multi-utility approach, and owes its market leader position in a growing city to efficient and environmentally friendly power generation. Its subsidiary GPEC, part of the company's operations in Poland, is market leader in the supply of heating to the region around the northern Polish city of Gdansk. SW Leipzig is a wholly owned subsidiary of LVV Leipziger Versorgungs- und Verkehrsgesellschaft mbH, Leipzig (LVV).

Key learnings:

- Product portfolio of SW Leipzig (Power generation, distribution, load management and dissemination of renewable installation/generation, scheduling, balancing, energy forecasting, gas, district heating, solar generation, biomass)
- German power market and its products including market for control energy
- Power Trading
- How it feels to test drive the BMW i3



2. BMW Production Facility

More than 850 premium standard BMW vehicles are produced at the Leipzig plant with the aid of highly qualified employees and innovative production technology. Around 100 of these cars are the electric vehicles belonging to the BMW i-series. The BMW i3 has a high-voltage (94 Ah) battery (lithium-ion high-voltage battery) with a NEDC range (New European Driving Cycle) of up to 300 km (200 km in everyday operation).

Key learnings:

- Germany is intensifying its efforts to increase the number of electric vehicles to 1 million in 2020 from 30,000 today.
- The battery, production technologies, and respective infrastructure are some of the major technical challenges.



3. "India Meet and Greet" event

An "India Meet and Greet" event was organised as part of the Get-Together at the VGB Congress, with the aim of exchanging information and sharing experiences about the Indian and European energy markets. Prominent speakers from India (Harpreet Singh Pruthi, Ministry of Power; Shubba Sharma, Central Electricity Regulation Commission) and from the VGB (Dr. Bernhard Fischer, Chairman of the VGB Board; Dr. Oliver Then, Head of Power Plant and Environmental Technologies of VGB) talked about areas of energy co-operation between India and Germany.



September 21, 2016 – VGB Congress “Power Plants 2016”

Plenary Sessions

“NEW HORIZONS: NAVIGATING THE POWER INDUSTRY IN TIMES OF CHANGE”

The role of energy supply in the industry 4.0

Dr. Jörg Rothermel, Member of the Management at the German chemical industry association VCI – Verband der Chemischen Industrie e. V.

Security of supply – “Cinderella” of the European energy transition?

Hans ten Berge, EURELECTRIC, Belgium

“FUTURE ENERGY SUPPLY WITHOUT FOSSIL FUELS?”

Chair: Sonja van Renssen, ep energy post, Belgium

Decarbonisation as a future duty!

Ulrich Benterbusch, Head of Subdivision Efficiency and Heat in Industry and Households, Sustainable Mobility, Federal Ministry for Economic Affairs and Energy, Germany

Change management in connection with industry transformation processes

Jens Baier, Boston Consulting Group, Germany

National emission reduction = global climate protection?

Dr. Frank Umbach, Research Director of the European Centre for Energy and Resource Security (EUCERS), King’s College, United Kingdom

The VGB Initiative Hgcap

Dr. Oliver _ en, Head of Power Plant Technologies, VGB PowerTech e.V.

GUIDED TOUR THROUGH THE EXHIBITION

The following companies provided insights into activities in the Indian Market:

GE, DURAG, Siemens, STEAG, VPC, and Wallstein



September 22, 2016 – VGB Congress “Power Plants 2016”

Extract from the congress program

Integrating renewable power plants with battery storage

Riccardo Amoroso, ENEL Green Power, Italy

Large scale storage options under special consideration of 6 x15 MW battery example

*Dr. Wolfgang A. Benesch, STEAG Energy Services GmbH,
and Christian Karalis, STEAG GmbH, Germany*

Peaking plant Bayonne (New Jersey): A flexible solution to support a volatile grid

*Shawn Picard, Ethos Energy Group PPS, USA,
and Tobias Aschoff, Siemens AG, Germany*

The value of flexibility for fossil fuel power plants under the conditions of the German Electricity Market 2.0

Sascha Lüdge, Vattenfall Europe Generation AG, Germany

Meeting the BREF limits – Technological solutions for new and existing plants

Dr. Matthias Jochem, Mitsubishi Hitachi Power Systems Europe, Germany

Improving merit order position by reducing start-up costs

Gerhard Heinz, GE Power AG, Germany

Overview on measures to increase flexibility in existing coal fired power plants and economic assessment

*Udo Gade, Vattenfall Europe Generation AG,
and Jörg Böwe, Mitsubishi Hitachi Power Systems Europe, Germany*



September 23, 2016 – Visit to the Lippendorf Power Plant

About the power plant

The first unit was connected to the grid for the first time in June 1999, with the second connection to the power system following six months later. With an investment volume of approx. 2.3 billion Euros, the building of the Lippendorf power plant was the largest private construction project realised after 1990 in the Free State of Saxony. Environmental protection standards were also set. Compared with the specific emissions of the old plants (reference year being 1990), the following reductions could be reached for each kilowatt hour supplied to the power system: 44.6% for carbon dioxide, 99% for dust, 98% for sulphur dioxide and 73% for nitrogen dioxide.

Other important technical power plant data:

Unit

Rated capacity (gross): 920 MW

Steam boiler

Number: 1 each – Once-through forced flow

Steam output: 2,420 t/h

Live steam pressure: 267.5 bar

Live steam temperature: 554 °C

Turbine

Number: 1 each

Construction: Five-cylinder condensing turbine

Generator

Apparent power: 1,167 MVA

Nominal voltage: 27 kV

Cooling tower

Number: 1 each – Natural draught wet

Height: 174.5 m

Cooling water flow: 84,600 m³/h

Flue gas cleaning

Dedusting: Electrostatic precipitator

Denitrification: By primary measures at the firing system

Desulphurisation: Unhydrated lime wet washing process



The Plant Manager Christian Rosin accompanied the delegation on the tour through the plant and answered numerous questions during and after the plant visit.



And last but not least...

Some time to visit important places in Germany





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