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GOVERNMENT OF INDIA  
MINISTRY OF POWER

## AGENDA

# COAL GENERATION FLEXING OPERATIONAL PRACTICES TO SUPPORT VARIABLE RENEWABLE ENERGY INTEGRATION WORKSHOP

## GREENING THE GRID PROGRAM

COORDINATED BY  
**UNITED STATES ENERGY ASSOCIATION**  
FUNDED BY  
**U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT**  
UNDER  
**GREENING THE GRID/INDIA**

**March 8, 2018**

**Power Management Institute  
NTPC Limited, Sector 16-A  
Noida, India**



## GREENING THE GRID/INDIA

USAID's Greening the Grid is a five year program implemented in partnership with India's Ministry of Power (MOP) under the U.S.-India partnership to Advance Clean Energy Deployment (PACE-D). This program aims to support the Government of India's (GOI) efforts to manage large-scale integration of large Renewable Energy (RE) into the grid. The program combines the following three components:

- Power system planning reforms and targeted analysis for large RE parks and RE integration pilots
- Renewable Integration and Sustainable Energy (RISE) initiative to implement innovation pilots to improve the integration of RE
- Peer-to-Peer exchanges between U.S.-India system operators and regulators

Under the U.S.-India System Operators Partnership, the U.S. Energy Association is implementing a series of activities to support the GTG program targeting system operators from the national, regional and state load dispatch centers and other stakeholders. It will focus on sharing transmission system operation and planning best practices for large-scale variable renewable energy (VRE) integration into the power grid.

## WORKSHOP GOAL & OBJECTIVES

### **Workshop Goal:**

This one-day workshop in New Delhi, India aims to discuss coal flexing operational practices, infrastructure improvements and damage mitigation techniques to confront impacts caused by flexing. In most of the world, coal power plants are designed to run at constant output, and electric utilities typically claim that ramping and cycling reduces efficiency, increases costs, lowers equipment lifetime, and is generally ill-advised or even impossible. However, in a number of countries, such ramping and cycling has long been considered normal practice. In countries such as India with high coal dependence but ambitious goals for integration of variable renewable energy, "hourly ramping" and "daily cycling" of coal power plants, that is, varying their output over a wide range during the day and on a daily basis, and even shutting them down, is becoming an increasing operational necessity.

### **Workshop Objective:**

The objective of this one-day bootcamp workshop is to advance participants' knowledge of coal flexing generation operational improvements and mitigation techniques to confront impacts. During the one-day training, delegates will discuss:

- Operational modifications to existing coal plants to increase their flexibility to allow for increased load gradients (ramping rates), reduced minimum stable outputs, faster startup (from zero output)
- Infrastructure improvements that can be made to coal generators, including control software and equipment
- How to accurately measure and minimize operation and maintenance (O&M) impacts

Participants will develop action plans for expanding coal generation flexing and a proposed timeline for achieving highlighted strategies and next steps.

## ORGANIZERS

**Ms. Sara Burback**  
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## SPEAKERS

### **Dr. Colin Henderson**

#### ***Expert Advisor, International Energy Agency (IEA) Clean Coal Centre (CCC)***

Dr. Colin Henderson has worked at the IEA CCC as an analyst and author for over 15 years. Previously with British Coal's Coal Research Establishment (CRE) for more than 20 years, Colin worked on technology reviews and techno-economic and financial assessments of the major coal utilization systems for power generation. He is familiar with all the major coal power station processes, such as supercritical pulverized coal and gasification combined cycles. He currently works as an expert advisor to the IEA CCC. Colin graduated from the University of Oxford with a degree in chemistry and was awarded a PhD from the University of Hertfordshire in physical chemistry.

### **Mr. Douglas Hillerman**

#### ***Principal Engineer, Intertek***

Mr. Hilleman has 47 years of experience in the power industry as an engineer/supervisor/manager. Experience includes general boiler design including auxiliary equipment; powerplant operations and maintenance; boiler and balance of plant; plant reliability improvements; and process management, improvements and forensic including claims. He has most recently worked as the Principal Engineer Eastern Region Technical Manager and Senior Project Manager, addressing all aspects for Cost of Cycling Team including: marketing, engineering analysis of cost, design, and operation of plants for cyclic duty, plant inspections for damage assessment, plant subject matter expert interviews, countermeasures for cycling damage, and design alternatives including cost benefit analysis with the final reporting and presentations to the customers.

### **Mr. Mahesh Kendhe**

#### ***Marketing & Strategy Leader, GE Power – Steam Power System***

Mr. Mahesh is responsible for GE Power India's Marketing & Strategy function for steam plants and related services based out of Noida. Mahesh specializes in power plant operation, maintenance, economics and all aspects of strategies related to new builds as well as large and complex brown field retrofit projects aimed at improving efficiency, flexibility and emission reduction in power plants. A mechanical engineer with a MBA with more than 22 years' experience in the power sector, Mahesh has worked in power plant operation/ maintenance, sales and marketing, techno-commercial tendering, contract management, product management, integrated life cycle management, economic modelling, value modelling, and the regulatory function in the field of power generation industry.

### **Mr. Bernd Okkels**

#### ***Head of Instrumentation and Control, Ramboll Power Generation***

Mr. Bernd Kim Okkels has worked with engineering, procurement and construction of power plants and offshore wind farms for 20 years, primarily as project manager and head of department. Mr. Okkels started his career executing power plant projects with responsibility for electrical equipment, instrumentation and control systems. Mr. Okkels has comprehensive experience with development, maturation, execution and commissioning of offshore wind farm projects with special focus on grid connection. He has worked with operation and maintenance of electrical and SCADA assets for offshore wind farms and developed contingency plans enabling fast repair of HV-equipment and marine cable faults.

**Mr. Volker Schuele**

***Manager of Coal Plant Flexibility, GE Power - Germany***

Mr. Schuele has worked at ABB, Alstom, GE for more than 25 years, serving as the Manager Plant Engineering, Director of R&D, Director for Product Management and currently, for coal plant flexibility. He works on improving existing coal fired plants worldwide in terms of efficiency and flexibility. He worked in close cooperation with major utility customers on identifying and implementing cost effective improvement measures of power plants.

## AGENDA

- 9:30 am Welcoming tea & registration
- 9:30 am Completion of pre-workshop evaluations
- 10:00 am Inaugural session  
*Moderated by Ms. Sara Burback – USEA*
- 10:00 am Welcome, Introductions of speakers and participants  
*Moderated by Ms. Sara Burback – USEA*
- 10:20 am Welcoming remarks  
Mr. C.V. Anand, ED (OS), NTPC
- 10:30 am **Current Status & Challenges of GTG Coal Flexing Pilot**  
*Speaker: NTPC Ltd. Mr. A.K.Sinha*
- 11:30 am **Coal Flexing Operational Practices: Session One**  
*Mr. Doug Hilleman, Principal Engineer – Intertek*  
*Mr. Mahesh Kendhe, Marketing & Strategy Leader – GE*  
*Mr. Volker Schuele, Manager of Coal Plant Flexibility – GE*
- Firing systems
    - Changes in mill operation
    - Decoupling coal grinding from firing
    - Monitoring of furnace conditions
  - Pressure parts
    - Designing for faster load changes
    - Reducing a boiler's minimum load capability
  - Plant configuration options
- 12:30 pm Group photo followed by lunch
- 1:30 pm **Coal Flexing Operational Practices: Session Two**  
*Mr. Bernd Okkels, Head of Instrumentation and Control – Ramboll Power*  
*Mr. Doug Hilleman, Principal Engineer – Intertek*
- Improving control systems and instrumentation
    - Various improvements to boiler, turbine, and plant control systems
  - Challenges and setbacks
    - Plant modifications for cycling – how to quantify
  - Cost comparison
- 2:30 pm Q&A
- 2:45 pm Tea break
- 3:00 pm **Roundtable Discussion: Coal Flexing Damage Mitigation**  
*Led by Dr. Colin Henderson, Expert Advisor – IEA Clean Coal Centre*

- Changing operation and maintenance strategies
- Preventative maintenance and condition monitoring
- Maintaining high reliability and economic viability

- 3:30 pm Participants divide into small groups to discuss coal flexing issues faced in their jobs and prepare action plan with steps on making their coal plant more flexible.
- 4:30 pm Representatives from each group will present their action plans and participate in roundtable discussion to present action plan and discuss next steps  
*Led by speakers*
- 5:15 pm Complete workshop evaluation & return evaluations to Sara Burback, USEA
- 5:30 pm **Adjourn**