

**Sixth Policy and Implementation Committee Meeting  
Vancouver Canada 29-30 October 2008**

# **Asia Pacific Partnership (APP) Power Generation and Transmission Task Force**



**Jarad Daniels, U.S. Department of Energy  
Chair, APP Power Generation and Transmission Task Force**

# APP Power Generation & Transmission Task Force

## Major task statements:

- Identification and Implementation of Applicable Best Practices for:
  - Power Generation
  - Transmission & Distribution
  - Demand Side Management
- Information Sharing Consistent with Clean Development and Climate Change

# Power Generation Best Practices

## American Electric Power (AEP) Site Visit

- **First event, held in Fall 2006**
- **100 attendees from 6 inaugural APP nations, including 40 Chinese and 33 Indians**
- **High-level AEP Corporate and U.S. Government Participation**
- **Two Technology Tracks**
  - Existing Plants – discussed best practices for efficiency and O&M at two AEP power plants
  - Advanced Power Generation
    - discussed AEP’s plans for new ultra-supercritical p.c. and IGCC power plants
    - visited DOE’s/Southern Company’s Power System Development Facility and 260-MW Tampa Electric Polk IGCC Plant
    - met with all major IGCC technology providers (GE, GTI/Synthesis Energy, Shell, and Siemens)



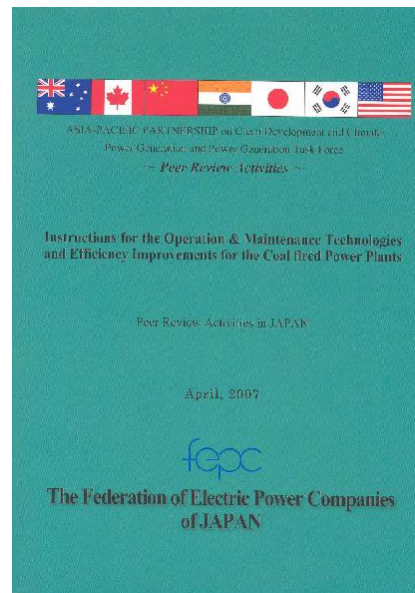
# Power Generation Best Practices

## Japanese Peer Review

- **Japan proposed to lead, with U.S. support from the Edison Electric Institute, a series of peer reviews for existing coal-fired plants**
  - Open discussions among plant engineers on best practices for power plant efficiency and O&M
  - Development of efficiency improvement check list
  - Development of power plant design and operations handbook (“Green Book”) for wider dissemination of accumulated knowledge
- **Initial review hosted by Japan’s Ministry of Economy, Trade and Industry (METI) and Federation of Electric Power Companies**
  - About 50 participants, mostly plant engineers, from over 40 different organizations from all 6 inaugural APP countries during 16-19 April 2007

# Power Generation Best Practices Japanese Peer Review

- Format:
  - “Classroom” discussions
  - Power plant visits (3)
- Reviewed and discussed
  - Plant operation management
  - Turbine maintenance
  - Boiler water chemistry
  - Environmental protection
  - Ash recycling
- Developed initial efficiency review sheet and improvement checklist



FEPC's "Green Book"

Country	Company	Plant Name	Asia-Pacific Partnership Peer Review Activities	Review No.	Date	Page
JK	JY Power	JJA Power Station	ASIA-PACIFIC PARTNERSHIP Peer Review Activities EFFICIENCY REVIEW SHEET			
B-7	Boiler Casing	Air leakage into the furnace (from manholes, ducts, expansion joints, etc.)				

<p><b>2. Recognizing the current situation</b></p> <p><b>2-1. Graphical Description</b></p>	<p><b>3.4. Findings during the minor outages, operation, and the recent</b></p> <p>3.4.1. Description of the problem (including the location and the extent of the problem)</p> <p>3.4.2. Description of the cause (including the location and the extent of the problem)</p> <p>3.4.3. Description of the effect (including the location and the extent of the problem)</p> <p>3.4.4. Description of the countermeasures (including the location and the extent of the problem)</p> <p>3.4.5. Description of the results (including the location and the extent of the problem)</p>
<p><b>2-2. Phenomenon (Efficiency/Function)</b></p> <p>2-2-1. Phenomenon (Efficiency/Function)</p> <p>2-2-2. Countermeasures and Results</p> <p>2-2-3. Observed furnace hopper size</p> <p>2-2-4. Countermeasures and Results</p> <p>2-2-5. Expansion joint pitting</p> <p>2-2-6. Air leakage of the HV electrical</p> <p>2-2-7. Bleeding of air leakage area shafts</p> <p>2-2-8. EP fuel conversion setting</p> <p>2-2-9. EP fuel conversion setting</p>	<p><b>3-5. Physical Causes</b></p> <p>3-5-1. Degradation of man-hole sealing</p> <p>3-5-2. Corrosion of furnace hopper size</p> <p>3-5-3. Corrosion of furnace hopper size</p> <p>3-5-4. Expansion joint pitting</p> <p>3-5-5. Bleeding of air leakage area shafts</p> <p>3-5-6. EP fuel conversion setting</p> <p>3-5-7. EP fuel conversion setting</p>
<p><b>3-1. Countermeasures and Costs</b></p> <p>3-1-1. Countermeasures</p> <p>3-1-2. Costs</p>	<p><b>3-2. Schedule</b></p> <p>3-2-1. Countermeasures</p> <p>3-2-2. Costs</p>
<p><b>7. Estimating the efficiency recovery (if applicable)</b></p> <p>7-1. Efficiency recovery (if applicable)</p> <p>7-2. Efficiency recovery (if applicable)</p> <p>7-3. Efficiency recovery (if applicable)</p> <p>7-4. Efficiency recovery (if applicable)</p>	<p><b>8. Recommended OAM Procedure Improvements</b></p> <p>8-1. Recommended OAM Procedure Improvements</p> <p>8-2. Recommended OAM Procedure Improvements</p> <p>8-3. Recommended OAM Procedure Improvements</p> <p>8-4. Recommended OAM Procedure Improvements</p>

FEPC's Efficiency Review Sheet

# Power Generation Best Practices Indian Peer Review

- Organized by Ministry of Power and NTPC in February 2008
- Participation by 150 mainly power plant engineers and management from 6 inaugural APP countries
- Visits to:
  - NTPC's National Capital Thermal Power Project at Dadri
  - Rajasthan's Kota Thermal Power Station
- Reviewed operations using checklist developed during Japanese Peer Review
- Identified opportunities for efficiency improvement



NTPC's Dadri  
Power Plant



Opening Session of Indian Peer Review

# Power Generation Best Practices

## U.S. Peer Review

- Hosted by Alliant Energy Corporation during 28 April to 2 May 2008
- Organized with support from Edison Electric Institute
- 90 participants from China (2), Japan (30), India (6), Korea (9), and USA (43)
- Visits to 2 Alliant power stations:
  - Edgewater: 70-MW & 340-MW cyclone-fired boilers, and 400-MW pulverized-coal wall-fired boiler
  - Columbia: Two 500-MW pulverized-coal tangential-fired boilers
- Reviewed operations using checklist



Alliant's Columbia Station



Checklist Review



Alliant's Edgewater Station

# Power Generation Best Practices

## U.S. Peer Review



- Presentations and discussions on many advanced technologies:
  - Applications of neural networks to Distributed Control Systems (DCS)
  - Combustion optimization utilizing data mining techniques
  - Computational fluid dynamics (CFD) boiler modeling to optimize over-fired air system design as part of emissions control system
  - Mercury reduction using carbon injection
  - Computerized maintenance planning program and cost tracking
  - Case study of condenser air in-leakage

# Power Generation Best Practices

## Australian Brown Coal Peer Review

- Hosted by Department of Resources, Energy, and Tourism and National Generators Forum (NGF) in Melbourne during 23-27 June 2008
- Visit Loy Yang and Hazelwood power plants in Latrobe Valley
- Goals:
  - Build on experiences and lessons from previous site visits by improving checklist, but focus on brown coal
  - Provide forum to openly discuss unique challenges to brown coal efficiency improvements and opportunities to reduce overall emissions
  - Provide forum to exchange information on technology and/or process enhancements to increase efficiency of brown coal power generation

# ***Proposed for Feb. '09:*** **India Peer Review & Checklist training event**

- **NTPC and a State Electricity Board (SEB) would host an in depth Peer Review of an SEB facility and follow-up “Peer Review Checklist” training sessions.**
- **Provide facility management a detailed list of potential efficiency improvements that can be used long term to assist in developing a “model” facility and future training ground**
- **Training sessions for 60 or more employees of NTPC, SEBs, and other appropriate entities on the use of the “Coal Fired Power Plan Efficiency Checklist”**
- **Builds on experiences and lessons from April 2007 Japanese, February 2008 Indian, April/May 2008 US, and June 2008 Australian Brown Coal Peer Reviews.**

# Power Generation Best Practices

## Indian SEB Coal-Fired Plant Efficiency Improvement

- Build upon 12 years of technical assistance under USAID's Greenhouse Gas Pollution Prevention Project to improve performance of Indian coal power plants
  - With NTPC, established Centre for Power Efficiency & Environmental Protection (CenPEEP) and two regional CenPEEPs
  - Provided basic power plant diagnostic equipment
  - 20+ visits by U.S. experts conducting 200+ demonstrations and providing 7,700+ man days of training
  - CENPEEP conducted over 125 workshops, 14,000 man days of training and 319 hands-on demonstrations
  - **Conservatively avoided total of ~75 million tons of CO<sub>2</sub>**



**NTPC's 1000-MW  
Rihand Power Plant**

**NTPC's 2000-MW  
Singrauli Power Station**

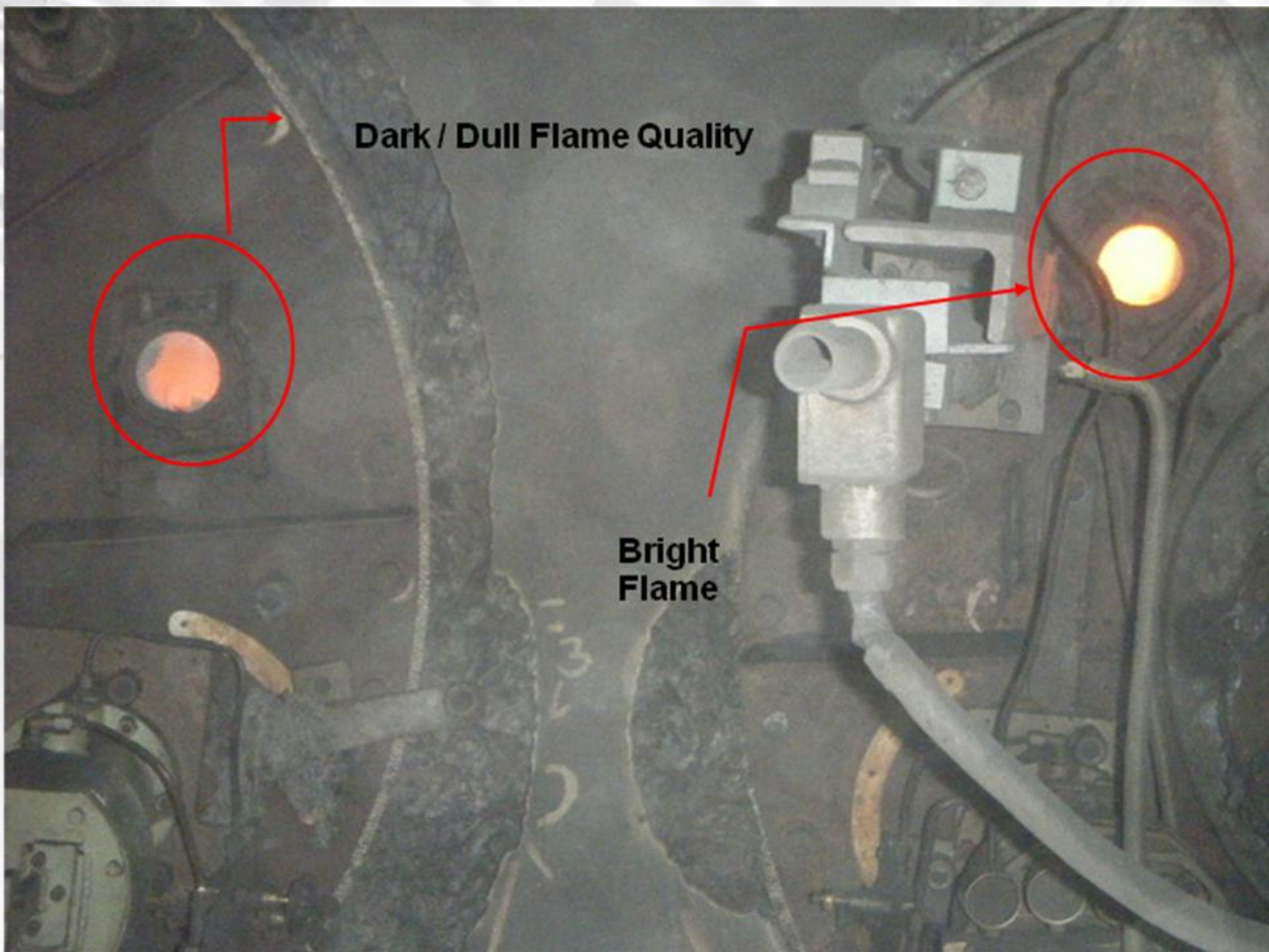


# Power Generation Best Practices

## Indian SEB Coal-Fired Plant Efficiency Improvement

- Extend NTPC/CenPEEP's know-how and successes to poor performing plants operated by State Electricity Boards
  - Two SEB coal plants selected (Kolaghat in West Bengal and Ropar in Punjab)
  - Provide test & diagnostic equipment to both CenPEEP and SEBs
  - Benchmark, recommend improvements, and train SEB engineers
  - SEB/CenPEEP engineers visit U.S. power plants to observe efficiency improvement activities and best practices
  - Recommend best practices and tools to sustain efficiency gains
  - First U.S. Expert Team Visit:
    - **Identified potential to regain 3-5% efficiency improvement & lost 30 MW's at Kolaghat and several percentage points at Ropar**
    - Final Report on recommendations to be issued soon

# Complex machines have complex problems



# Power Generation Best Practices

## Application of Plasma Ignition Technology in Power Generation

- Guodian Kehuan has nearly 400 installations in China, mostly 300- and 600-MW units firing variety of coals
  - 1<sup>st</sup> foreign sale to Korea's 560-MW Samchonpo Power Plant
- Visits by NTPC (India) during January 2007 and by Guodian to Alliant in May 2008 following U.S. Peer Review
- U.S. supported project
  - Evaluate commercial plasma igniter technology for application in U.S. coal-fired power plants
    - Detailed questionnaire sent to China Guodian
    - Visit igniter manufacturing facility and 2 Chinese power plants with plasma igniters (April 2008)
- Compare technology with conventional ignition technology for both new and retrofit applications
- Estimate potential energy and economic savings, and emissions reductions in U.S. coal-fired power plants

# Power Generation Best Practices

## IEA/G8 Gleneagles Plan of Action



- Audit several coal-fired power plants in China
- Support from USDOE/NETL, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, U.K. Foreign and Commonwealth Office - Strategic Programme Fund, and Monash University (Australia)
- Coordination by China Electricity Council
  - China Guodian's Jingmen Power Plant (Unit 4 and 5) in Hubei Province
  - China Power Investment Corporation's Fushun Power Plant (Unit 1) in Liaoning Province
- U.S. and European experts to review all major plant components to validate estimates and identify efficiency improvement opportunities
- Report on plant audit findings and conduct several regional workshops

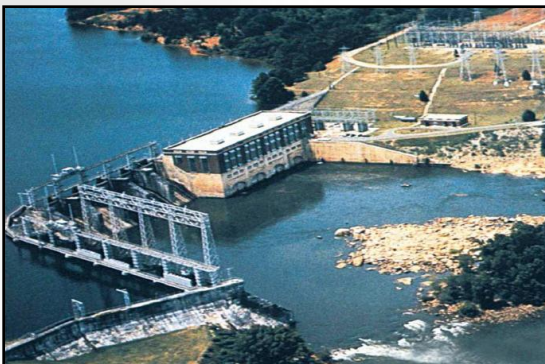
# Power Generation Best Practices

## Quantification of CO<sub>2</sub> Emissions Reduction

- USDOE to support Abatement Solutions (Australia) and Science Application International (SAIC/USA) to develop simplified **power plant** efficiency / CO<sub>2</sub> quantification methodology
- Japan's Federation of Electric Power Companies model to be modified to quantify energy savings/CO<sub>2</sub> emission reduction potential, through efficiency gains and/or avoided efficiency degradation by O&M improvement, at **national** level
  - Project team to discuss methodology, review assumptions, and verify country data to generate reliable estimates
  - Team may explore technology road mapping and potential benefit of application of advanced technologies

# Power Generation Best Practices

## Hydroelectric Generation Best Practices



- Duke Energy and First Energy led event held August 2007 with coordination by Edison Electric Institute
- 50+ participants from China, India, Japan, Korea, and USA
- Visited Conventional and Pumped Storage Facilities in North Carolina, South Carolina, and New Jersey

Duke Energy's 17-MW Wylie Hydro Plant

# Power Generation Best Practices

## Wind Electric Generation

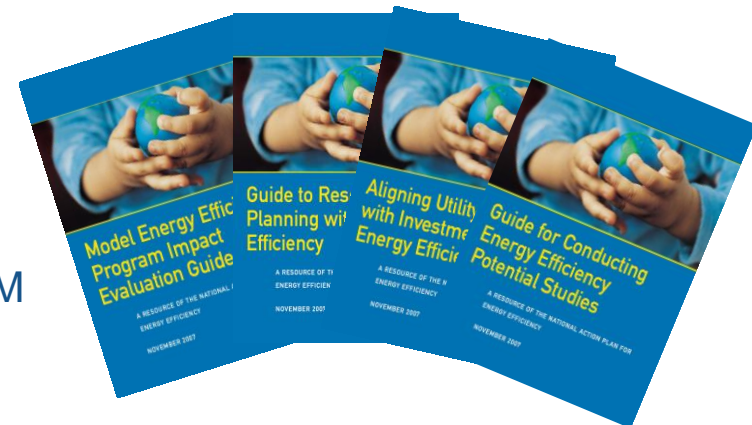
- Initial information exchange from differing perspectives of purchaser, operator/developer, and integrated system operator
- Scheduled 2-6 March 2009 in San Francisco, CA
- 40-50 expected participants from all APP nations
- Hosted by PG&E and FPL Energy in cooperation with Edison Electric Institute
- Jointly with APP Renewables and Distributed Generation Task Force



# DSM Best Practices

## Promoting Clean Energy Options in the Electricity Supply and Demand Sector in India

- Lawrence Berkley National Laboratory (LBNL) led activity
  - Use lessons learned from USA, especially California, to explore approaches to overcome institutional, regulatory, and procedural barriers to energy efficiency in India
  - Begin in Maharashtra as it seeks assistance on most productive ways to utilize about \$25 million of public benefits charge funds
    - Training workshop at Tata Power Company, 14-18 March 2008
    - Provide technical assistance and training to electricity regulatory commissions, public and private utility companies, consumers, and equipment manufacturers
    - Target investments in appropriate supply and demand side options
    - Design, implement, monitor, and evaluate DSM policies and programs



Some of the information shared at  
Mumbai Workshop

# DSM Programs and Load Research in Maharashtra



- Current Status
  - Current peak demand ~19 GW, is projected to increase to 25 GW in next 5-6 years,
  - Current electricity peak shortage in March 2008 was about 4.8 GW: large opportunities for savings
  - Maharashtra Electricity Regulatory Commission (MERC) approved \$25 million DSM budgets for FY 08-09 for four utility companies
- LBNL Plan for DSM program in Maharashtra
  - Assistance to MERC on regulatory policies (DSM cost recovery, utility incentives for DSM, regulatory guidance)
  - Assistance to Maharashtra electric utility companies to implement quick-win DSM programs, Load research and integrated resource planning, Monitoring and verification

## DSM Programs and Load Research in Maharashtra (cont.)

- Goals for this coming year
  - Establish an inter-utility group for DSM design and implementation
  - Assist in implementation of quick-win DSM projects
  - Provide targeted training on Demand Response and Monitoring and Evaluation
  - Provide information about new DSM technologies
  - Conduct load research on residential and commercial sector end-uses
  - Develop integrated resource plan (IRP) for utility companies

# Promoting DSM Programs in Delhi

- Advantages of promoting DSM in Delhi
  - Current peak demand ~4 GW, is projected to almost double in next 5-6 years, large opportunities for savings
  - Initiatives in Delhi receive national attention – expanding to other states becomes easier
  - Well managed electricity sector with mostly private utilities that could move rapidly on DSM
  
- LBNL Plan for DSM promotion in Delhi very similar to efforts in Maharashtra

# Expanding the DSM Initiative Nationally in India

## Strategies:

- Leverage the regulatory precedence related to DSM and quick win DSM experience in Maharashtra and Delhi
- Reach out to other state electricity regulatory commissions (SERCs) in cooperation with the Forum of Regulators (SERC Chairpersons only) and Forum of Indian Regulators
- In cooperation with SERCs, build capacity in public and private utilities and related stakeholders in other states on DSM implementation and load research
- Develop standardized DSM policies and programs that can be implemented nationally through the SERCs and Bureau of Energy Efficiency (BEE)

# Further Expanding DSM & Distribution Best Practices

- Large event being planned for Spring 2009 – hosted in California and North Carolina, led by Lawrence Berkeley National Lab and Progress Energy
- Active participation sought from all APP nations
- Topics to include:
  - Regulatory policies and electricity sector reforms for DSM
  - Design, implementation, and evaluation of DSM options
  - DSM and Demand Response programs
  - Distribution best practices
- Multiple site visits

# Information Sharing

## Energy Regulatory and Market Development Forum

- Objective: foster and facilitate exchange and sharing of information and experience on regulatory policy and practice relating to the operation of energy industries and markets (electricity and gas)
- First meeting of Forum Steering Committee held 30-31 August 2007 in Queensland, Australia
- Steering Committee agreed on 2-year work plan, focused on:
  - Clean Energy Development
  - Energy Infrastructure and Market Regulatory Arrangements
  - Reliability and Energy Security
- Forum met 25-27 June 2008 in Sydney, Australia
- The Forum has released the first Volume of an Information Report outlining the market design and regulatory structure within each country. Volume Two will be released later this year.
- The Forum has also commissioned a Reliability and Security Review which will be available by the end of 2008

# Bureaucratic Issues

- **Currently updating our Action Plan. Still waiting on responses from China, India, and Korea.**
- **Plan to use [www.asiapacificpartnership.org](http://www.asiapacificpartnership.org) website for all US event logistics, starting with the upcoming Wind Event planned for 2-6 March.**
- **No definitive plans for our next Task Force meeting.**

# In Summary

- Significant progress has been made in the past two years by the APP Power Generation and Transmission Task Force.
- Successful approaches to share and implement Best Practices are being implemented by our power industries.
- We will continue to build upon these early successes, and work to refine and expand our Best Practices efforts in the power sector.

# For More Information

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