BANGLADESH POWER EXECUTIVES LEARN ABOUT TURKEY'S POWER PLANT OPERATION & MAINTENANCE BEST PRACTICES

USEA EXECUTIVE EXCHANGE TO ANKARA AND ISTANBUL, TURKEY

Senior executives and plant managers from the Bangladesh Power Development Board (BPDB) and its affiliates and the Bangladesh Ministry of Power, Energy and Mineral Resources studied best practices in the operation and maintenance (O&M) of power plants in Turkey.

The U.S. – Bangladesh Power Generation Partnership is a U.S. Government-supported project aimed at working jointly with BPDB to promote best practices in power plant efficiency, operation, and maintenance. This program is intended to further build the capacity of Bangladesh's senior-level managers and plant operators by providing them with the opportunity to work with and learn best utility operation and maintenance practices for power plants directly from their peers at selected U.S. and global electric utilities.

EXECUTIVE EXCHANGE HIGHLIGHTS

During this weeklong program, the delegation met with Elektrik Uretim A.S. (EUAS), Turkey's state-owned electric power generation utility, as well as several Independent Power Producers (IPPs). The executive exchange also included several technical site visits to power generation stations. The Research Department of EUAS met with the delegation to discuss EUAS's recently implemented pilot program with a Computerized Maintenance Management System (CMMS). EUAS also explained its experience in overhauling O&M practices at a state-owned power utility and provided its manual to the delegation as a potential guideline for Bangladesh's own reforms in this area.

The Bangladesh delegation meets with EUAS, Turkey's state-owned power generation utility. Seated from left to right: A.S.M. Alamgir Kabir, Chairman, BPDB; Halil Alis, General Manager, EUAS; Foiz Ahamed, Joint Secretary, Bangladesh Ministry of Power; John Hammond, Program Manager, USEA. Standing from left to right: Zahid Uddin Ahmed, BPDB; Mete Atmaca, EUAS; Serkan Ozek, EUAS; Kartik Chandra Kuri, BPDB; Benan Basoglu, EUAS; Mehmet Bicer, EUAS; Mehmet Bulut, EUAS; Khaled Mahmood, BPDB; Md. Aktharul Islam, BPDB; Md. Abu Bakar Siddique, BPDB; Mohammad Tahir Mian, BPDB; Md. Abdul Hakim Sarker, BPDB; Andrew Palmateer, USEA; Mahbubur Rahman, BPDB.

BACKGROUND ON BANGLADESH'S ELECTRIC POWER GENERATION SECTOR

Bangladesh's power sector is confronted by significant challenges. These include the limited availability of natural gas, aging and unreliable power plants, a rapidly growing population and corresponding energy demand, and vulnerability to volatile diesel and fuel oil prices. Unscheduled power plant outages regularly occur due to natural gas shortages and technical problems. With steady annual growth in energy demand around 7%, addressing the challenge of providing power for a growing population of more than 150 million is crucial to the continued development of Bangladesh.

As of October 2011, Bangladesh's total generation capacity was 7,119 MW. In 2011, 82% of actual generation was fueled by natural gas, 7% by diesel, 6% by fuel oil, 3% by hydropower, and 2% by coal. This heavy reliance on natural gas for power plants has become a challenge as Bangladesh has suffered from persistent gas shortages. The shortages reduce power generation capacity by 400-600 MW. Combined with overall generation capacity shortages due to unplanned maintenance, this results in load shedding of up to 800 MW during peak summer days.

At ENKA's Adapazari/Gebze Power Station, the delegation discussed the O&M practices of the 2,310 MW IPP natural gas combined cycle plant, located 40 miles east of Istanbul.

Bangladesh is also facing the problem of an aging power plant fleet. 23% of Bangladesh's generation capacity comes from plants that are over 20 years old. To address the current generation shortage and aging power plants, Bangladesh is pursuing an aggressive plan to commission 14,000 MW of new projects by 2016. Although 6,000 MW of the planned capacity additions are BPDB projects, over 8,000 MW of generation capacity will be added by IPPs.

The delegation tours EUAS's Ambarli Termik Santrali, a natural gas combined cycle power plant that supplies 50% of Istanbul's power.

TURKIYE ELEKTRIK URETIM ANONIM SIRKETI (EUAS)

The delegation met for two days with EUAS to discuss its current operation and maintenance practices. EUAS produces around half of the power in Turkey and is state-owned, similar to BPDB.

EUAS outlined its challenges in providing power to a large and growing population with aging natural gas power plants. EUAS also described the process of developing and planning a transition to a national **Computerized Maintenance Management System (CMMS)**. The delegation met with EUAS leadership at EUAS headquarters in Ankara to discuss the challenges of implementing a maintenance management system before traveling to the Ambarli Thermal Power Station to see EUAS's efforts firsthand. Like many power plants in Bangladesh, the Ambarli Thermal Power Station can run either on natural gas, or distillate oil when gas is unavailable.

HAVELSAN A.S. – COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

Havelsan A.S., a major Turkish defense and IT contractor, designed the CMMS for EUAS. The computerized system allows the operator to remotely monitor all individual parts in a power station for upcoming planned maintenance, diagnose unplanned outages, and share information with other power stations and BPDB maintenance teams in real time. Havelsan completed the CMMS for EUAS in 2009. Upon completion, the system was installed as a pilot project in three EUAS power plants. Havelsan continues to work in coordination with EUAS to ensure the system functions properly.

ENKA POWER IPP 2,310 MW CCGT PLANT

Just over half of Turkey's generation capacity is owned by IPPs. ENKA Power owns three power plants, with a total generation capacity of 3,830 MW. The 2,310 MW Adapazari/Gebze plant consists of three power "blocks"- each consisting of two gas turbines, a heat-recovery steam generator, and a steam turbine. The plant is the largest natural gas combined cycle power station in Turkey.

Since its commission in 2002, the plant's availability factor has averaged 92.1%. ENKA has successfully operated the plant since commission without a single lost-time incident. According to ENKA staff, this is due to their sophisticated computerized maintenance management system and rigorous maintenance policies. This combination of advanced technology and constant predictive maintenance allows ENKA's Adapazari/Gebze plant to also enjoy the highest availability factor of any thermal plant in Turkey. Availability factor is the percentage of time when the plant is functional and able to produce power. The plant tour demonstrated to the delegation the benefits of advanced O&M best practices.

The delegation tours one of Turkey's most efficient thermal power plants. ENKA's Adapazari/Gebze natural gas combined cycle plant has a capacity of 2,310 MW and boasts an exemplary O&M record.

DOGA ENERJI IPP 180 MW COGENERATION PLANT

The final meeting of the program took place at another IPP plant, a 180 MW cogeneration plant owned by Doga Enerji. Doga Enerji was established in 1993 and developed as a partnership with 80% ownership by Edison Mission Energy and 20% ownership by Doga Holding. The 180 MW natural gas-fired thermal plant provided an example of cogeneration- producing both electricity and hot water- and is the first and largest District Heating system in Turkey.

Maintenance and inspections are conducted annually, and Doga has implemented several equipment upgrades to increase the plant's efficiency. For example, the Esenyurt plant installed a natural gas preheater to increase efficiency. This results in an overall plant efficiency increase of 0.5% for every 100˚F of increased gas temperature. Ozgur Calik, Operations Supervisor for Doga, highlighted the importance of maintaining at least two sets of spares for as many parts as possible. Although procurement of spare parts is more difficult for BPDB than IPPs due to more stringent procurement policies, the delegation acknowledged the importance of an efficient procurement process for spares.

RESULTS

The Bangladesh delegation had the opportunity to meet with a state-owned power utility, EUAS, that has recently overcome many of the same challenges faced by BPDB. The program allowed the delegation to compare the O&M experience of EUAS with the sophisticated systems utilized by the IPPs.

The ENKA and Doga plants provided examples of IPP operations, maintenance systems, and procurement policies. Meanwhile, EUAS demonstrated the steps necessary for a large, state-owned power utility to adopt O&M best practices. EUAS provided all of the documentation of their O&M transition process to BPDB, including their comprehensive manual on managing the transition to CMMS.

The delegation received a demonstration of the capabilities of Computerized Maintenance Management Systems (CMMS) at Havelsan, a Turkish defense and IT contractor. Havelsan designed a CMMS for EUAS.

Additional specific outcomes of the exchange are as follows:

- BPDB is considering implementing a Computerized Maintenance Management System (CMMS) like Turkey's. Havelsan expressed interest in working with BPDB to develop such a system.
- BPDB learned strategies to increase plant efficiency from Doga Enerji by installing several equipment upgrades for added efficiency, including modified firing nozzles and pre-heating the natural gas fuel.
- BPDB received EUAS's manual on managing O&M changes. The manual details EUAS's process of designing, implementing, and monitoring its new Maintenance Management System, including the CMMS.
- BPDB learned Turkish generator methods of streamlining procurement processes for spare parts with EUAS and the two IPPs. The delegation was also able to compare the long-term service agreements (LTSA) used by each power plant and identify potential time-savings.

The BPDB delegation at Ambarli Power Station outside Istanbul. Left to right: Zahid Uddin Ahmed, BPDB; Md. Abdul Hakim Sarker, BPDB; Md. Abu Bakar Siddique, ASPCL; Foiz Ahmed, Bangladesh Power Division; Md. Akhtarul Islam, BPDB; A.S.M. Alamgir Kabir, BPDB; Kartik Chandra Kuri, BPDB; Ali Muslim Celiktepe, EUAS; Mahbubur Rahman, BPDB; Mohammad Tahir Mian, NWPGC; Khaled Mahmood, BPDB; Andrew Palmateer, USEA.

HOST ORGANIZATIONS

- **Turkiye Elektrik Uretim Anonim Sirketi (EUAS)**
- **Havelsan A.S.**
- **Gelism Park**
- **Power-Serv International**
- **Doga Enerji**
- **ENKA Power**
- **GE Energy**

EXECUTIVE EXCHANGE PROGRAM PARTICIPANTS

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