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# U.S. TRANSMISSION EXPERTS SHARE TRANSMISSION OPERATIONS "BEST PRACTICES" WITH AFGHANISTAN, TAJIKISTAN, TURKMENISTAN AND UZBEKISTAN

by Jason M. Hancock, United States Energy Association



*Transmission Operations Workshop participants (front row from left to right: Nahida Akbari, Afghanistan; Peggy Olds, BPA; Dr. M.J. Shams, Afghanistan; Parveen Shams, Afghanistan; Keith Hartley, SMUD; and Najmia Amini, Afghanistan. Back row from left to right: Mirzo Ismoilov, Tajikistan, Abdul Wardak, USAID-Afghanistan; ???; Habibulah Hamdard, Afghanistan; Rustam Zogakov, Tajikistan; Kermikuli Nuryagdyev, Turkmenistan; Umar Karimov, Uzbekistan; Mirwias Shams, Afghanistan; and Jason Hancock, USEA.)*

The **United States Energy Association's (USEA)** Energy Utility Partnership Program funded by the **United States Agency for International Development (USAID)** conducted a four day Transmission System Operations Workshop for transmission operators from Afghanistan, Tajikistan, Turkmenistan and Uzbekistan in Istanbul, Turkey July 22-25, 2008.

The program was conducted with two tracks:

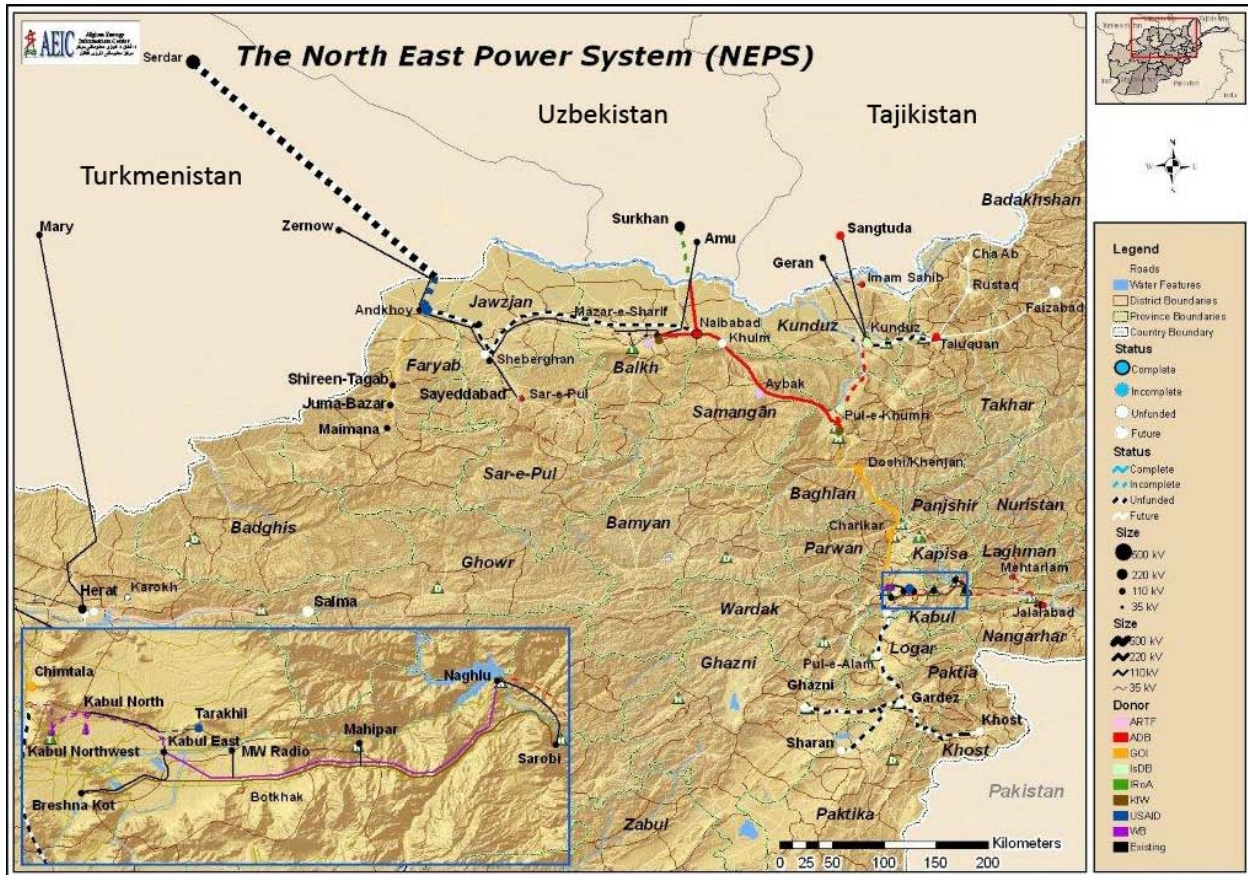
- Transmission Operations Workshop for transmission operators
- Utility Orientation for Dr. M. J. Shams, Minister of Economy of Afghanistan and the newly appointed Head of DABS-- the recently corporatized Afghanistan electric utility

## **BACKGROUND**

The objective of the Transmission Operations Workshop was for representatives of from the Central Asia Republics (Tajikistan, Turkmenistan and Uzbekistan) to meet with their Afghan counterparts in an effort to facilitate the construction and operation of the transmission corridor between Afghanistan and the Central Asia Republics and to promote confidence in cross-border power exchange.

Afghanistan is currently nearing completion of the North East Power System (NEPS) 220kv transmission system, portions of which will go into operation sometime in October of 2008. The NEPS transmission system will allow Tajikistan, Turkmenistan and Uzbekistan to export electricity to Afghanistan and greatly improve supply reliability and coverage to North Eastern Afghanistan.

Afghanistan's neighboring countries view the construction of the NEPS transmission system as somewhat of a mixed blessing. On one hand, it is looked on as a means to export excess power to a country that needs it and can pay for it. On the other hand it introduces a significant degree of reliability issues stemming from the volatility of the situation in Afghanistan and the lack of a unified set of transmission operation standards and procedures. Additionally, power purchase agreements have become an issue as they are done on a bilateral basis between Afghanistan and its neighbors and coming to a mutually beneficial agreement has proven to be extremely difficult.



Map showing current and future interconnections between Afghanistan and its Central Asian neighboring countries

### TRACK ONE: TRANSMISSION OPERATIONS WORKSHOP

The workshop component was conducted by highly experienced transmission operations staff from the **Sacramento Municipal Utilities District (SMUD)** of California, and **Bonneville Power Administration (BPA)** and included participants from **DABM** in Afghanistan, **Barki Tojik** in Tajikistan, **Turkmenergo**, in Turkmenistan, **CDC Energia** in Uzbekistan and **TEIAS** the transmission company in Turkey.

The workshop began with each country providing a thirty minute overview of the transmission system in their country. TEIAS representatives from Turkey described to the participants how Turkey had recently reformed and reorganized its electric utility by dividing the vertically-integrated state-owned utility into three separate corporations-- one for generation, one for transmission and one for distribution. Additionally TEIAS described ongoing efforts to privatize its generation and distribution companies. This was of great interest especially to the Afghan delegates who are anticipating similar reform and reorganization efforts.



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## TRANSMISSION OPERATIONS WORKSHOP KEY TOPICS

Transmission Operations Experts from BPA and SMUD made extensive presentations on the following:

- Maintenance/Repair of Transmission Equipment
- Outage Planning and Coordination
- Remedial Action Schemes (RAS) & Emergency Operations
  - Load and Generation Imbalance
  - Restoration Practices
  - Emergency Standards
- Coordination Issues with Other Utilities
- Treaty Obligations and Other Legal Issues
- Reliability and System Protection: Standards-FERC, NERC Requirements
- Hardware and Procedures for System Protection and Improved Reliability
- US Organizations that Manage Inter-Regional Coordination
- Interchanges and Interties

### Results:

- Reinforced the importance of conducting planned outages to maintain system reliability;
- Demonstrated load balancing techniques including the use of equipment to shed load in emergency situations;
- Highlighted importance of having a standardized set of operating parameters to ensure inter-system compatibility;
- Received NERC handbook of transmission operating procedures; and
- Introduced new system protection equipment applicable to the region.

## PLANNED OUTAGES NECESSARY TO MAINTAIN SYSTEM RELIABILITY

U.S. transmission experts stressed the importance of planned outages to perform system routine system maintenance. In most cases, maintenance in the CAR countries and in Afghanistan is done on an as-needed basis. Typically this means that maintenance is only performed when equipment fails. By performing routine maintenance and repairing and upgrading equipment before it actually fails, long-term outages can be avoided.



*SMUD crew rehabilitating a transformer during a planned outage.*

BPA and SMUD both routinely perform planned outages to maintain their systems. With adequate planning alternate transmission routes can be used and the system can be maintained with minimal imposition on consumers. Additionally both BPA and SMUD have the ability to do live-line maintenance where crews are trained to work on energized equipment performing repairs without the need to take an outage.

## SYSTEM RELIABILITY POSES PROBLEMS FOR UTILITIES EXPORTING POWER TO AFGHANISTAN

One of the major concerns facing Tajikistan, Turkmenistan and Uzbekistan as they prepare for large scale power exports into Afghanistan is system reliability and security. One of the major concerns for the Central Asian countries is that adverse conditions and system integrity in Afghanistan can play havoc on their own systems. Current load protection schemes in Tajikistan, Turkmenistan and Uzbekistan all rely on taking generation off-line to correct overvoltage problems. This is time consuming and critical equipment can be damaged in the process. In the volatile situation in Afghanistan, there are a myriad of factors that could lead to significant over-voltage situation.

BPA and SMUD both employ the use of specialized breaks and resistors to remedy over-voltage conditions without the need to take generation off-line. Load shedding through the breaks and resistors can also be nearly instantaneous, which greatly lessens the likelihood of damaging costly equipment. Of particular interest to the participants of this workshop was BPA's Chief Joseph Break located in Washington State. The Chief Joseph Break is a large resistor that is capable of instantaneous load shedding. Similar applications of equipment like the Chief Joseph Break could be highly beneficial on the NEPS transmission system.

U.S. transmission experts also stressed the importance of working from a unified set of standards for transmission operations. The best coordination practices can be totally negated if the operating standards of one organization and another are in conflict with one another. Additionally, system modeling needs to be standardized so that load forecasting and other planning can be done in a unified manner. It is increasingly difficult to maintain system reliability the more operators from different organization are introduced into the system. With multiple operators in multiple jurisdictions, having a unified system of operational procedures becomes very significant for maintaining system integrity. The U.S. transmission experts emphasized the NERC standards as an internationally accepted set of operating procedures that would be ideal to use as a model to create standardized operating procedures for the NEPS transmission systems.

### Turkey Transmission Company Substation Site Visits



The workshop concluded with a site visit to a TEIAS high voltage (400kv) substation and regional control and dispatch center on the western side of Istanbul responsible for serving the greater portion of Istanbul and the outlying region. The regional control center monitors and evaluates the transmission system as well as maintains switching control for both maintenance and emergency situations.



*TEIAS 400 kv Substation (top) and Enclosed Substation Gas Busbar (bottom)*

The transmission substation visit was followed by a site visit to a smaller transmission substation in a residential area that due to space constraints was housed inside a building. The enclosed substation was of particular interest. As TEIAS continues to make improvements to its electric system, new construction is increasingly difficult to site. Often, the most efficient location to site a new substation is within the residential neighborhoods they will serve. Those areas typically needing improvements and upgrading tend to be already heavily populated with no remaining open space large enough to site a traditional substation. In an effort to make substations less obtrusive, TEIAS has elected to build many of its urban substations inside a structures that have a considerably reduced foot print compared to that of a traditional substation. The cooling concerns are handled with special gas cooled equipment that eliminates the need for open air cooling. The new substation blends in nicely with the surrounding

residences and is barely noticeable. The unobtrusiveness and the added protection of the structure around the substation add a greater degree of security for areas prone to sabotage or other attack and may prove useful in the energy sector rehabilitation in Afghanistan and elsewhere.



*Delegates of the Transmission Operations Workshop at the Turkey Transmission Company's Northwestern Regional Dispatch Control Center in Istanbul, Turkey*

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**TRACK TWO: UTILITY ORIENTATION FOR DR. M. J. SHAMS, MINISTER OF ECONOMY OF AFGHANISTAN AND THE NEWLY APPOINTED HEAD OF DABS-- THE RECENTLY CORPORATIZED AFGHANISTAN ELECTRIC UTILITY**



Dr. M. J. Shams met with senior Turkish representatives from the generation utility (EAUS), the distribution utility (TADAS) and the transmission utility (TEIAS) to get an overview of the current level of privatization in Turkey. Dr. Shams received a thorough briefing on the Turkish power sector restructuring and reform program, which began in the early 1990s. Dr. Shams was able to meet with representatives from each of the three areas. He was also presented Turkey's plan for privatizing the remaining state-owned generation facilities and distribution companies.

*Dr. M.J. Shams receives a sample digital residential electricity meter from executives of the Istanbul distribution utility*

**UTILITY SITE VISITS**

As part of his orientation, Dr. Shams made site visits to the following:

- Gas fired, combined cycle power plant and fuel oil fired, steam power plant, soon to be converted into a gas fired combined cycle power plant;
- The billing and customer service management center of the Istanbul distribution company;
- A mobile substation;
- Customer bill payment center;
- Equipment and inventory management warehouse;
- Distribution system SCADA operations center; and
- Transmission system operations and control center for northwest Turkey.

**KEY FINDINGS/RESULTS OF UTILITY ORIENTATION**

- Dr. Shams was particularly interested in the Turkish model of unbundling and privatization which can provide a model approach for the corporatization and restructuring of the electric system in Afghanistan, ultimately moving toward privatization;
- Turkish Generating utility EUAS introduced Dr. Shams to the CEO of the Turkish engineering firm ProTerm that is potentially interested in providing services for the rehabilitation of the Alstom combined cycle generation facility in Kabul. The CEO of ProTerm intends to be in contact with Dr. Shams in the near future;
- Dr. Shams was particularly impressed with recent achievements by the Turkish distribution utility in reducing their technical and theft losses to below twelve percent. The Turkish distribution utility provided an in depth description of their electronic meters and meter-reading systems and their theft prevention organizational units;
- The Turkish utilities provided Dr. Shams the names and contact information of Turkish firms that provide power sector services to Turkish utilities and which may be interested in providing services for Afghanistan;
- Turkish utility senior executives offered to send their experts to Afghanistan to provide advice to Dr. Shams once the security situation has "calmed down"; and
- Dr. Shams was also quite impressed with the load shedding and emergency operations systems of the distribution utility.
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