

**AGENDA FOR THE
U.S.-JORDAN ELECTRIC POWER TRANSMISSION PARTNERSHIP
EXECUTIVE EXCHANGE VISIT**

**FOR THE
NATIONAL ELECTRIC POWER COMPANY (NEPCO)
OF JORDAN**



**WITH
ARIZONA PUBLIC SERVICE**

**October 2 to 11, 2009
in Amman, Jordan**

Managed by
UNITED STATES ENERGY ASSOCIATION (USEA)

Funded by
THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)



USAID
FROM THE AMERICAN PEOPLE

USEA
United States Energy Association

Partnership Goal:

To introduce and transfer best utility practices for planning, operating, managing and maintaining electric power transmission systems.

Executive Exchange Objectives:

1. Improving the reliability and stability of the transmission grid system.
2. Accelerating the integration of renewable energy into the grid.
3. Improving transmission system planning and operations.
4. Introducing advanced techniques for operating the Jordanian electricity market and handling cross-border electricity exchange and cooperation.

Participants:

Arizona Public Service (APS) www.aps.com

Robert Smith, Director Energy Delivery Asset Management and Planning

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Mark Hackney - Transmission Service Trading Section Leader, mark.hackney@aps.com

John Lucas - Transmission Planning & Engineering Department Leader, john.lucas@aps.com

USEA Coordination (www.usea.org)

Jason Hancock, Senior Program Coordinator, jhancock@usea.org

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Thursday, October 1, 2009

USEA Traveler

9:46 pm United Airlines Flight 924 departs Washington Dulles to London Heathrow, arriving at 10:05 ,Friday, October 2, 2009

Friday, October 2, 2009

Flights to Amman, Jordan

APS Travelers

12:05 pm US Airways Flight #14 departs Phoenix, AZ for New York JFK International Airport arriving at 8:01 pm

10:30 pm US Airways Flight 8702 departs JFK for Amman, Jordan arriving Saturday, October 3, at 5:15 pm

USEA Traveler

1:50 pm United Airlines flight 4894 departs London Heathrow for Amman, Jordan arriving at 9:05 pm

Saturday, October 3, 2009

Lodging: Amman Marriott Hotel
Shmeissani Issam Ajluni Street
P.O. Box 926333
Amman, 11190 Jordan
Phone: (926) 6 5607 607
Fax: (926) 6 5670 100

Confirmation Numbers: Hackney 84453953
Hancock 84451864
Lucas 84453212
Smith 84452490

Sunday, October 4, 2009

Executive Time

Monday, October 5, 2009

9.00 **NEPCO Site Visits-** *NEPCO National Control Center*

12.00-13.00 **Lunch**

13:00 **NEPCO Site Visits-** *Amman South 400 kV Substation*

Tuesday, October 6, 2009

9.00-9.10 **Introductions and Program Overview**
Jason Hancock, Senior Program Coordinator, USEA

9.10-9.50 **Overview of NEPCO system**
NEPCO representative to be determined

9.50-10.30 **Overview of APS system**
Robert Smith, Director Energy Delivery Asset Management and Planning

10.30-10.50 **Break**

10.50-13.00 **Operations- Control Room**

- Control Room design and layout
- Organizational structure
- Relationship and interaction between:
 - Short-term system planning (1-5 days); and
 - Real-time control room operations
- Training requirements and programs for control room dispatchers and other personnel
 - Technical training
 - Dispatch training
 - Overview of APS Training Program, materials, goals and regulatory requirements
 - Integrating simulators into training programs

13.00-14.00 **Lunch**

14.00-15.30 Emergency Transmission Restoration Procedures

- Emergency Operations
 - Load and generation imbalance
 - Restoration Practices
 - Emergency Standards

15.30-15.50 Break

15.50-17.00 Use of Relays and Other Equipment

Types of Faults:

- Under frequency and under voltage load shedding
- Dead bus clearing and auto restoration
- Typical APS substation configurations
 - main bus/auxiliary bus
 - ring bus
 - 1 ½ breaker bus

Wednesday, October 7, 2009

9.00-10.30 Transmission Planning

- Technical issues of integrating renewable energy power plants into the grid
 - Technical impact
 - Required regulations
- Technical issues of integrating large scale nuclear plants into the grid
 - Stability
 - Reserve
 - Light Load
 - Transmission capability

10.30-10.50 Break

10.50-13.00 Transmission Planning (continued)

- Planning under uncertain conditions
- Considerations for transmission planning during privatization of distribution and generation sectors
- Technical ownership boundaries between Transmission Service Providers, distribution companies and generation companies

13.00-14.00 Lunch

14.00-15.30 Transmission Planning (continued)

- Short circuit reduction methods in high voltage grids
 - Fault calculation
 - Methods for detecting faults

15.30-15.50 Break

15.50-17.00 Transmission Protection Equipment

- Typical protective relaying schemes used in the APS system
- Allowable fault clearing times
- Backup protection; Redundant systems, over lapping zones, breaker failure protection, etc.
- Allowable clearing for backup schemes
- Reclosing

Thursday, October 8, 2009

9.00-10.30 Standard Practices for Maintenance of Substation Equipment

- Transformers, breakers, disconnects, switchers, capacitors, arresters, batteries, and instrument transformers
- Parts Process, stock and purchasing
- Reliability Centered Maintenance

10.30-10.50 Break

10.50-13.30 Substation Maintenance (continued)

- Tools and test equipment
- Oil, SF6, and silicon insulating media
- Oil spill mitigation
- Fire prevention and combat

13.30-14.00 Lunch

14.00-15.30 Substation Maintenance (continued)

- Power Transformers
 - Troubleshooting
 - Reconditioning
 - Ancillary equipment
- Standard protection Schemes for overhead transmission lines
 - Cable feeders
- Reactive Power Compensation
 - Voltage control

15.30-15.50 Break

15.50-17.00 Round Table Discussion: Additional Considerations Not Addressed during Program

- Wrap-up Discussion
- Discussion of Future Activities
- Evaluation of Workshop

Friday, October 9, 2009

Executive Time

Saturday, October 10, 2009

Executive Time

Sunday, October 11, 2009

7:30 am Depart Hotel for homeward flights

APS Travelers

10:30 am US Airways Flight 8703 departs Amman, Jordan for Chicago O'Hare International Airport arriving at 3:55 pm

8:30 pm US Airways Flight 6886 departs O'Hare for Phoenix, AZ arriving at 10:16 pm

Monday, October 12, 2009

USEA Traveler

6:30 am Depart Hotel for homeward flights

8:50 am United Airways Flight 4895 departs Amman, Jordan for London Heathrow arriving at 12:35 am

4:20 pm United Airways Flight 925 departs London Heathrow for Washington Dulles arriving at 7:34 pm