



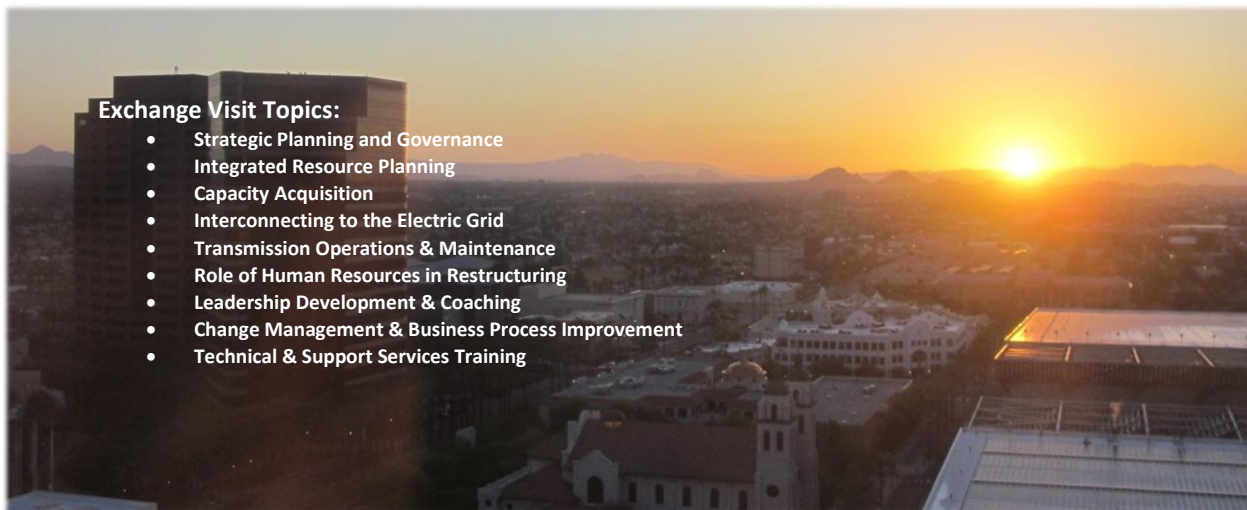
JORDANIAN AND US UTILITIES SHARE INFORMATION ON TRANSMISSION BEST-PRACTICES

National Electric Power Company of Jordan and Arizona Public Service discuss technical and managerial “best practices” for transmission companies

By Lauren Dickerson, Program Coordinator, United States Energy Association



Delegates from the **National Electric Power Company (NEPCO)** of Jordan traveled to Phoenix, Arizona to meet with their utility partner **Arizona Public Service (APS)**. The exchange visit was conducted from March 28 to April 3, 2011 and intended to improve NEPCO’s generation and transmission planning procedures, introduce modern human resources (HR) practices to NEPCO’s senior management and ameliorate NEPCO’s strategic planning and corporate governance frameworks. NEPCO and APS also signed a Memorandum of Understanding solidifying their partnership for the next 2 years. The NEPCO-APS Utility Partnership is sponsored by the **United States Agency for International Development (USAID) Mission in Jordan** and organized by the **United States Energy Association’s (USEA) Energy Utility Partnership Program (EUPP)**.



Exchange Visit Topics:

- Strategic Planning and Governance
- Integrated Resource Planning
- Capacity Acquisition
- Interconnecting to the Electric Grid
- Transmission Operations & Maintenance
- Role of Human Resources in Restructuring
- Leadership Development & Coaching
- Change Management & Business Process Improvement
- Technical & Support Services Training



APS President Don Robinson (left) and NEPCO Assistant Managing Director/Technical & Administrative Support Services Abdelfattah Aldaradkah (right) after signing the NEPCO-APS-USEA Memorandum of Understanding.

Topics under Memorandum of Understanding and Work Plan

The purpose of NEPCO-APS Transmission Utility Partnership Program is to develop long-term cooperative relationships between Jordanian and U.S. transmission experts and to transfer U.S. experience in market-based, environmentally sustainable energy production, energy transmission and energy distribution to NEPCO. This partnership will continue for another 2 years under a Memorandum of Understanding signed by NEPCO, APS and USEA during this executive exchange.

Under the MOU and partnership work plan, the partnership seeks to address four specific topic areas:

- Strengthening NEPCO’s strategic planning and governance initiatives;
- Improving NEPCO’s integrated resource and capacity planning;
- Improving transmission system planning and operations; and
- Transforming of NEPCO’s human resources department.

Governance, Ethics & Compliance – Discussion with APS President Don Robinson

As the first step in its restructuring process, NEPCO formed a Strategic Planning and Governance Committee charged with developing and executing the company’s strategic plan for the next several years, and revamping its governance structure. In order to gain a deeper understanding of APS’s planning philosophy and governance, APS President Don Robinson joined NEPCO for a discussion on the roles and responsibilities of APS’s Board of Directors and senior management. Robinson emphasized the importance of continual and ongoing planning as a means of addressing changes to the company’s needs and external influences. In order to accommodate the changing economic and regulatory landscapes in Arizona, APS underwent a reorganization of several departments and is planning to restructure areas of the company. While emphasizing the importance of planning in making strategic changes, he also acknowledged the challenges associated with planning, notably the need for planning assumptions to be correct and well-founded.



APS President Don Robinson discussing the Pinnacle West corporate governance model with NEPCO delegates.

Comparing APS and NEPCO Boards of Directors & Decision Making

Robinson also addressed APS’s corporate governance model. APS is governed by the Board of Directors of its parent company, Pinnacle West Capital Corporation, which consists of Pinnacle West’s CEO and 11 shareholder-elected Directors. Their principal duty is to make sure that APS’s management is running the company in the best way possible for their shareholders and customers. While short term financial interests are a key concern for Pinnacle West’s Board, their overall goal is long-term company sustainability. During their 9 yearly meetings, the Board hears reports on progress towards corporate and financial objectives, and makes high-level management decisions. For example, in November 2010 Pinnacle West’s Board of Directors had to approve the decision to purchase additional shares in the Four Corners Power Plant, a project led by APS management in order to meet electric demand growth. The

Pinnacle West governance bylaws delegate responsibility for large financial decisions to the Board of Directors and general project management to APS leadership.

NEPCO delegates compared and contrasted their Board’s governance structure with that of Pinnacle West and asked many questions about the duration of Pinnacle West Board deliberations on individual issues, availability of Board minutes to the public and types of decisions that the Board must make. Unlike Pinnacle West’s Directors, NEPCO’s Board is appointed by the Jordanian government. Their decision-making sessions are generally much longer than that of Pinnacle West, whose average deliberations take less than 20 minutes for individual issues. Robinson directed NEPCO delegates to Pinnacle West’s website, which details all of Pinnacle West’s corporate governance information, bylaws and financial reports: <http://www.pinnaclewest.com/>.

NEPCO and APS Utility Restructuring

Arizona’s economy suffered dramatically from the global financial crisis and economic recession. Due to the formerly booming real estate market and consequent population growth in APS’s service territory, APS used to have 3-6% base load and peak demand growth annually. To adjust to slower electricity demand growth, APS is undergoing a corporate reorganization. Jason Fernandez and Eric King, Business Partners to APS’s finance and information technology departments, spoke with NEPCO delegates on the restructuring process for their departments. Both of these departments have moved from a decentralized to a centralized structure in order to streamline financial and IT operations.

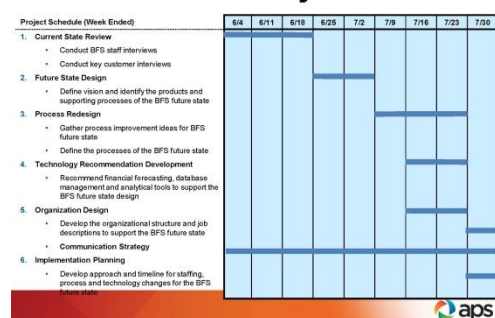


APS HR Business Partner Eric King (left) stresses the importance of communication during any corporate restructuring process.

APS Business Partner Program and its Contributions to Restructuring

To begin, Fernandez explained the APS Business Partner Program. The Business Partners are Human Resources department representatives with special technical competencies related to the APS department to which they are assigned. Each Business Partner is responsible for assisting their department’s senior leadership with identifying needs that support the company’s strategic plan and implementing human resources initiatives to address those needs. Business Partners are critical players in each department’s strategic planning process, as they are responsible for providing the human resources support to strategic initiatives, such as professional development programs, change management seminars, administering severance packages, etc. They work closely with their assigned department’s senior management and report back to the Director of HR Business Partners, Jeff Brodin. NEPCO delegates were very enthusiastic about the possibility of creating their own Business Partner Program.

Transformation Project Calendar



APS Restructuring Guidelines

Fernandez and King identified three basic steps to their restructuring process. First, outline the business case for reorganization. Second, do everything possible to eliminate the need for lay-offs. Third, if lay-offs are unavoidable, create a severance authorization form to be approved by the Vice President of Human Resources in the event that individuals refuse to participate in the reorganization. During a corporate restructuring, Fernandez and King

stressed the critical importance of transparency, communication and education about the process of change. They also emphasized the importance of having support from company leaders during restructuring. Additionally, APS believes it is necessary to provide employees who lose their jobs with essential tools for transitioning outside of APS, including resume workshops and interview training.

ADDIE Training Development Program

APS follows a basic ADDIE training development program (Analyze, Design, Develop, Implement and Evaluate), a fully integrated program that begins with a needs assessment to determine whether or not training is an appropriate solution to a manager or employee’s needs. If training is recommended to address the issue at hand, then APS’s Talent Management staff develops or assigns a training program to individuals who would benefit. Trainees are required to sign a learning commitment document and submit a work plan that clearly shows how the training will improve their job performance.

Specifically APS recognizes leadership training as an important tool, especially for employees who have been tracked for promotion. APS also assigns coaching roles to senior employees in order to foster active, continual, on-the-job learning and knowledge transfer between senior and junior employees.

Business Improvement University to Improve Corporate Efficiency

In an effort to streamline APS’s operations and render the organization more efficient, APS established the Business Improvement University (BIU), an accredited Masters-level certificate program in business improvement. Over the next 5 years, 800 APS high-potential employees (15% of the APS workforce) will be selected by senior management to attend the BIU with colleagues from different departments. This university supports and implements the APS Strategic Framework by:

- developing critical new business skills that will expand and broaden the capabilities of the workforce & leaders;
- identify and eliminate waste to improve efficiency and reduce costs; and
- defeat organizational barriers in order to allow for global prioritization and resource sharing across the organization.

APS Strategic Framework



OPERATIONAL EXCELLENCE
Operational excellence is achieved through the disciplined and business-focused management of all aspects of our company to reach best-in-class performance.

ENVIRONMENTAL STEWARDSHIP
We will be an environmental leader that provides benefits for our stakeholders today and tomorrow.

CUSTOMERS & COMMUNITIES
Success for APS is tied to the value we provide our customers and the continued economic vitality of the communities we serve.

Tom Glock, APS’s Director for Process Excellence and BIU Manager, defined waste as the duplication of processes and the utilization of unnecessary resources. His goal for the BIU is to incent change and to create a culture at APS that values efficiency, claiming that strong values will drive strong culture. The BIU intends to transform the way that APS employees and business units operate such that inefficiencies are self-corrected. BIU students will learn methodologies for eliminating waste and sustaining efficiencies, as well as apply these methodologies to their own jobs. Upon graduation, they may execute other process improvement projects and receive cash prizes for their completion, as well as mentor new BIU students in order to remain connected to the program and its lessons.

NEPCO delegates were excited about this program and the potential that it could hold for eliminating waste within their organization. At the same time, they wondered whether NEPCO employees from specific departments would be open to recommending changes to NEPCO’s operations, a necessary outcome of BIU participation. Glock acknowledged the difficulties associated with creating and sustaining change, but pointed out that BIU exercises were very openly embraced by all APS technical departments accustomed to procedural processes. He also stressed the importance of incentivizing

change, be it through cash prizes or other kinds of positive reinforcement and recognition. APS leadership views the BIU as an important element in APS's process improvement and leadership development strategies.



NEPCO and APS delegates inspect GE and Hyundai transformers at APS's Pinnacle Peak substation. APS is currently in the process of expanding this substation in order to prepare for electricity generated by renewable energy projects under construction.

Site Visit – Pinnacle Peak 500-230kV Transmission Substation

In order for NEPCO's engineers to get a first-hand look at some of APS's newest equipment, delegates toured the Pinnacle Peak substation, a 500-230kV transmission substation. Pinnacle Peak is northwest of downtown Phoenix and is currently undergoing significant construction to expand the facility. Delegates asked questions about APS's experience with different transformer suppliers, in particular APS's experience using supplier-recommended maintenance programs. The design of this particular substation differed from NEPCO's Amman South substation, which APS representatives had visited on previous trips to Jordan. Unlike NEPCO's substation, Pinnacle Peak does not have fire walls, is composed of monopole transmission supports (rather than lattice towers) and utilizes different protection schemes.

Site Visit – Net-Zero Power Project by Frito Lay/PepsiCo

A national leader in sustainability practices through resource conservation across its supply chain, PepsiCo has demonstrated its commitment to reducing its environmental footprint by investing in on-site renewable power production at its facilities.



Maha Al-Ramahi, Interconnection of the Grid Section Head at NEPCO, inspects the reflective mirrors on a 3kW concentrated solar power (CSP) Stirling Dish-Engine. 40% of the electricity needs at the Frito Lay facility in Casa Grande, AZ are met by solar PV and CSP.

In the last 10 years, PepsiCo has reduced its natural gas consumption by 33% and its electricity usage by 25%, equating to \$75 million in savings.



PepsiCo's new biomass boiler at their Frito Lay facility in Casa Grande, AZ. This combined heat and power plant will provide steam and electricity to manufacturing operations and displace 80% of the facilities natural gas needs.

The company is presently reinvesting some of those savings in a "net-zero" power project at the Frito Lay Distribution Facility in Casa Grande, AZ. Power installations consist of 4.3MW of solar photovoltaic panels, a biomass-fired combined heat and power (CHP) boiler system with waste heat recovery and ten 3kW Sterling Engine solar power dishes used for plug-in electric delivery vehicles. By contributing \$10 million in funding from APS, roughly half of the total cost for the solar installations, APS will count this project towards its consumer-owned distributed generation mandates set by the Arizona Corporation Commission.

New APS Substation Maintenance Reduced Outages

In recent months, APS overhauled its maintenance scheduling program for substations and has come up with a Substation Criticality Ranking (SCR) system. The SCR ranks substations from 1-10 based on each substations’ reliability, importance, redundancy and revenue attributes. Substations are then ranked into 4 tiers, with Tier 1 being the most critical level and Tier 4 being the least. APS reevaluates each SCR every 1-2 years in order to account for system changes that occur over time.



NEPCO Operations Section Head Mazen Al-Nabulsi (right) and APS’s Brian Clark discussing IEEE standards for clear weather average outage data collection and APS average outage goals.

Various components of a substation require different kinds of maintenance based on a variety of factors. For example, maintenance

Revenue Scale	Redundancy Scale
Peak MW input to station:	10 No redundancy
10 >2,000 MW	9
9 1250 to 2000	8
8 750 to 1250	7 N-1 (Contingency)
7 500 to 750	6
6 200 to 500	5
5 100 to 200	4 N-2 (Contingency)
4 50 to 100	3
3 25 to 50	2
2 10 to 25	1 High Redundancy
1 5 to 10	
0 0 to 5	

schedules for breakers at a Tier 1 substation are based on the number of times that a breaker opens and closes. At Tier 2 and 3 substations, maintenance schedules are based upon fault history, operational history and time period since last servicing. Oil screen testing for all transformers follows the same annual and bi-annual schedules for all Tiers, whereas Doble and Duval’s Triangle testing occurs based upon a substation’s Tier. Other forms of maintenance performed at APS substations include technical diagnostics such as thermography, corona scans, sound/acoustic levels, SF6 scans.

In addition to carefully scheduling and tracking maintenance tests and servicing procedures, APS tracks customer interruptions due to equipment failures, such as breaker operations, transmission outages, buss outages and protective equipment mis-operations. Unfortunately some outages and equipment failures occur due to extreme weather conditions, a problem also encountered by NEPCO. However, this new maintenance scheduling system is showing notable benefits to APS’s energy delivery operations. APS presenter Brian Clark noted that since the tiered SCR has gone into place, emergency response substation managers have received significantly fewer after-hours calls, a clear demonstration that the SCR approach to maintenance scheduling is limiting outages and enhancing system reliability.



Tony Tewelis explains some of the advantages of smart meters, including their ability to announce outages and accurately record information on electricity consumption

Smart Grid and APS Community Power Project

After a week filled with informative meetings and interactive site visits, NEPCO delegates traveled to Flagstaff, Arizona to meet with Tony Tewelis, Manager of Smart Grid Programs who also oversees APS’s Community Power Project. Tony began his presentation with an explanation of how APS defines the “smart grid” and the ways in which APS sees a range of smart grid technologies entering into its generation and energy delivery asset portfolios.

Smart grid entails bringing “intelligence” through automation to the electric grid and transferring



Mohammad Amin Abu Zarour, Generation Planning Department Manager at NEPCO, in front of an APS-owned solar PV display in APS's Community Power Project.

that “intelligence” on to consumers, utilities and markets. Beyond automation and intelligence, a smarter grid will give utilities and consumers greater flexibility and options around consumption patterns, and will also enable greater efficiency and grid optimization. APS has invested in almost 600,000 smart meters mostly in the Phoenix metropolitan area, in addition to a range of technologies (smart meters, distribution feeders for local substations, fiber communication backbone, volt/var control & optimization technologies, etc.) to support the Flagstaff smart grid pilot program. This pilot program is allowing APS the opportunity to engage their customers in a trial run of their anticipated larger smart grid technology deployment.

APS also launched its Community Power Project in Flagstaff in order to study the effects of a high concentration of distributed energy resources (400kW commercial, 600kW residential and 500-700kW small utility scale for a total of 1.5MW) on a single APS distribution feeder. While this pilot project will not count towards APS's goals of consumer-owned distributed generation, it will help APS to track, analyze and model the impacts of high concentrations of intermittent renewable energy on the grid while simultaneously educating consumers about distributed renewable resources like wind and solar PV.

Next Steps

USEA is currently planning a follow-up exchange for APS to visit NEPCO in Amman, Jordan in September 2011.

NEPCO Executive Exchange Visit Results

The NEPCO Executive Exchange Visit gave the delegates from NEPCO the opportunity to interact with their peers at APS to discuss matters pertaining to transmission and generation planning and operations, human resources and strategic planning & corporate governance. This visit provided a hands-on look at the APS transmission system which resulted in the following:

- NEPCO, APS and USEA entered into a 2-year Memorandum of Understanding that further defines the terms of cooperation in this utility partnership, as well as the topics to be addressed;
- NEPCO delegates learned about APS's corporate governance and decision making procedures by conversing with APS President Don Robinson. NEPCO also received a multitude of resources on APS's corporate governance bylaws, financial reporting procedures and strategic direction that govern the company's operations and culture;
- NEPCO took ideas from APS's experience with restructuring that would help them to avoid lay-offs by creating liaison and advisory positions for senior employees whose positions will be consolidated into other existing jobs. NEPCO delegates particularly liked the idea of “business partner” positions that report to the human resources department and assist with developing and supporting strategic planning initiatives from a human resources/workforce development perspective;
- NEPCO delegates received in-depth information on APS's load forecasting and resource planning, acquisition and interconnection processes and procedures, as well as a sample pro forma contract for renewable energy resource acquisition;

- NEPCO delegates learned about the ADDIE training development program and the process that APS follows in order to maximize the potential for training to aide in workforce development;
- NEPCO delegates learned about APS's Business Improvement University and envisioned the ways in which this program could help them to eliminate waste and optimize their organizational efficiency;
- NEPCO delegates received hands-on exposure to state-of-the-art renewable energy and transmission technologies, including concentrated solar Stirling Dish-Engines and substation equipment;
- NEPCO delegates learned about APS's experience with reforming its substation maintenance scheduling system according to substation size, reliability, importance, redundancy and revenue attributes. They also learned about unconventional metrics for measuring the success of a reformed maintenance scheduling program, including fewer emergency calls to maintenance team leaders in the middle of the night;
- NEPCO delegates learned about APS's investments in smart grid technologies and complimentary/experimental investments in distributed renewable energy resources. NEPCO learned about the regulatory and financial drivers behind their investments, as well as APS's plans to expand these programs in the future;
- NEPCO delegates received documents pertaining to the following topics:
 - Electronic versions of all PowerPoint presentations given by APS representatives during the exchange;
 - Information on business unit initiatives intended to support APS's corporate strategic plan;
 - APS's Human Resources department's strategic objectives & priorities, including detailed information on strategic initiatives and expected deliverables;
 - APS's guidelines and selection criteria for administering severance programs;
 - Detailed information on APS's rates structures for residential and commercial customers, including information on time of use (TOU) rate blocks, kWh sales and total revenues;
 - A copy of the labor agreement between APS and IBEW Local 387, a union representing APS employees;
 - A list of all the job titles held by APS employees, as well as information on APS's hourly wage and salaried employee salary structures for 2009;
 - Dozens of documents pertaining to change management, restructuring, attracting and maintaining talented employees, workforce/succession planning and leadership development.

NEPCO Executive Exchange Visit Participants:

1. *Mr. Abdelfattah Al-Daradkah*, Assistant Managing Director/Technical & Administrative Support Services
2. *Mr. Younes Sharai'ah*, Member of the Strategic Planning & Governance Committee
3. *Mr. Faisal Al-Manaseer*, Member of the Strategic Planning & Governance Committee
4. *Ms. Einas Tamimi*, Human Resources Department Manager
5. *Mr. Mohammad Amin Abu Zarour*, Generation Planning Department Manager
6. *Mrs. Maha Al-Ramahi*, Interconnection with the Grid Section Head
7. *Mr. Mazen Al-Nabulsi*, Operation Section Head