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DISTRIBUTION UTILITY EXECUTIVES OF JORDAN EXAMINE ENERGY EFFICIENCY PROGRAMS AND UTILITY TRAINING METHODOLOGIES AS IMPLEMENTED BY SACRAMENTO MUNICIPAL UTILITY DISTRICT AND TACOMA POWER

by Jason Hancock, Senior Program Coordinator, United States Energy Association



The first day's meetings with SMUD concluded with a tour of SMUD's Hedge Training Facility, where Tom Mullally arranged a pole climbing/hot stick demonstration. Delegates watched as journey line-men demonstrated their skills by climbing poles and tying lines, both copper and aluminum, to conductors using hot sticks. The line-men demonstrated that with training, hot sticks can be used as dexterously as hands and are more efficient than taking time to erect ladders or platforms.

From Left to right: Tom Mullally, SMUD; Sami Zwatten, EDCO; Bader Tashtoush, EDCO; Osama Sabbagh, JEPCO; Saleh Massad, JEPCO; Mazin Marji, IDEKO; Jamal El Arja, KEC; and Adnan Al Doumi, IDEKO.

The **United States Energy Association (USAID)** conducted the third executive exchange for Distribution Utility Executives from Jordan under the partnership funded by the **United States Agency for International Development (USAID)** from May 8 to 15, 2010. Seven executives from **Electricity Distribution Company (EDCO)**, **Irbid District Electricity Company (IDEKO)**, **Jordan Electric Power Company (JEPCO)** and **Kingdom Electricity Company (KEC)** met with **Sacramento Municipal Utility District (SMUD)** and **Tacoma Power** to continue discussions on energy efficiency programs and review the training programs as implemented at both U.S. utilities as were discussed in the previous two exchange visits.

BACKGROUND

The distribution partnership for Jordan was formed to discuss policy and regulatory initiatives and incentives for energy efficiency programs, the U.S. regulatory process, and reducing distribution system losses through system design and upgrades. Meetings centered on energy efficiency programs for residential, commercial and industrial customers; equitable tariff setting, providing incentives for energy efficiency and conservation, incentive based performance measures and indicators, creating regulatory departments, and regulatory relationships; and optimizing network efficiency by improved planning and system design.

MEETINGS WITH SACRAMENTO MUNICIPAL UTILITY DISTRICT



The Sacramento Municipal Utility District (SMUD) is the fifth largest municipal utility in the United States. SMUD provides electricity for Sacramento County and a small portion of Placer County, with a peak energy load of 3,280 MW (set in 2006). SMUD generates the bulk of its power with natural gas (56%) and Hydro (22%). SMUD is an environmentally conscious company and has pushed its renewable generation to 19% of its total generation.

SMART GRID: ENERGY EFFICIENCY, LOAD MANAGEMENT AND DEMAND RESPONSE

SMUD is continually looking at improving energy efficiency as a means to manage its load while reducing consumer demand. SMUD is starting a pilot project to maximize the efficiency of its distribution system through system optimization and power factor correction.

SMUD is installing power sensors that will report fault information and real-time load. These power sensors will send the information back to SMUD allowing more efficient control of the system while improving reliability and decreasing the time required restoring power during an outage event.

SMUD hopes to reduce voltage through conservation by 10.4 MW, 36,520 MWh/year which will save 6.1 MW, 11,150 MWh/year. Even though the optimization will ultimately result in less electricity being sold by SMUD to its consumers, SMUD still finds that optimizing is to their benefit on days when they reach their peak load and would otherwise have to resort to rolling blackouts. Additionally, the long-term reduction of new generation construction will also offset the loss of revenue from electricity sales.



SMUD uses **Demand Response**, which typically happens at the consumer level, to reduce demand during critical peak periods. Demand Response allows customers to react in ways that will reduce load which in turn reduces demand during critical peak moments. SMUD's demand response efforts focus on air conditioning cycling, resetting air conditioning temperature to higher temperatures, choice of time of use rates and critical peak pricing. SMUD also appeals directly to its customers through advertising campaigns to inform them of demand response programs, and to instill in them a sense of community which inspires them to reduce their electrical load for the communal good.

Load Management is the process of balancing the supply of electricity on the network by adjusting or controlling the load rather than by controlling output at the generation level. Load management is a long-term approach and reduces future requirements for new generation construction. Load management requires sophisticated analysis of the load and must take topology, capacity and even weather patterns into consideration to accurately model the physical properties of the distribution network. Once an accurate model is established, operators can determine the most effective means to shed load to maintain system stability. With SMUD's move toward Smart Grid and the use of sensors that report real-time load conditions, SMUD's operators can monitor the network more closely and make react to volatile situations more effectively.

SMUD ENERGY EFFICIENCY CUSTOMER PROGRAMS AND SERVICES



SMUD begins its energy efficiency programs by first evaluating the area where energy efficiency could possibly benefit the consumers. Next, SMUD begins a period of market research to determine how the efficiency program could be implemented. At this point, SMUD begins planning the project for actual implementation and ultimately moves to the implementation phase of the program. This four step process is conducted on an annual basis.

For a program to be considered financially viable it must be able to have its overall cost covered by funds available in SMUD's annual budget. The project must be cost effective and have an adequate return on investment (ROI). SMUD also looks at whether the work on the project can be performed with internal labor or if it will have to be contracted to a third party. The investment in technology must not exceed the value of the energy efficiency program.

Market considerations for energy efficiency programs start with a needs/opportunity assessment. During the assessment, customer response to the program is gauged, the short-term and long-term benefits of the program are evaluated, the feasibility of the project is weighed against the acceptance of the project by customers, and any market barriers are identified and means to mitigate these barriers are determined.

Implementation begins with the development of an incentive structure which is set in a manner to give the majority of targeted consumers enough impetus to actually start the program. Programs are coordinated regionally and SMUD seeks partnership opportunities to leverage greater efficiency gains by including other interested parties in the project. SMUD also invest a significant amount of funds to market and advertise its energy efficiency programs.

Due to budget limitations and limited resources, SMUD evaluates its energy efficiency programs on a three year cycle. The larger more complex projects take priority over smaller projects. New and modified projects are moved to the head of the evaluation schedule to allow for adjustments early in the program cycle.

The majority of SMUD's energy efficiency programs are evaluated by independent third-party contractors, but SMUD supervises impact evaluations through its Resource Planning Group, and SMUD's Market Research Group conducts both process evaluation and customer satisfaction research.

MARKET RESEARCH: CUSTOMER PROGRAM DESIGN, MARKETING, AND IMPLEMENTATION

SMUD utilizes Perception Tracker, a study that tracks customer awareness of a product or service SMUD is offering. Perception Tracker graphs the marketing of a product or service and shows a “funnel” shape that is broad as the program marketing is started meaning that it is reaching a large number of customers and gradually narrows as customer have been informed and marketing saturation has been reached. At this point SMUD will either consider marketing to be complete, or will look at other methods to reach customers due the ineffectiveness of the marketing being studied.

SMUD uses mailings through the U.S. Postal Service to inform and educate its customers. SMUD has found that mailings are much more successful if they are targeted to specific groups identified through market research. If SMUD sends mailings to all of its customers on items that only concern a small percentage of its customers, then customers may start to regard SMUD as a junk mailer and discard future mailings without opening or view them. Reciprocally, if SMUD targets its mailings to the appropriate demographic, customers appreciate and act on the information.

In Jordan, some of the utilities actually go door-to-door to customers to inform them of their programs. EDCO is beginning construction on a customer service center in June 2010. The customer service center will be used to inform customers of available energy efficiency programs.

DISTRIBUTION SERVICES TECHNICAL TRAINING PROGRAMS

SMUD seeks to employ people from diverse backgrounds. SMUD has both centralized training and decentralized, meaning that there is centralized training that is applied to employees District-wide whereas decentralized training is training that is specific to individual units.



SMUD has a Learning Strategy Committee that meets weekly to discuss training needs for the company, how to evaluate training programs, and to insure uniformity in training throughout the District. SMUD uses principles from Steven Covey's Seven Habits of Highly Successful People in its training approach and spends approximately 7.4% of an employee's salary on training.

THERE ARE THREE CATEGORIES OF TRAINING METRICS AT SMUD:

- Regulatory/Required
- Job Essential
- Developmental

The key drivers for SMUD's Corporate Learning Strategy are to enable workforce planning, to develop the skills of existing employees, to transfer knowledge from older employees to younger employees, and to manage the change that is continually taking place in the District. SMUD could not track training because there was no clear definition of what constituted training.

In 2007 SMUD clearly defined training and began tracking costs accordingly. During this time SMUD also clearly defined trainer competencies and standardized training evaluation forms.

SMUD TECHNICAL TRAINING

SMUD conducts its technical training in-house. For **engineering designers (line)**, there are three entry levels: Engineering Designer I (entry), Engineering Designer II (intermediate), and Engineering Designer III (journey). Once an design engineer has reached the journey level engineers may advance to Engineering Designer IV (Lead) which is a promotional position. A Lead Engineer will oversee four to six design engineers. Levels are distinguished by the complexity of the design work, the independence of the designer in the design work and the level of decision making authority of the designer. Engineering designers are not required to have an engineering degree at the first three levels, but engineering designer leads and above must be professional engineers.

Entry level designers start an eight-week training program upon hire. They learn basic electricity, distribution system and operations, design and construction standards, meter and service requirements, and overhead and underground design and engineering calculations. Usually it takes five years to move from level one to level five, but individuals can move at an accelerated pace based on their competency.



SMUD ASSOCIATE ENGINEER TRAINING

Degreed Engineers also have multiple levels within SMUD. SMUD's levels for engineers are Associate Engineer, (entry and journey) Senior Engineer, Principal Engineer. Associate Engineers must have an engineering degree. Senior Engineers must have a Professional Engineering License (PE). SMUD provides training specific to its system to its employees within normal business hours.

SMUD hires new engineers from two sources: they hire them directly from universities and like all other utilities, they also do their best to "steal" them from other utilities after they have already received some utility training.

GIS TRAINING PROGRAM

The GIS system serves many of SMUD's other sections. As such, it is a critical component at SMUD. As SMUD formed its GIS group, it quickly found that universities could not adequately prepare a graduate for entry into SMUD's GIS group because the skill set was too broad for a university to cover. In response to this, SMUD found it necessary to develop an 18-month training program in order to adequately fill in the gaps in their GIS technicians' education.

MEETINGS WITH TACOMA POWER



Tacoma Power was purchased from the city of Tacoma in 1893 and established as a municipal utility governed by a five member board that is appointed by the Tacoma City Council. Tacoma Power's service area is 180 square miles with a peak system load 1212MW (set in 1989). Tacoma Power has actually seen a decrease in load as many of the industries in its service territory have either relocated, or gone out of business.

Tacoma Power generates roughly forty percent of its own power. The rest of Tacoma Power's generation is purchased through contracts, mainly with BPA, and with the exception of some nuclear generation from the Hanford Nuclear Generating Facility in Eastern Washington. Distribution voltage is 12.47 kV and 13.8 kV (three-wire) for industrial load.

Tacoma Power invested 100 million dollars to install a fiber optic network to link its substations and enhance its electric system control and reliability. Tacoma Power soon noticed that they could utilize their additional communications capacity to provide television service to their customers. In the 1990s, Tacoma Power established the Click! Network and went into direct competition with the local cable TV provider. Competition with Click! Network has forced the other cable TV company to keep its rates lower within Tacoma Power's service territory and provides an additional revenue source for the utility.

UTILITY EFFORTS TO PROMOTE ENERGY EFFICIENCY, CONSERVATION AND DSM

Tacoma Power establishes its energy efficiency programs by marketing them directly to the intended customers of the specific program. Tacoma breaks this marketing process into four categories: Product, Price, Place, and Promotion.

The Energy Efficiency Program (product) must be cost effective while satisfying the customer's needs for that type of product. Products must meet the needs of Tacoma Power, the customer, and the needs of the market channel. Because all customers pay for conservation, all customers should receive some benefit from conservation. Utilities are not islands, what one utility does will affect neighboring utilities. As such, it is much more effective for utilities to work together to share media, trade allies and program contractors. Sometimes even service areas are shared. By working together, utilities can maximize their efforts and enjoy greater returns, proving that the whole is greater than the sum of its parts. Additionally, by working together, utilities can avoid customer confusion from similar products being marketed at the same time.



TACOMA POWER BREAKS ITS MARKETING PROCESS INTO FOUR CATEGORIES:

- Product
- Price
- Place
- Promotion

Tacoma Power has learned not to invest too much effort or resources into a single energy efficiency program, regardless of the perceived benefit of the program. Markets are too complex to predict their outcome and what can look like a well conceived program can turn into a failure due to these complexities. In Tacoma Power's experience, the retail lighting program underperformed whereas weatherization over performed. Maintaining flexibility in energy efficiency programs is important.

Distribution Companies of Jordan to SMUD and Tacoma Power, May 8-15, 2010

Price is important in getting customers to adopt energy efficiency. Tacoma Power uses rebates, loan buy-downs, and instant retail markdowns. The program needs to be cost effective in order for customers to adopt it.

Place (distribution channel) must be determined. It is important to understand where a program should be implemented in order to gain the most leverage on the investment. Product availability must be considered. Coordination of regional messages is important to avoid customer confusion.

Promotion is the opportunity for synergy between the utility's brand and conservation programs. Promotion begins with good actionable research. Tacoma Power uses direct mail brochures to reach its customers. Tacoma uses bag stuffers which retailers place in shopping bags as customer pay for their purchases.

TACOMA POWER TRAINING PROGRAM

Training at Tacoma Power is organized through the Human Resources Department of the City of Tacoma. The Human Resources Department is a shared asset meaning that they provide service for all of the City held resources, but remain a part of the General Government of the City of Tacoma.



The Human Resources Department works with Tacoma Power to identify training requirements, develop training curricula, and to provide training for technical and engineering staff. Additionally, the Human Resources Department also provides SAP training on the software products that are utilized throughout the City of Tacoma.

The largest focus of the Human Resources department is on management training. They offer a supervision class that prepares employees to enter management level positions. They are also tasked with monitoring the training and coaching that is provided for the trainers in addition to evaluating the effectiveness of the training provided. The Human Resources Department works with a local university that allows city employees who take specific training courses to improve their job skills to receive college credits toward a degree.

The Human Resources Department conducts Tacoma Power's new employee orientation. The general orientation provided by the Human Resources Department is a requirement for all new hires at Tacoma Power. Additionally, new employees must also attend an orientation specific to the utility, conducted by employees of the utility.

Field Training is conducted by the Joint Apprenticeship Training Committee (JATC). JATC was established as joint effort between the International Brotherhood of Electric Workers and Tacoma Power to take new hires with no electric utility skills and put them through an apprenticeship course that will eventually take them to journey status. JATC consists of both classroom training and on-the-job training. Trainers in the JATC program perform this function in addition to their normal Tacoma Power duties.

ASSET MANAGEMENT



The Asset Management Group sets methodologies to determine a tangible number for the life-span of a piece of equipment. The asset management team rates each piece of equipment and then compares it against the cost of failure for the piece of equipment and the replacement cost of the equipment. This number is the "risk cost". With input from management, the Asset Management Group

determines the benefit-to-cost ratio sets standards for replacing what they have determined to be end-of-life equipment.

Equipment can also be replaced due to obsolescence. There are two categories of obsolescence: discretionary and non-discretionary. Discretionary obsolete equipment is equipment that Tacoma Power has determined no longer meets functionality requirements of similar, modern equipment and, at their own discretion, they determine to replace it. Non-discretionary obsolete equipment is equipment that is no longer supported by its manufacturer and as such cannot be repaired due to lack of spare parts.



DISTRIBUTION COMPANIES OF JORDAN PARTICIPANTS

EDCO

Bader Mousa Tashtoush, Projects Department Manager
Sami Salim Zwatten, Regulatory Department Manager

IDEKO

Adnan Khalaf Al Doumi, DG Assistant for Administrative Affairs
Mazin Hekmat Mousa Marji, Director General Assistant for Planning, IT and Development

JEPCO

Eng. Saleh Massad, Technical Manager
Osama Sabbagh, Head of Budgeting Department

KEC

Jamal Al Arja, Technical and Regulatory Director

For more information, please contact Jason

Hancock at jhancock@usea.org

or visit:

http://www.usea.org/Programs/EUPP/Jordan_Distribution/jordan_distribution_may_2010/jordan_distribution_may_2010.htm



Documents Transferred

Sacramento Municipal Utility District Documents

New Service Installation

- [Detailed Process Diagram for Distribution Services](#)
- [New Service-Commercial](#)

Department of Energy Efficiency Standards for Distribution Transformers

- [Distribution Transformer Losses and impacts on First Cost](#)
- [Distribution Transformer Value of Losses](#)
- [Impact of Fixed Efficiency Standards on the Cost of Distribution Transformers](#)
- [Engineering Specifications for Padmount Transformer Three-Phase](#)

Ethics

- [Code of Conduct](#)

Generator Interconnection to Distribution

- [Interconnection Guidelines](#)
- [Interconnection Application](#)
- [Net Metering Rate](#)

GIS

- [SMUD GIS](#)

Engineering Job Descriptions

- [Principal Distribution Systems Engineer](#)
- [Associate Distribution Systems Engineer](#)
- [Distribution Design Engineer](#)
- [Associate Distribution Design Engineer](#)
- [Principal Distribution Design Engineer](#)

Safety

- [Understanding Electric and Magnetic Fields](#)
- [Connections: SMUD has a Bird's Eye View on Safety](#)
- [Injury and Vehicle Accident Classifications](#)
- [Safety Performance Metrics December 2009 with Quarterly Comparisons](#)
- [Confined Space](#)
- [Winter Storm Tips](#)

SMUD Organization Chart

- [Distribution Services Organization Chart](#)
- [May 3, 2010 Revision](#)
- [May 12, 2010 Revision](#)

SMUD Reliability Indices- SAFI, SADI and CAIFI

- [Five Statistics \(2004 to 2009\)](#)

SMUD System Losses 2008

- [Summary of SMUD Delivery System Losses in 2008](#)

Tacoma Power Documents

- [Tacoma Power Conservation Resources Management Program Profile](#)



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