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International Practices in Demand Side Management: Practices and Barriers

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Working Group Middle East Electricity Infrastructure

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Track 4. Going "Green"

INTRODUCTION

On behalf of the Energy Development and Power Generation Committee, welcome to this Panel Session on International Practices in Demand Side Management: Practices and Barriers

A traditional approach to determine how best to provide the necessary energy to meet economic growth has been to rely on increasing the supply of conventional energy resources. Yet energy is not an economic output that must be maximized at all costs. Rather, it is an input to the generation of goods and services, such as heating, lighting, and consumer goods. Reducing the input needed to provide these goods and services would have benefits that reverberate throughout a country's economy, including improved environmental quality, and economic competitiveness.

Reducing a country's energy intensity (the energy consumed per unit of Gross Domestic Product (GDP)) is a meaningful goal and has positive economic ramifications. Energy efficiency is one approach that has a positive payback. A growth of power shortages in any one country would threaten its economic growth and needs to be avoided while delaying new investments in new power plants. As a result, it becomes more important than ever to find ways to use energy more efficiently. One tool that has proven effective for delivering energy efficiency in many countries is demand-side management (DSM).

DSM refers to a mechanism that utilities through targeted educational or incentive programs use to modify end-use electrical energy consumption through energy efficiency (reducing overall consumption) or using load management to reduce demand at times when it is beneficial in terms of cost to do so. Such measures could significantly improve the reliability of electric power systems and help narrow the gap between supply and demand, while lowering the economic and environmental costs of electric service.

DSM was first used in the United States in the early 1980s, later adopted in the United Kingdom, Europe and Australia and today, in terms of DSM implementation in many countries, the concept has been gaining much attention. DSM measures take advantage of opportunities to increase the efficiency of energy service delivery; these opportunities are not being fully taken advantage of in many countries worldwide. To make use of DSM measures requires special programs that help overcome various barriers that prevent many cost-effective DSM measures from being adopted. Such barriers exist even in countries with fully developed market economies. Without DSM programs, these energy and peak demand savings would not occur or would materialize only after significant delay, and in any case could not be relied upon, forcing utilities to construct expensive back-up capacity and causing higher rates. Numerous studies in many countries worldwide have found that cost-effective DSM programs can reduce electricity use and peak demand by approximately 20 to 40 percent. In a vertically integrated electricity environment, where generation, transmission, and distribution are owned by one entity, the primary objective of most DSM programs has been to provide cost-effective energy and capacity resources to help defer the need for new sources of power, including generating facilities, power purchases from neighboring utilities, and transmission and distribution capacity additions, and provides possibilities for saving fuel and reducing negative environmental impacts.

Benefits

Traditionally, electric utilities planned their supply to meet all the needs of their customers with little regard to how or when customers use energy, if any. DSM can be the least cost planning option. Utilities consider implementation of DSM programs because such programs benefit customers, the program sponsor and society.

- From a customer perspective, DSM programs make sense because the energy savings which result from the use of energy efficient technologies more than offsets the higher first costs of these technologies.
- Utilities can benefit from reductions or shifts in customer energy use. In the near term, DSM programs can reduce energy costs for utilities, and in the longer term, DSM programs can help limit the need for utilities to build new power plants, distribution, and transmission lines. In short, a DSM program can be much cheaper to implement than building a new generation plant.
- Society benefits from DSM because reduced or shifted energy usage can directly translate into less air pollution, less carbon/NO_x emissions, and a way to lower the potential environmental threats associated with global warming.
- DSM programs are a promising alternative strategy to the increased concerns customers, utilities, and government agencies have now regarding global warming and carbon emissions. Moreover, a properly designed DSM program can actually track the program impacts and measure the amount of carbon reduced or saved based on program activities.

Basic Strategies

Depending on their overall objectives and needs, DSM basic strategies that utilities can use include:

- Energy Efficiency
- Peak Load Reduction
- Load Shifting
- Load Building.

Other strategies include Demand Response.

DSM programs consist of the planning, implementing, and monitoring activities of electric utilities that are designed to encourage consumers to modify their level and pattern of electricity usage. The critical question that a utility needs to answer is how much does it want to be involved in these programs. To answer these questions, the utility needs to address the following DSM program planning process steps:

1. Determine Market Potential
   - Identify load objectives
   - Identify sectors, end-uses and efficiency measures to target
   - Understand the market for targeted sectors and measures.
2. Develop Program Designs
   Conduct cost-effectiveness screening.
3. Implement programs
   - Determine in-house vs. out-source approach.
4. Evaluate
   - Build metric measurement into program design.

A good DSM program requires developing a thorough knowledge of the utility's operational profile and customer needs. This Panel is designed to cover several aspects of DSM and including recent approaches including Demand Response.

The Panelists and Titles of their Presentations are:

1. B. Kirby and John Kueck, (Oak Ridge National Laboratory, USA) and T. Laughner and K. Morris (Tennessee Value Authority, Knoxville, TN, USA). Spinning Reserve from Responsive Load (Invited Panel Presentation Summary 09GM0510).
2. Jin-Ho Kim (Kyung University, Korea), Tae-Kyung Hahn (Illinois Institute of Technology, Ill, USA) and Kwang-Seok Yang (ADICA Consulting, IL, USA). Roadmap for Demand Response in the Korean Electricity Market. (Invited Panel Presentation Summary 09GM0003).
3. Mikael Togeby (Ea Energy Analyses, Denmark). Danish DSM Activities – Current Results and Possible Developments. (Invited Panel Presentation Summary 09GM0663).
4. Russell Stewart (Transpower New Zealand, Wellington, New Zealand). Demand Side Management in Support for the Grid (DSM): The New Zealand Experience. (Invited Panel Presentation Summary 09GM0083).
5. Dhevan Pillay (South Africa-Eskom, South Africa). Migration from Energy Efficiency to

Energy Effectiveness. (Invited Panel Discussion).
6. Steven J. Norrie and Peter Love (Ontario Conservation Bureau, Toronto, ON, Canada). Creating a Culture of Conservation in Ontario: Approaches, Challenges and Opportunities. (Invited Panel Presentation Summary 09GM0359).
7. Saurabh Kumar (Bureau of Energy Efficiency, India, New Delhi, India). The DSM Road Map for India. (Invited Panel Presentation Summary 09GM1089).
8. Invited Discussers.

Each Panelist will speak for approximately 20 minutes. Each presentation will be discussed immediately following the respective presentation. There will be a further opportunity for discussion of the presentations following the final presentation.

The Panel Session has been organized by A. (Rahim) A. El-Keib, GETCon (Director Electrical Engineering Department, The Petroleum Institute, Abu Dhabi, UAE) and Tom Hammons (Chair of International Practices for Energy Development and Power Generation IEEE, University of Glasgow, UK).

Tom Hammons and A. (Rahim) El Keib will moderate the Panel Session.

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BIOGRAPHIES

Thomas James Hammons (F'96) received the degree of ACGI from City and Guilds College, London, U.K. and the B.Sc. degree in Engineering (1st Class Honors), and the DIC, and Ph.D. degrees from Imperial College, London University.

He is a member of the teaching faculty of the Faculty of Engineering, University of Glasgow, Scotland, UK. Prior to this he was employed as an Engineer in the Systems Engineering Department of Associated Electrical Industries, Manchester, UK. He was Professor of Electrical and Computer Engineering at McMaster University, Hamilton, Ontario, Canada in 1978-1979. He was a Visiting Professor at the Silesian Polytechnic University, Poland in 1978, a Visiting Professor at the Czechoslovakian Academy of Sciences, Prague in 1982, 1985 and 1988, and a Visiting Professor at the Polytechnic University of Grenoble, France in 1984. He is the author/co-author of over 350 scientific articles and papers on electrical power engineering. He has lectured extensively in North America, Africa, Asia, and both in Eastern and Western Europe.

Dr Hammons is Chair of International Practices for Energy Development and Power Generation of IEEE, and Past Chair of United Kingdom and Republic of Ireland (UKRI) Section IEEE. He received the IEEE Power Engineering Society 2003 Outstanding Large Chapter Award as Chair of the United Kingdom and Republic of Ireland Section Power Engineering Chapter (1994~2003) in 2004; and the IEEE Power Engineering Society Energy Development and Power Generation Award in Recognition of Distinguished Service to the Committee in 1996. He also received two higher honorary Doctorates in Engineering. He is a Founder Member of the International Universities Power Engineering Conference (UPEC) (Convener 1967). He is currently Permanent Secretary of UPEC. He is a registered European Engineer in the Federation of National Engineering Associations in Europe.

Rahim El Keib received the BSc degree from The University of Al-Fateh (UAF), 1973; MS, University of Southern California, 1976; PhD., North Carolina State University (NCSU), 1984. He is the Director of the Electrical Engineering Department, The Petroleum Institute, Abu Dhabi and co-Founder of GETCon. His work has been in the area of electrical power engineering. The US National Science Foundation (NSF), the Electric Power Research Institute (EPRI), Palo Alto, California, the US Department of Energy, Southern Company Services (SCS) and Alabama Power Company (APCO), Birmingham, Alabama sponsored his work. Several companies in USA have implemented results of some of his work on Emissions Constrained Economic Dispatch and Volt/Var compensation on primary distribution feeders. He also served as a consultant to several organizations including APCO and SCS in the USA and the National Investment Company in Libya. He has published numerous technical papers and reports, and book chapters on topics related to power system planning and operations, and applications of intelligent techniques to solve power system problems. He organized panel discussions on issues of interest to industry including, delivered invited presentations, seminars, short courses, and tutorials, served on many international conference committees, and chaired the 2007 International Conference on Modeling, Simulation, and Applied Optimization. In response to the request by the IEEE/PES International Practices Subcommittee, he has been working on organizing the panel session: "Demand Side Management: International Practices and Challenges", IEEE/PES General Meeting, Calgary, Canada, July 2009.

He is member of the Board of Directors, the Arab Science and Technology Foundation, a member of the Science and Technology Panel, the ID Bank, an active Senior member of IEEE, was Associate Editor for the IEEE Power Engineering Society Letters, and the World Science and Engineering Academy and Society Transactions on Power Systems, and a member of the Editorial Advisory Board of the Korean Institute of Electrical Engineers/Society of Power Engineering. Also, he has served on a number of IEEE Committees, Subcommittees, and Task Forces and as a member of the Executive Committee of the UAE-IEEE Section. He joined The University of Alabama (UoA) in 1985 and became Professor of electrical engineering in 1996. He has taught at The UAF, NCSU, The UoA, the American University of Sharjah (AUS), and recently at The Petroleum Institute (PI) in UAE. He supervised MS Theses and PhD Dissertations and is recipient of several teaching and research awards. He served as the Director of the Division of Electrical, Electronics, and Computer Engineering at AUS (1999-01), and the Director of the Electrical Engineering Department at the PI (2005-). He led the effort to build the two programs and together with his colleagues achieved accreditation for both. He is experienced with curriculum design and with ABET accreditation (the engineering accreditation body in the USA). He is trained to serve as an ABET evaluator and is experienced in developing assessment processes and in preparing accreditation material.