IEA DSM REPORT - EXECUTIVE SUMMARY

TASK XI FINAL REPORT

TIME OF USE PRICING AND ENERGY USE FOR DEMAND MANAGEMENT DELIVERY

Background

Many countries are concerned that liberalised markets may not deliver adequate peak electricity generation and network capacity. The domestic sector consumes between 20% and 40% of electricity in developed countries and is very attractive for energy saving. ustomers can save energy by reducing use and shifting use from high to low demand times. Savings are achieved by increasing the propensity of customers to purchase energy efficient end uses, changing their behaviour to reduce thermostat settings, use hot water and lighting more wisely, reduce system losses and reserve generation and increase off peak space for wind generation.

Objectives

The objectives of Task XI are to determine whether and how smaller customers can participate in demand markets and change end use behaviour to deliver energy saving, reduced energy costs and maintain supply security.

Approach

Three mechanisms, by which smaller customers can save energy and assist system security have been developed and evaluated.

- End Use Monitoring and Feedback (EUMF), where customers are presented with a breakdown of their individual end uses of electricity, its costs and environmental impacts.
- Time of Use (TOU) and Dynamic TOU pricing, where customers are presented with different prices at different times and respond by shifting demand from high to low price periods.
- Demand Side Bidding (DSB), where customers participate in energy trading, by contracting and delivering specific demand changes in response to requests by System Operators or Suppliers.

This study has analysed work carried out and results of trials of EUMF, TOU pricing and DSB involving smaller customers in the participating countries. It has also considered the impact that dynamic demand changes could have on profile settlements systems and methodologies for validating that participating customers have responded to requests for demand change. Analysis has also been carried out into end use demands which could respond to dynamic TOU pricing, aggregated and made available to System Operators as part of DSB processes.

Response modelling and communication and metering mechanisms, to enable payments to be made to customers participating in DSB, have been considered for each Demand Response (DR) delivery process.

Five reports have been completed:
Subtask 1 - Smaller Customer Energy Saving by End Use Monitoring and Feedback (July 2005)
Subtask 2 - Time of Use Pricing for Demand Management Delivery (Sept 2005)
Subtask 3 - Demand Side Bidding for Smaller Customers (Sept 2005)
Subtask 4 - The Impact of Dynamic Demand Changes on Profile Settlement Systems (Oct 2007)
Subtask 5 – Demand “available” and “turndown” Mechanisms for Market Bidding of Smaller Customer Demand (Oct 2007)

Results

Task XI has quantified the potential of EUMF, TOU pricing and DSB mechanisms to deliver demand reductions and energy savings. It has also provided routes dealing with dynamic profile changes in profile settlement for systems and rewarding DSB participation.

Monetary savings resulting from the application of EUMF (Task XI Subtask 1) to direct electric heating customers have been estimated to be worth approximately 100 Euro per year per customer. Clever and very "smart" meters have been considered for the provision of limited, demand disaggregation information as alternatives to customer interviews.

Task XI Subtask 2 has estimated the financial viability of implementing different TOU pricing regimes by equating reliable and flexible demand shift with scheduled generation, transmission and distribution network construction costs. The financial benefits, available to motivate smaller customers to participate in TOU pricing, are not large.

Task XI Subtask 3 has shown that there is a role for smaller customers to bid demand to assist system operation, improve supply security and reduce supply costs. The study has shown that unobtrusive as well as obtrusive management of end uses of energy may be possible in order to enable smaller customers to be "available" for automatic "turn down" of demand.

Dynamic TOU and Critical Peak pricing, if widely applied, will have an impact on profile settlements as examined in Subtask 4. If the profile settlement error becomes unacceptable, new, dynamic profiles may be needed to reduce it. This would be technically feasible by feeding the dynamic control signals into the settlements process.

Task XI Subtask 5 has shown that validation requirements of DR, in order for it to be used as DSB, should not present a fundamental barrier for smaller customers. In principle DR validation can be estimated based on control group measurement, statistical modelling and Grid substation measurements of demand "turndown" in response to DR motivator signals on specific days and at specific times. Various meter "smartness levels" have been considered for this process.

The ESCO (Energy Service Company) route to delivering smaller customer DR is considered very attractive in moving forward.

Implications

Motivating customers to buy energy efficient end uses and use them in a price flexible way to save energy and assist system security, is a difficult challenge. EUMF and TOU pricing have very important roles to play in this process. End use disaggregated energy data statistics, available now in many countries for national populations, should be added to smaller customer energy bills to start the education process of making them more aware of end use costs and environmental impacts.

International Energy Agency Demand-Side Management Programme
Task XI: Time of Use Pricing and Energy Use for Demand Management Delivery

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