IEA, DSM REPORT EXECUTIVE SUMMARY

Task XI Subtask 2
Time of Use Pricing for Demand Management Delivery

Background

End uses of energy and smaller customer behaviour change in response to stimuli are of particular importance in achieving energy savings and increasing supply system security. If end use demand profile shape for smaller customers can be changed in response to financial and other stimuli, it can be used to reduce peak generation capacity and spinning reserve and enable demand participation in balancing and reserve markets. With the growth of embedded generation, there are also strong financial motivators for local areas to become "self balancing" in terms of local demand and local generation. Time of Use (TOU) electricity pricing is one mechanism for encouraging energy demand profile shape change. This is already a normal pricing, billing and settlement mechanism for larger customers. It is not generally used for smaller customers where energy use "settlement" costs among suppliers is achieved using "profiles". Single rate and sometimes two rate tariff metering is generally used for smaller customer billing.

The demand elasticity of smaller customer end uses of energy is largely unknown, particularly the financial incentives needed to mobilise specific end use demand changes. It is probable that specific end use profiles can be modified with the right financial incentives. However, the scale of the required incentives, the specific end uses which can be influenced and the size of the resulting demand changes will be different for different households. This report quantifies the potential, value and cost of modifying smaller customer end use demands.

Objectives

Subtask 2 has the objective of quantifying TOU pricing and remote switching as methodologies for motivating and delivering obtrusive as well as unobtrusive changes in specific energy end uses and embedded generation. It also has the objective of evaluating the costs and benefits of implementing tariff, dynamic and real time, TOU pricing systems.

Approach

The approach taken relates together the three main types of TOU pricing; Tariff, Dynamic and Real Time, with particular concentration on whether customers are allowed to manually over ride remote demand switching commands. If no override option is allowed, then single rate tariff metering may be used for billing. Individual end use demand types are considered for their potential to be remotely switched and their possible use inhibited for infrequent, short periods. Notice times required by customers in order to accept remotely switched demand changes as well as reward mechanisms are considered. Quantification of the benefits of Dynamic TOU pricing, in terms of reducing peak demands, and estimation of the costs of implementing individual end use switching is carried out. Results of field trials of TOU pricing carried out in participating countries are presented.

Results

The study has estimated the financial viability of implementing different TOU pricing regimes by equating reliable and flexible demand shift, including operation of embedded generation, with scheduled generation, transmission and distribution network construction costs. In order to do this, the study estimated the costs of implementing Dynamic TOU pricing regimes per kw of demand shift as well as the costs of new supply side construction. Based on comparison of these estimates an annual payment to customers of €234 could be available as an incentive for them to participate in demand shifting regimes. This figure is based on shifting demand for a mix of both electrically and none electrically heated households.

If the option to override automatic demand shift signals is not provided for customers, then single rate metering is possible. However, customers are likely to require greater financial incentives to participate in some demand shifting, particularly appliance controls, if an override option is not provided.

Other than direct space and water heating demand shift carried out by reducing thermostats, the study has identified air conditioning, lighting and some domestic appliances as potential end uses, which could be moved off-peak. Customer small scale micro generation also has an important role to play in generating outside normal heat led times, and made responsive to TOU pricing.

The study identified thermostat reductions of direct space and water heating and air conditioning for a few hours per year are able to make significant contributions to reducing system peak demands. It also identified that small scale micro generation could easily be controlled on the basis of TOU pricing to reduce unscheduled peak demands. Results of Field Trials of dynamic pricing identified that automatic intervention is preferred by customers for shifting demand rather than requiring manual actions.

It may also be possible to inhibit demand for short times for each customer but apply it to a large population in sequence to achieve large overall demand reductions for long periods.

Implications

The study identified Tariff, Dynamic and Real Time TOU pricing as delivering valuable demand reductions depending on the end use demands being controlled. The important factors in this regard are that the demand shift is reliable and predictable. The more available the demand shift is, the more valuable it is as an alternative to scheduled generation. Consequently Real Time pricing with automatic demand reduction is the most valuable because it can be used to deal with supply shortages. However, it is likely to be the most expensive to implement. Combinations of Tariff, Dynamic and Real Time pricing can be considered where different demands in the same household are managed by each mechanism. This is particularly the case where no customer override is allowed and single rate metering can be used. Customer acceptance of infrequent and short duration end use inhibits requires evaluation.

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

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