Energy efficiency and Demand Side Management

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Introduction

- How can energy efficiency be encouraged?
- Can energy efficiency be fully integrated into the energy supply system or does it need instead to be stimulated by special incentives and subsidies?

Overview

- design of tariffs and prices to encourage lower consumption
- demand side management, least cost planning and integrated resource planning
- mechanisms such as public benefits charges to fund energy efficiency
- energy efficiency obligations and certificate schemes (including trading)

Why promote energy efficiency?

- To reduce overall costs of energy systems
- To reduce dependence upon imported oil
- To meet people's energy needs at a lower cost
- To preserve the environment:

  "the greenest unit of energy is the one saved rather than the one used no matter how cleanly it is generated"

How governments intervene?

- publicity and awareness campaigns
- energy labelling of appliances
- standards for new buildings
- energy taxes
- grants or loans towards energy saving measures

The role of energy companies

- Energy suppliers have regular contact with their customers and so may be a good way to deliver energy efficiency measures
- However, there are some concerns that energy customers will not trust energy suppliers (who make profits by selling units of energy) to help them reduce energy use

Tariff design

- Regulators only set prices where retail/distribution is a monopoly or where competition is not fully established
- Prices should be set to reflect the full marginal cost of producing, distributing and using electricity. Ideally, this includes externalized environmental costs.

Various kind of tariff to consumers

- Flat - i.e. the same price is charged to all consumers
- Time of day - i.e. different prices for energy consumed at peak and off-peak times
- Declining block - i.e. consumers pay a fixed charge irrespective of the amount used and then a fixed rate per unit
- Inverted block - i.e. no fixed charge, a first block of units at a low rate (or even free) followed by higher rates for additional blocks of units

Tariff to consumers and energy efficiency

- To reduce consumption tariffs will operate with a first block of consumption (per month or quarter) that is charged at a low rate, followed by further blocks charged at progressively higher rates

  Example of Italy in the household sector: rates rise to 30 eurocents per kWh for each unit consumed in excess of 220kWh per month

- Energy efficiency measures are installed to help reduce the need for high consumption

Demand side management

- actions taken on the customer side of the electricity meter, such as energy efficiency measures and power factor correction
- arrangements for reducing loads on request, such as interruptibility contracts, direct load control and demand response
- fuel switching, such as changing from electricity to gas for water heating
- distributed generation, such as stand-by generators in office buildings or photovoltaic modules on rooftops.

Least cost /integrated resource planning

- Least cost planning and integrated resource planning are the planning methodologies that are used to evaluate demand and supply options on an equal basis:
  - Done by the utility that has the obligation to provide reliable and reasonably priced power,
  - Overseen by a responsible government entity with well staffed and trained people,
  - Using analytical methods, focusing on long-term, least-cost solutions.
- The planning process should reflect government policies and be connected to the investment and pricing process

Cost Reduction & Environment Driven DSM

- The initiative began to develop in the US in the early 1980s to reduce total costs (financial and environmental) of meeting energy demand
- DSM became a major activity in the US with utilities spending $2.8 billion on it by 1993
- The main activity undertaken under DSM programmes was energy efficiency for customers (efficient heating systems, appliances, lighting and insulation)

Network and market driven DSM

- Market-driven DSM is a growth area in the United States
- Market-driven DSM, primarily motivated to achieve cost savings, can also reduce energy demand although it may mainly shift demand to times when prices are lower
- Network-driven DSM can delay the need for network expansion and provide short-term responses to energy market volatility

Public Benefits Funds

- When the US electricity industry was liberalised in the mid-1990s, the US utility regulators wanted to continue energy efficiency activity
- However as new entrants would not be price regulated, this require a mechanism, Public Benefit Funds, to collect revenues in an equitable manner to continue funding DSM.
- In 2004, Public Benefit Funds were being used in 18 US states to support energy efficiency programmes – collecting and spending nearly $1 billion a year.

Public Benefits Funds 2

Public Benefit Funds can be established:

- **Electricity Surcharge.** The most common source of funds in the U.S., is a small surcharge on retail electricity rates, sometimes called a “wires” charge
- **Pollution Charge.** Funds can be collected through pollution levies or fees that are applied to electricity generators or utilities.

Public Benefits Funds 3

- Consistency of policy over time is particularly important as energy efficiency programs take time to implement and savings are realized over relatively long periods.
- Another important factor affecting success is consensus of key stakeholders (the utilities and the regulators, customers, environmental groups) about goals, structure, programme design, and measurement.

Obligations/certificates

- White certificates: energy efficiency measures (// Green certificates: renewable energies)
- to impose an obligation on actors in the energy market to achieve a certain amount of energy saving or reductions in greenhouse gas emissions

The obligation scheme

1. An overall quantitative target (for kWh or greenhouse gas emission savings) is set, in absolute terms or relative to some level of energy consumption
2. Translation into individual targets for the obligated parties: generators, distributors, suppliers (retailers) or energy consumers
3. Definition of the eligible measures
4. Criteria are set for accrediting those able to create and sell certificates

In conclusion

- The energy industry is being transformed from one that is focused on producing and selling more units to one that adopts an energy services approach
- Even in those countries with a long tradition of encouraging energy efficiency and DSM by energy companies, these demand side options are in the main undertaken only because governments and regulators mandate them.
- Energy efficiency is the quickest way to respond to an energy shortage (e.g. California)
- Energy efficiency is an endless process