

Demand-Side Management – Economic Evaluation

Croatia and New York Regulatory Partnership Program

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by: Mark Reeder
New York State Department of Public Service



NYS Department of Public
Service

OVERVIEW

1. Background on Demand-Side Management
2. Benefit/Cost studies: three tests
3. Unintended impacts, indirect impacts
4. Effect on market prices
5. A few other details

Demand-Side Management (DSM): Background

- Definition of DSM: Government and/or utility programs that intervene into the marketplace to induce a reduction in energy use.
- Sometimes targeted at consumers (rebate coupons for highly efficient refrigerators), sometimes directed at suppliers (insulation subsidy for homebuilders).
- Funded through utility bills.
- Very strong in New York in early 1990's, moderate from 1995 through 2005, becoming much stronger now.
- New York's current goal is to reduce electricity consumption by 15% from where it would otherwise be by the year 2015. Labeled "15 by 15".
- To be implemented, a program must have benefits that exceed costs. Hence the importance of benefit/cost tests.

Some Key Preliminary Observations

- Several perspectives on benefit/cost, i.e., benefit to whom?; cost to whom?
 - participating consumers
 - non-participating consumers
 - utility
 - economy as a whole
 - society as a whole (including environmental impacts)
- Price versus marginal cost
- Does electric system have excess capacity or is it very tight?
- How much importance is given to environmental considerations such as global warming

Specific Benefit/Cost Tests

1. Total Resource Cost Test
 - regular
 - with environmental externalities
2. Non-participants test
(Also known as rate impact test or unit cost test)
3. Utility revenue requirement test

Total Resource Cost Test

➤ Benefits

- Costs avoided by the utility
 - Capital cost of foregone construction of generation, plus some transmission and distribution
 - Operating costs saved, primarily fuel costs
- Reduction in cost of environmental impacts (this one can be very difficult to quantify)

➤ Costs

- Direct utility costs of the DSM program
- Incentive payments made by the utility to the participating customer
- The net cost of the DSM measure to the participating customer (beyond the incentive payment)
- Any possible increase in the utility's operating and capital cost.

Total Resource Cost Test: discussion

- Environmental externalities is a huge issue
 - Parties can be passionate
 - Wide range of cost estimates
 - Is the environmental cost fully internalized or not?
- New York PSC has so far chosen to ignore environmental externalities for purposes of DSM evaluation
- Cost of customer's inconvenience is assumed to be zero
- In a competitive market, benefits of DSM are priced out using the market price of generation instead of avoided capital and operating costs of generation
- Price suppression is not included (to be discussed later)

Non-Participant Test

- Do the utility bills of non-participants go down as a result of the DSM program?
- Price versus marginal cost is the key
- Price = $\frac{\text{total cost}}{\text{total KWH}}$ (denominator gets reduced)

Benefits

- Capital costs and operating costs avoided by the utility

Costs

- Direct utility costs of the DSM program
- Incentive payments made by the utility to the participating customer
- Any possible increase in the utility's operating and capital cost
- (Effect of usage reduction on cost – per unit (denominator))

Non-Participant test: discussion

- Compare to total resource cost test
- Test result depends heavily on price versus marginal cost
- In New York, virtually all DSM programs fail the non-participant test
- In New York, failing the non-participant test is not used to disapprove a DSM program. Rather, it is used to rank the rate impact of DSM programs that passed the total resource cost test
- A superb DSM measure:
 - total resource cost test has large net benefits (3 to 1 ratio)
 - non-participant test has small rate impact (.99 ratio)

Utility Revenue Requirement Test

- Does the utility revenue requirement fall as a result of a DSM Measure?

Benefits

- Capital costs and operating costs avoided by the utility

Costs

- Direct utility costs of the DSM program
- Incentive payments made by the utility to the participating customer
- Any possible increase in the utility's operating and capital cost

Utility Revenue Requirement Test: discussion

- Compare to total resource cost test
 - I do not recommend this test
 - It ignores too much, especially the cost incurred by the participating customer to purchase the DSM measure
 - Example: it ignores the cost to the customer of the gas heating furnace and the cost of gas for a DSM program that induces a customer to switch from electric heat to gas heat

Market Price Effects

- A reduction in demand can cause a reduction in the wholesale market price of electricity, in theory, in the short-run
- This can be considered a benefit to consumers, a benefit to non-participants
- Called “price suppression”
- The effect occurs only in the short-run
 - excess supply becomes more excess
 - a shortage of supply becomes less short
 - in long-run, supply adjusts (for example, less generation gets built) and price returns to a long-run equilibrium level
- Standard economic theory labels this a “transfer payment” and not a benefit
 - benefit to consumers is exactly offset by loss to suppliers
- New York PSC ruled that market price effects should not be included in the total resource cost test
- But, where high prices are deemed to be an unacceptable burden to consumers, it can be considered as part of DSM evaluation

FREE RIDERS

- A free rider is a consumer that receives a DSM incentive payment when purchasing an energy-saving appliance, but would otherwise have bought that same appliance at full price.
- The DSM program should not be given credit for the saved energy.
- Explicitly accounting for free riders lowers the benefit/cost ratio of a DSM measure.
- In New York, over the last 4 years, the rate of free riders is estimated to be 31%.

SPILLOVER

- Spillover is the opposite of free riders
- Example: a DSM program incentive payment induces some stores to sell energy-saving light bulbs. This causes other, competing, stores to sell them too, even though they don't receive incentive payments.
- Example: a DSM insulation program induces a commercial business to buy and install insulation. While doing so, the business decides to also install energy-saving lighting.
- Spillover effects are very important in DSM programs whose goal is market transformation.
- A market transformation program attempts to influence the supply chain of a product so that suppliers adopt new practices that involve the use of more energy-saving aspects. An example is homebuilders (insulation, windows, etc.).
- In New York, over the last 4 years, the rate of spillover is estimated to be 51%.
- Explicitly accounting for spillover raises the benefit/cost ratio of a DSM measure.

Other DSM Considerations

- Length of appliance life
- Discount rate used in present value calculations
- Difficulty quantifying customer discomfort, enhancement
- Intentionally spreading DSM across all customer groups, such as low income, to achieve fairness
- One benefit/cost test of the whole aggregate DSM program or separate benefit/cost tests of each individual DSM program.