SMART EVALUATION OF ELECTRIC UTILITY SMART GRID INVESTMENT PROPOSALS

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What is a smart grid?

- Combination of hardware, software, communications, and monitoring and control equipment

- Definition is not precise, nor is there one standard definition

- Dynamic – what it is will continuously change

What will a smart grid do?

- More efficient operation of the grid
- Faster recovery from service outages (may not help much on reliability and notification of outages
- Integration of variable or intermittent energy sources, some of which are renewable such as wind and solar
- Integration of distributed generation or micro-generation
- Providing consumers information to make more efficient energy choices and, if desired, to reduce their electricity use

A smart grid sounds better than a dumb grid, but is that always the case?

Sometimes, dumb may be better

Smart grid is best considered in its component parts

- Smart generation

- Smart transmission

- Smart distribution

- Smart meters (and associated data and communication requirements)

Smart grid technologies can be deployed independently in each part of the grid

In particular, smart meters are separate from the rest

In some cases, though, the potential benefits from deploying smart grid technology in one segment may be increased if smart grid technology is deployed in another segment

Smart generation, transmission, and distribution technologies are put in place when there is a good business case

- Technology to manage variable power, outage management, monitoring, self-healing, communications, etc.

- Subsidies are not required

- Question of who should pay, though, especially when required for variable generation

- But, in general, this is not a policy issue

Large commercial and industrial customers generally have smart meters on a commercial basis

Residential (and small commercial and industrial) smart meter projects, especially beyond remote meter reading, often require subsidies

- Such subsidies are not automatically beneficial, however

- Need methodology for evaluating subsidies for smart meter deployment

Smart meter costs include not only the cost of the meter but also back office data systems and communications systems for smart meter services deployed

Smart meter costs also include installation and the un-depreciated cost of any existing meters that are removed

Remote meter reading is often deployed on a commercial basis for residential customers

Smart meters have other functions, among them

- communication with customer, retailer, distribution company
- remote connect and disconnect and usage, quality, and outage monitoring
- communication with appliances
- usage measurement, as often as continuous, and multi-period or real-time pricing abilities

Dumb meters offer seasonal and two-period time-of-day pricing

All meters will be smart, but it is a question of which functions are activated

- Additional costs for communications, data storage, back office
- Multi-period usage measuring (and pricing) is particularly expensive

It is these other functions (other than remote meter reading) that require subsidies in most cases

How should these subsidy requests be evaluated?

Benefits of smart meters

- Private operational benefits – captured when there is a business case

- Private consumer benefits – no demand for smart meters

- Societal benefits – more efficient use of resources, perhaps environmental benefit

- Primarily from multi-period pricing

- Issue of competitive retailers

Eight steps to measure the costs and benefits of smart meter deployment

Step One

Determine the smart meter program

Step Two

Determine the time periods

- Real time or multi-period use measurement and pricing
- Customers must be able to respond

Step Three

Determining the cost

- Including stranded investment, incremental meter and installation costs, data requirements, ongoing expenses

- Present value of costs

Step Four

Estimating Elasticities

- How much customers will increase or decrease use in each time period
- For each customer class
- Conduct study or use estimates from elsewhere or from pilot study

Step Five

Combine elasticities, prices, and electricity use

Step Six

Determining Benefits

- Operational, consumer, and societal benefits
- Only the additional benefits from the deployment of smart meters

It does not appear that operational and consumer benefits exceed the cost of smart meter deployment (except sometimes for remote meter reading and this will only cover the cost of deploying remote meter reading)

If they do, can end analysis
If they do not, then must determine societal benefits
* Primarily from multi-period pricing
* Example

Societal benefits from more efficient use of resources are greater

- When price elasticities are greater
- When current prices are further from cost (seasonal time-of-day costs vary more)
- When load and costs vary more over the day and over the year

Step Seven

Other benefits

Reduction in greenhouse gases and other emissions

- Measuring change in emissions is complex
- Change in load and change in generating facilities
- Increase in off-peak use versus reduction in peak use

Job creation – difficult to measure

Step Eight

Comparing the costs and benefits

- Compare net present value of costs to net present value of benefits

- Could have benefits exceeding costs for certain sub-groups, such as large residential customers

- If societal benefits are required for benefits to exceed the costs, how can required retail pricing be mandated?

Conclusions

Private benefits will be captured if greater than cost

Not optimistic that smart meters will be deployed, other than for remote meter reading, without subsidies

Even including societal costs, it is not clear that the benefits exceed the costs

Competitive retailing makes it difficult to mandate the multi-period pricing that is necessary to capture societal benefits

In these cases, dumb may be better than smart

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