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Smart Grid
Rate Design and Measuring Value

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Issues and Opportunities

2.0 Valuing Smart Grid

5.0 Rate Design

2.0 Valuing Smart Grid

2.1 A Smart Grid Vision

Basic Questions

1. What problem(s) are you trying to solve: manage future costs, improve reliability, or integrate renewables ?
2. Which customer(s) are you trying to serve: society, end-user (rate payer) or the utility ?
3. How is the "Smart Grid" different from what you've already been doing ?
4. What are the smart grid costs and benefits?
5. Where do you start and what information do you need to proceed: [1] Pilot programs or [2] Transition Plan ?

2.2 A Smart Grid Vision

Attributes

1. PHEV's 2. Advanced Metering 3. Dynamic Rates 4. Sensing
5. Automation 6. Expert Systems 7. New Technology

Claimed Societal Benefits		Attribute	Realistic ?
1	Dramatic reduction in tailpipe emissions	1-6	
2	Reduction in petroleum imports of >50%	1-5	
3	Reduction in peak loads – lowering prices for consumers	2, 3, 5	
4	Improved grid reliability	4-6	
5	Increased grid security	4-6	
6	Positive environmental impact	1-7	
7	Enable new products, services and competitive retail markets	3	
8	Anticipate and respond to system disturbances (self-heal)	4-6	
9	Perform continuous self-assessment, respond faster by supplementing human operators.	4-6	
10	Operate resiliently against attack and be less vulnerable to natural disaster	4-6	

2.3 A Smart Grid Vision

Attributes

1. PHEV's 2. Advanced Metering 3. Dynamic Rates 4. Sensing
5. Automation 6. Expert Systems 7. New Technology

	Claimed Consumer Benefits* (slide 15)	Attribute	Realistic ?
1	Equivalent of $1.00 per gallon for gasoline	1	
2	Provide prices and opportunity to buy when KWh prices are low and sell when high	2-7	
3	Home back-up power and mobile resource	1, 2-7	
4	Protecting against power losses and avoiding costly interruptions and spoilage	2-7	
5	Reducing the cost of electricity during peak power periods,	2-3	
6	Customer choice from products to services	2, 3	
7	Enhanced system reliability	2, 3	
8	Enable active participation by consumers	2, 3, 5, 7	
9	power quality at different prices	2, 3, 5	
10	Consumers access to information, control and options that allow them to better manage energy and environmental costs	2, 3, 5, 7	

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2.4 A Smart Grid Vision

Attributes

1. PHEV's 2. Advanced Metering 3. Dynamic Rates 4. Sensing
5. Automation 6. Expert Systems 7. New Technology

	Claimed Utility System Benefits* (slide 15)	Attribute	Realistic ?
1	Minimizing energy transmission losses	7	
2	Improving the efficiency of the electricity grid.	2-7	
3	Increased efficiency of power delivery	2-7	
4	Extended asset life	?	
5	Seamlessly integrate generation and storage options	[2,3,5] [4-7]	
6	Operate efficiently to improve load factors, lower system losses, and improve maintenance.	[2,3,5] [4-7]	
7	Grid operators have new resource options to provide energy, capacity and ancillary services	[2,3,5] [4-7]	

Sources

1. The Smart Grid – Benefits and Challenges, EEI Annual Convention, J.Miller – Modern Grid Strategy Team, June 16, 2008
2. What will the Smart Grid Look Like ?, A Vision for the Smart Grid., DOE Office of Electricity Delivery and Energy Reliability, June 2008.
3. Miscellaneous public reports, press releases, presentations, and private sources.

*

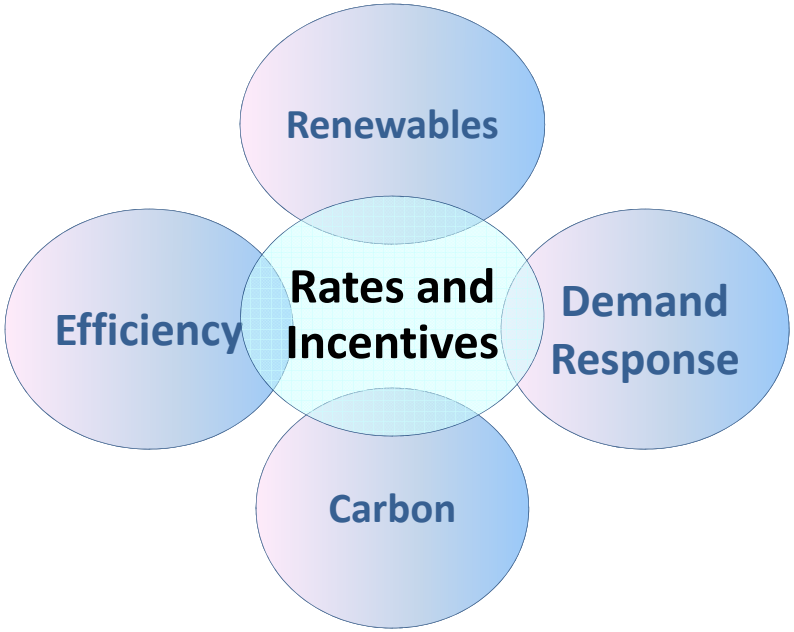
5.0 Rate Design

5.1 Rate Design

Opportunity

1. Create a long-term perspective
2. Integrate rates and incentives
3. Common, technology platform standard to link initiates
4. Customer focused

Smart Grid



Rate Designs for Smart Grid

- Digital price signals that can be communicated or broadcast electronically
- Signals that can be acted upon by automated customer controls, smart appliances and energy management systems
- Signals that integrate prices and incentives

5.3 Rate Design

Rate Pricing Features – Initiative Objectives

Initiatives	Time Differentiated Price	Automated Controls	Dispatchability	Year Round Need
Efficiency				●
Demand Response	●	●	●	●
Solar	●	●		●
Storage	●	●	●	●
PHEV	●	●	●	●
Carbon	●	○	○	●

Key

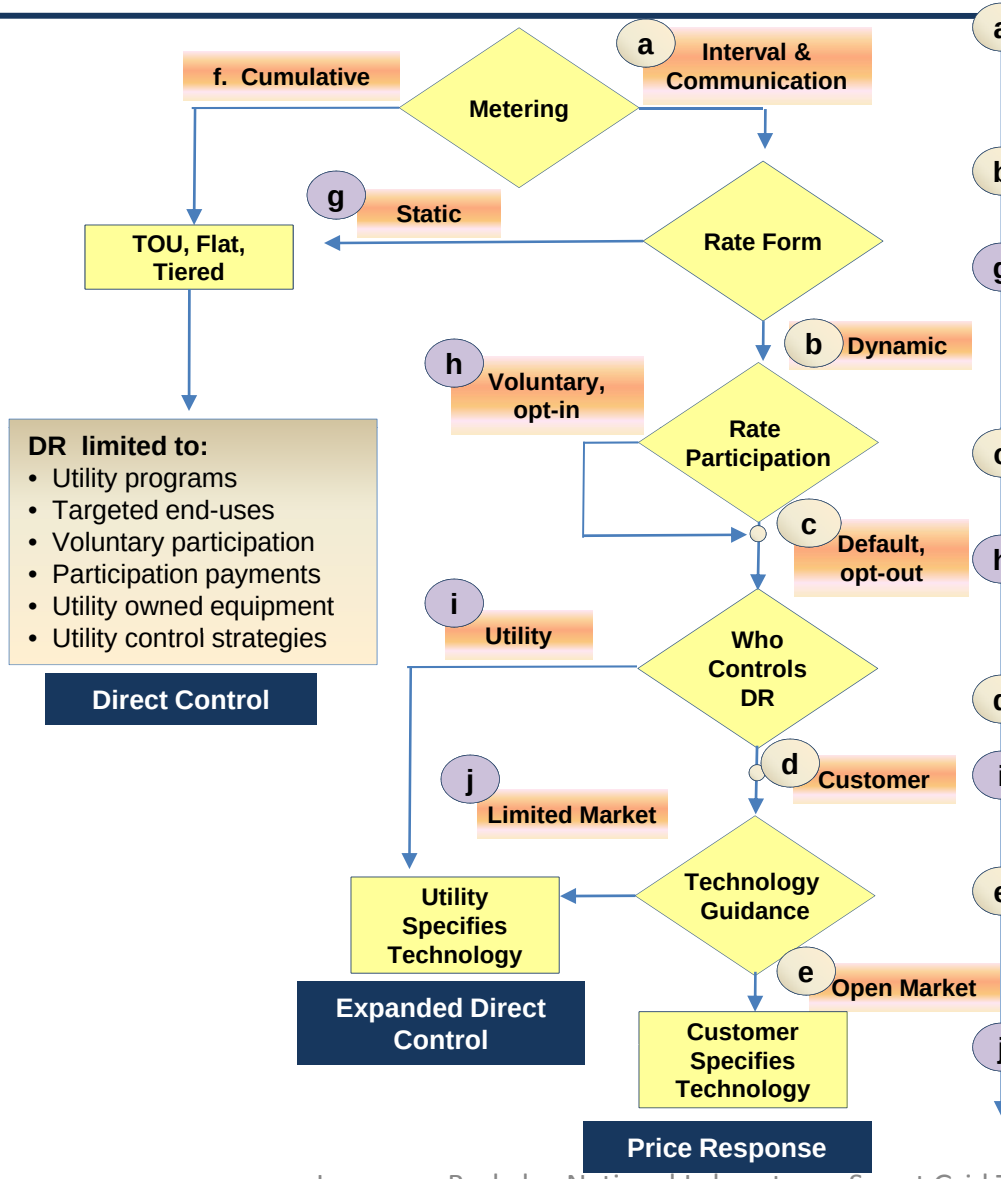
blank	Not Necessary
○	Useful but not required
●	Required

5.4 Rate Design

Rate Forms - Compatibility with Initiatives

	Non-Dynamic Rates			Dynamic Rates	
Initiatives	**Tiered**	**Time of Use**	**Peak Time Rebate**	**Critical Peak Price**	**Real Time Price**
Efficiency	No	No	No	Yes	Yes
DR – Reliability, Day Ahead	No	No	Yes	Yes	Yes
DR – Reliability, Day of	No	No	No	Yes	Yes
DR – Ancillary Services	No	No	No	Yes	Yes
Solar	No	Yes	No	Yes	Yes
Storage	No	Yes	No	Yes	Yes
PHEV	No	Partial	No	Yes	Yes
Carbon	No	Partial	No	Yes	Yes

5.5 Rate Design



a
- Interval metering provides data to support all rate forms.
- Communication supports dynamic rate, outage management, and customer information options.

b
- Dynamic rates (CPP, RTP) reflect system costs and support dispatchable economic and reliability options.

g
- Static rates do not reflect system costs or performance based rates / incentives.

c
- Default, opt-out rates create a market for DR.
- EE and DR implicit conditions of service for all customers
- DR ubiquitous system wide
- Expands and creates a market for customer ownership and competitive equipment providers.

h
- Voluntary, opt-in rates restrict market for DR to utility programs
- Limit ubiquity and value of DR.

d
- Customer choice opens the market for competitive non-utility DR suppliers and service providers

i
- Utility control disincents customer ownership and restricts competitive equipment and service provider

e
- Customer value establishes technology options
- Regulators establish: (1) Need for subsidies to address market barriers, (2) Data models - to provide interoperability, and (3) Data ownership to address security and privacy

j
- Utility establishes technology, value, and protocols.

5.6 Rate Design

Dynamic Pricing ?

"As long as consumers have flat rates, there is little incentive to manage what is scarce. With real-time pricing, residential customers still receive a monthly bill that represents an average of electricity costs across that month. However, these customers are now afforded an opportunity to manage their bills and reduce their energy costs by shifting some of their energy use from high price periods to lower price periods."*

*"Evaluation of the 2005 Energy-Smart Pricing Plan[SM], Final Report", August 1, 2006, Summit Blue Consulting, Inc., pp.ES-2.

Opt-in or Opt-out ?

Opt-in offers no greater protection than allowing consumers to "opt-out" of services to which they object, yet it imposes significantly higher costs on consumers, businesses, and the economy as it restricts the flow of information on which we all depend.

Smart Grid potential for demand response, reliability improvements, and cost reduction are very dependent upon widespread participation, which is consistent with opt-out, yet opt-in is the regulatory preference. Will the cost effectiveness of opt-in even support Smart Grid?