

Demand Management and Smart metering

IBM's point of view

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Demand Response and Demand Management

“Demand management refers to strategies aimed at reducing energy demand, especially peak demand for grid-delivered energy, or changing energy use patterns to encourage a demand response to price or other signals. “

Mechanisms

Demand Response

Time of Use Pricing

Critical Peak Pricing

Energy consumption information (in-home energy displays, energy usage portals, text message warnings)

Demand Management

contractual agreement – SLA for direct load control by cycling of airconditioners, water heating systems, washing machines

Matching demand with grid and local power generation

Distributed energy resources, micro-CHP, PHeV

IBM smart metering engagements span the globe

North America:

American Electric Power
Austin Energy
BC Hydro
BELCO
CenterPoint Energy
Con Edison
Consumers Energy
CPFL Energia
Entergy
First Energy
Florida Power & Light
Hydro One
Hydro Ottawa
IESO (Ontario)
London Hydro
NV Energy
Oncor
Ontario Energy Board
Pacific Gas & Electric
Pacific Northwest National
Laboratory
PECO
Pepco Holdings Inc
Progress Energy
Smart Meter Texas
Southern California Edison
Toronto Hydro

Europe:

A2A - AEM Torino	Enemalta
A2A - ASM Brescia	Enel
Alliander	ESB Networks
EDF (France)	Göteborg Energi
EDF Energy (UK)	MVV Energie AG
EDP	Nuon
EnBW	Oxxio
Endesa	RWE npower
	Scottish & Southern Energy
	30 Italian distributors

Australia:

Country Energy
Energy Australia
Western Power

The size, depth and breadth of IBM's contributions to smart meter projects confirms IBM as a smart meter leader

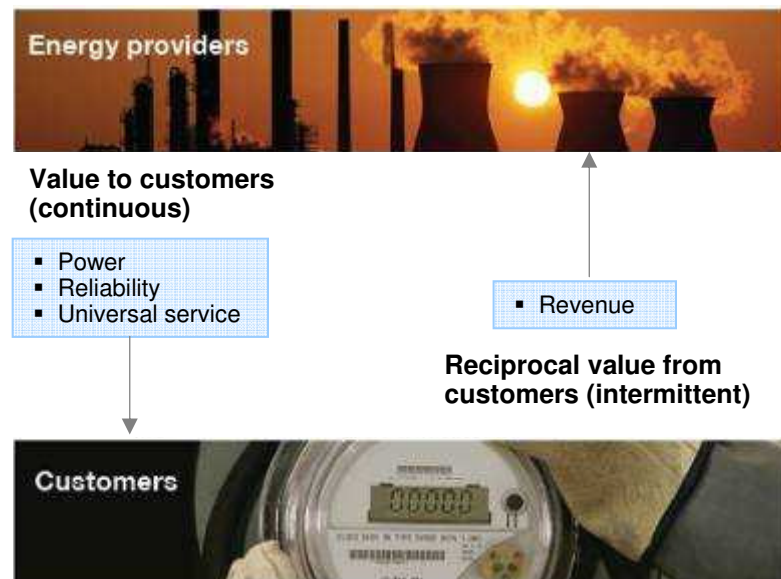


IBM has supported smart meter programs representing:

- 80 million installed or planned electric meters globally, supported by IBM
- Over 70 percent of the installed meters in North America
- In excess of 80 utilities, globally

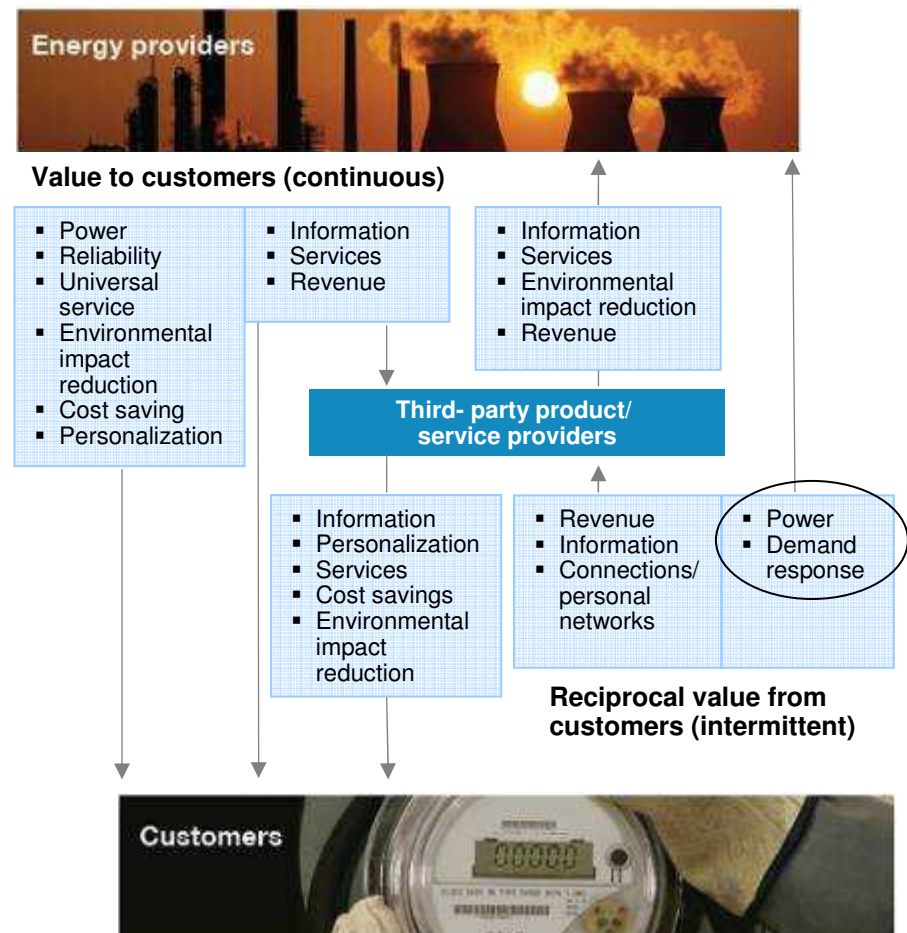
In the expanded value chain, the customer has more to offer power providers and other participants than just payment for energy

Traditional industry value model:



At the same time, customers are becoming more demanding; they actually have much more to offer in reciprocal value to energy and other product/service providers.

Emerging industry value model:



Demand reduction is emerging to drive smart metering deployments in developed countries; replacing operational efficiency drivers

Grid Efficiency Drivers

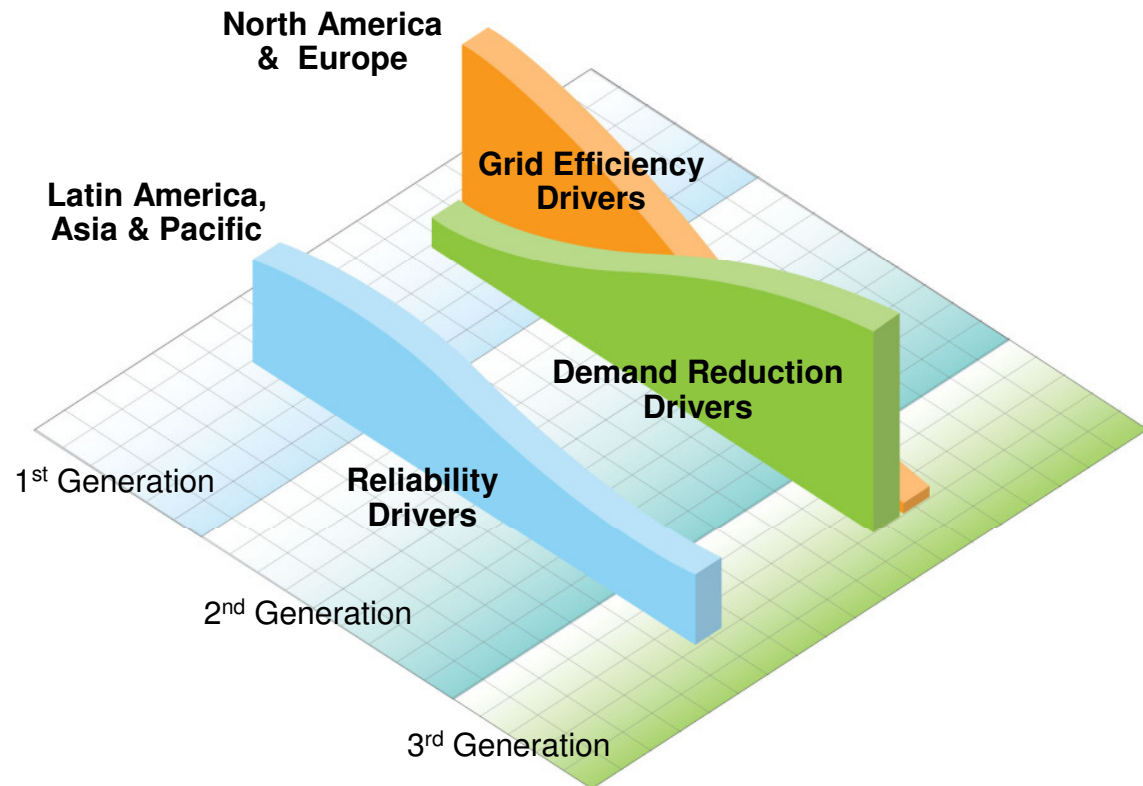
- Efficiencies
- Grid automation
- Competitive markets

Demand Reduction Drivers

- Governance model
- Policy agenda
- Energy independence
- Demand reduction
- Renewable energy integration

Reliability Drivers

- Growth capacity
- Electricity theft reduction
- Access
- Energy demand growth
- Reliability



Benefits realization of smart meter deployments is immature, but examples demonstrate value in key areas

Revenue enhancement

- Cash flow
 - Fewer estimated bills
 - Shorter billing cycles
- Loss Identification
 - Tamper alarms
 - Load balancing
 - Move-in detection
- Loss response
 - Load limiting
 - Remote and virtual disconnect

- Smart meter data indicated more electricity theft “than anticipated.”¹
- Electricity theft arrests double and \$1.6 billion in electricity payments recouped sooner over a two year period³

Demand management

- Time-based pricing (TOU, CPP)
- Energy profiling and analysis
- Online energy audits / analysis
- Load control extensions

- Estimation rate reduced over 85% from the non-smart meter estimation rate:
 - Non-smart meter estimation rate => 1.75%:
 - Smart meter estimation rate => 0.25%²

Distribution operations / reliability

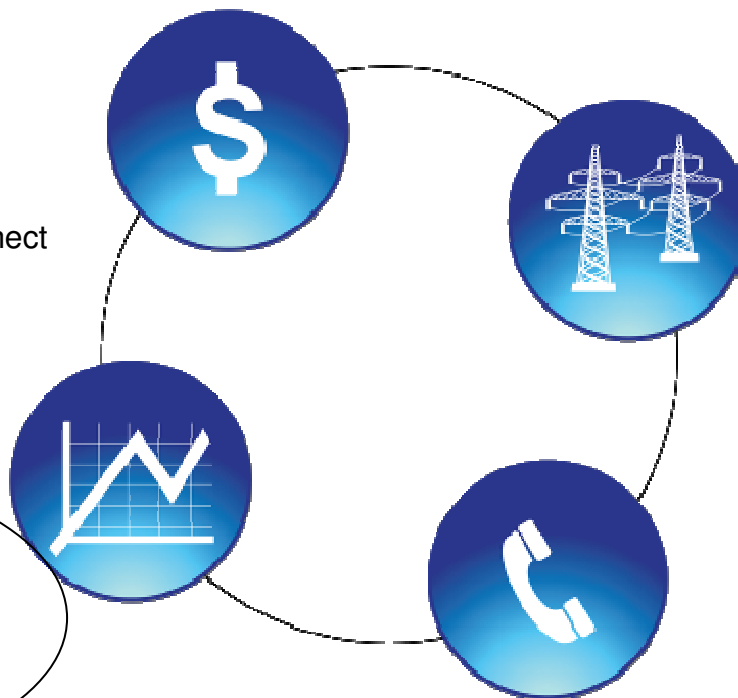
- Outage detection and restoration
 - Identifying “single-light-out” situations
- Asset optimization
 - Asset loading
- Emergency response
 - Emergency load shedding

- Reduced truck rolls to confirm service after outages.
- Avoiding 2,000 truck rolls per storm, which was not in the original business case.¹

Customer service

- Better customer information for Customer Service Representatives
- Reduced customer call volumes

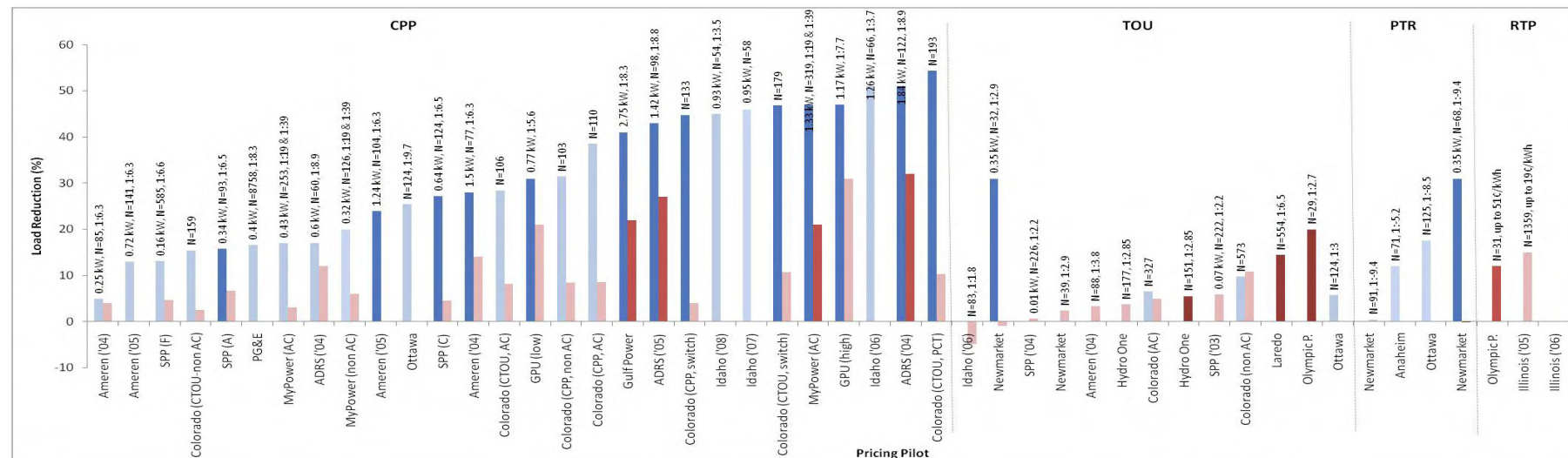
- Reconnect time – 36 minutes, 05 seconds²



Sources: ¹IBM Analysis for 1 million meter deployment; ²Smart Grid News, Sept 17, 2010; ³Jacksonville Electric Authority (JEA), smartmeters Research Store, Dec 7, 2010

Rate programs significantly impact peak demand reduction with some impact on overall demand

Load reduction during peak hours North American Pricing Pilots



Legend

- Critical event days
- Critical event days with enabling technology
- Non-event days
- Non-event days with enabling technology

Labels indicate size of average kW reduction per home; number of meters in study; ratio of lowest and highest price

Rate program

Key takeaways

Time-of-use (ToU)

- Drivers for variance include length of ToU periods, rate programs
- Simple ToU program can only expect 5% peak reductions
- Overall demand reduction in most studies

Critical peak pricing (CPP)

- Most effective strategy to curtail loads on event days
- A 30% load reduction expected
- Load reductions on non-event days indicate that behaviors formed on event days may carry over
- Overall demand reduction in most studies

Peak time rebate (PTR)

- Similar to CPP; fewer trials

Real time pricing (RTP)

- Needs a "buffer" for residential consumers

Source: The effect of utility time-varying pricing and load control strategies on residential summer peak electricity use. National Research Council Canada. Newsham, G.R; Bowker, B.G. (June 2010)

There are many ways to enable demand response and Smart Metering is one of them - but it has the promise to be the most pervasive platform

- Smart Grid is the key enabler for demand response and demand management
- Smart Metering is a key element of the smart grid
 - ➔ *Smart Meters are to be used for demand management/response*

combined with:

- In-home displays
- Smart appliances
- Home gateways
- Technologies from VPP service providers