

Putting a Value on Reliability: Iberdrola USA's Distribution Automation Cost Benefit Analysis

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For further information go to www.smartgrid.gov.



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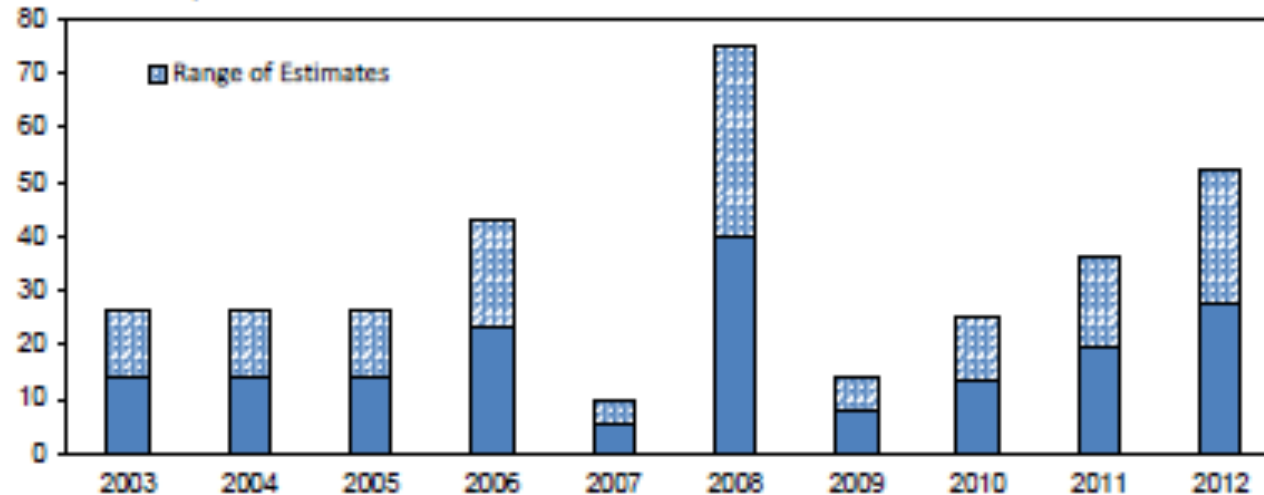
The Importance of Valuing Reliability for Non-Traditional Investments

- There is an implied value of reliability for traditional reliability investments based on history and experience
- Newer investments, such as Smart Grid, require a more explicit valuation to:
 - articulate value to key stakeholders
 - ‘compete’ in the allocation of internal capital dollars

White House Report Quantified National Economic Impact of Outages

Estimated Costs of Weather-Related Power Outages

Billions of 2012 \$



Year	Estimated Cost of Weather Related Outages (Billions 2012 \$)
2012	\$27 – \$52
2011	\$19 – \$36
2010	\$13 – \$25
2009	\$8 – \$14
2008	\$40 – \$75
2007	\$5 – \$10
2006	\$23 – \$43
2005	\$14 – \$27
2004	\$14 – \$27
2003	\$14 – \$26

Source: CEA estimates using data from Census Bureau, Department of Energy, Energy Information Administration, Sullivan et al 2009.

US DOE ICE Model: A Standardized Valuation of Reliability

- US DOE ICE model articulates the value of reliability:
 - Provides a translation of outage minutes to value (cost of outage)
 - Calculates outage values for 12 different time periods including by day of week and time per day
 - Based on extensive customer surveys
 - Can be modified to reflect demographics of service territories
- Using the ICE model, Iberdrola USA developed a tool to articulate and compare the value of reliability investments

Simplified example:

Outage Cost = # of outage minutes X number of customer (by customer type) X value of the cost of the outage

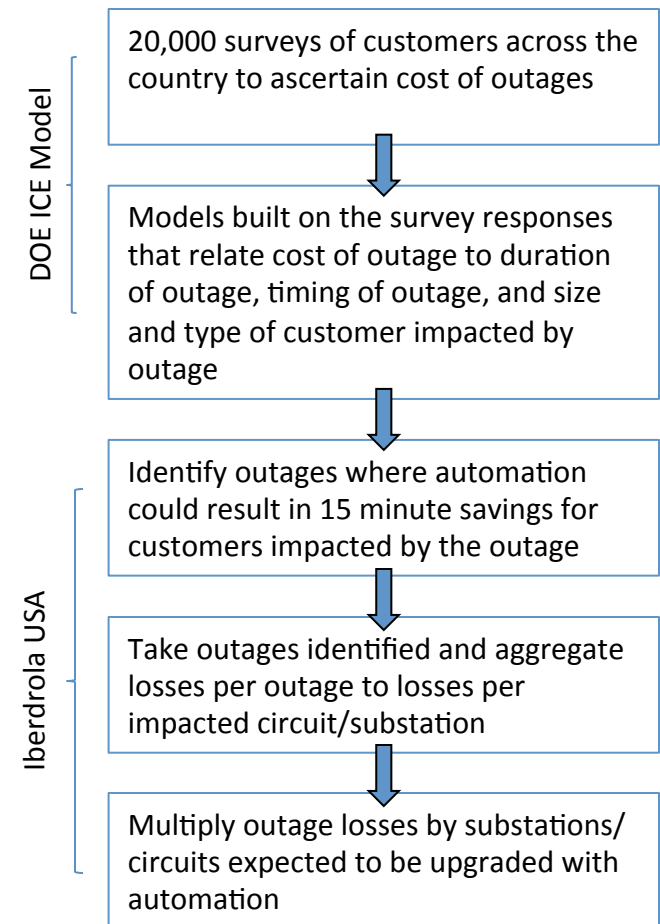
Reliability investment value = # of outage minutes 'saved' based on reliability investments X number of customer (by customer type) X value of the cost of the outage

Case Study: CMP's Rate Case

- CMP's rate case proposes \$30M in distribution automation investments
- CMP needed to articulate the benefit of automation investments to regulators

Methodology for Reliability Valuation:

1. Determine the improvement in reliability (in hours) Smart Grid investments would provide
2. Evaluate the outage cost opportunity based on Maine's service territory demographics and historical outage events
3. Apply the value of outage cost opportunity to the improvement in reliability to determine cost benefit



Automation Efficiencies in Restoration Effort



15 Minutes Saved per Outage Event with Distribution Automation Investments

	Pre-Automation	Post-Automation
1	Customer calls with outage – assess impact and prioritize for dispatch	Two second event notification from an automated network device (recloser/switch) <i>Faster time to dispatch</i>
2	Line mechanic drives to device based on best approximation of fault location – patrol from approximate start	Precise information on reporting device – line mechanic can start patrol from that device <i>Better data/faster damage assessment</i>
3	Line mechanic finds fault and repairs	Line mechanic finds fault and repairs
4	Line mechanic breaks down site, drives back to device and closes the switch Assumes all service restored	Line mechanic calls dispatch to remotely close switch; Circuit is fully cleared before crew leaves site <i>Faster time to re-energize</i>

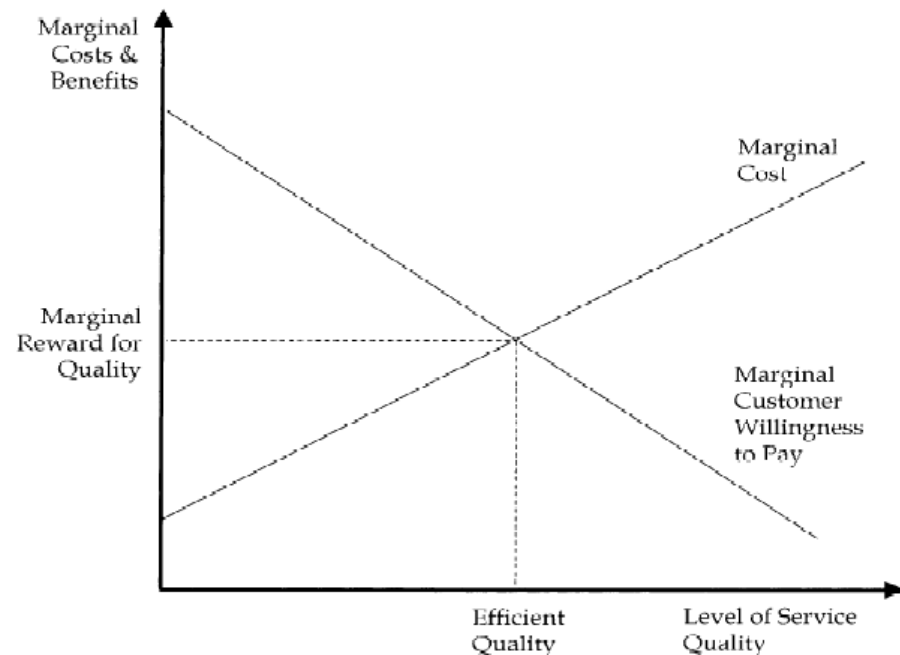
Average Outage Cost per Hour(s): National vs. Maine Comparison

Example	ICE Model Outage Cost Value per hour(s)			
	<i>Hours</i>	<i>0.5</i>	<i>1</i>	<i>4</i>
NATIONAL				
Residential		\$2.70	\$3.30	\$7.00
Small Commercial		\$435	\$619	\$2,623
Industrial		\$9,217	\$12,487	\$42,506
MAINE				
Residential		\$2.43	\$2.88	\$6.16
Small Commercial		\$572	\$841	\$3,137
Industrial		\$1,129	\$1,608	\$6,546

Projected 2014-2018 Automation Cost Benefit per CMP's Rate Case Filing

Projected Results from CMP's Automation Investments

- \$20.7m in reliability value to customers
- 213k hours outage hours reduced – with 0.4 percentage point reduction in CAIDI by 2018
- **Positive Cost Benefit for Automation:**
\$97/reduced outage hour compared to the automation investment of \$47/reduced outage hours



Case Study: Prioritized Hardening Investments

- System Hardening investment recommendations exceeded capital budget
- To meet the budget, we needed to prioritize reliability investments to achieve ‘biggest bang for reliability buck’

Methodology for Reliability Investment Prioritization:

- Define anticipated % reliability improvement per hardening recommendation
- Determine breakeven threshold for investment recommendation, i.e., \$25M investment will require 57k outage hour improvement to breakeven
- Assess if anticipated % reliability improvement meets or exceeds breakeven threshold
- Prioritize investments based on 1) meeting/exceeding breakeven threshold and 2) contribution to reliability

Prioritization Model Allows for Comparison Across Reliability Investments

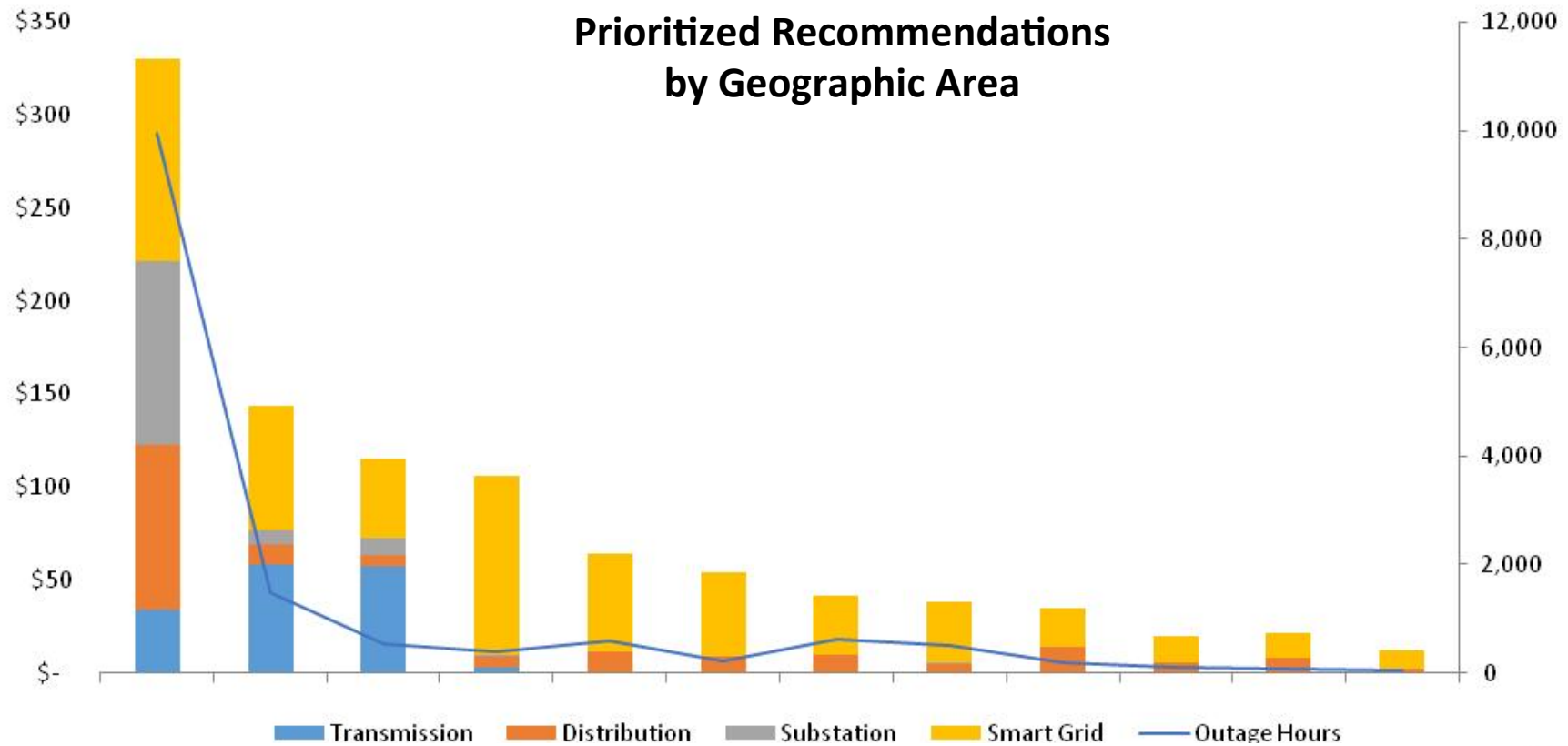
Example: Hardening Investment	\$M investment	% Reliability to Breakeven	Reduced Outage Hours
Rebuild substations	\$23M	0.4%	51k
Substation automation	\$41M	0.9%	101k
Upgrade distribution circuits	\$64M	1.4%	151k
Transmission Pole Replacement	\$157M	3.5%	379k

- Creating a value for an outage hour supports a translation from investment cost to reliability contribution
- Prioritization tool allows for comparison across traditional and non-traditional reliability investments

Case Study Results: Hardening Investments in Sync with Reliability Needs

Hardening Investments
(in millions)

Outage Hours
(in thous.)



Value of Reliability Summary

- Putting a value on reliability makes explicit a traditionally implied value
 - Supports explanation of benefits to key stakeholders
 - Allows for a standard, objective mechanism to compare reliability investments
- Provides a platform for comparison of expanding range of non-traditional technology investments, i.e., Smart Grid, DER
- Will require internal and external buy in and education