Smart Grid and Adaptation: Resilience – Risk Management & Preparedness

December 2, 2014

IBERDROLA USA

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

Yes, Outages Have Economic Impact

US DOE Value of Service Model:

- **DOE Model provides a standardized valuation of reliability**
- **US DOE Value of Service 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 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

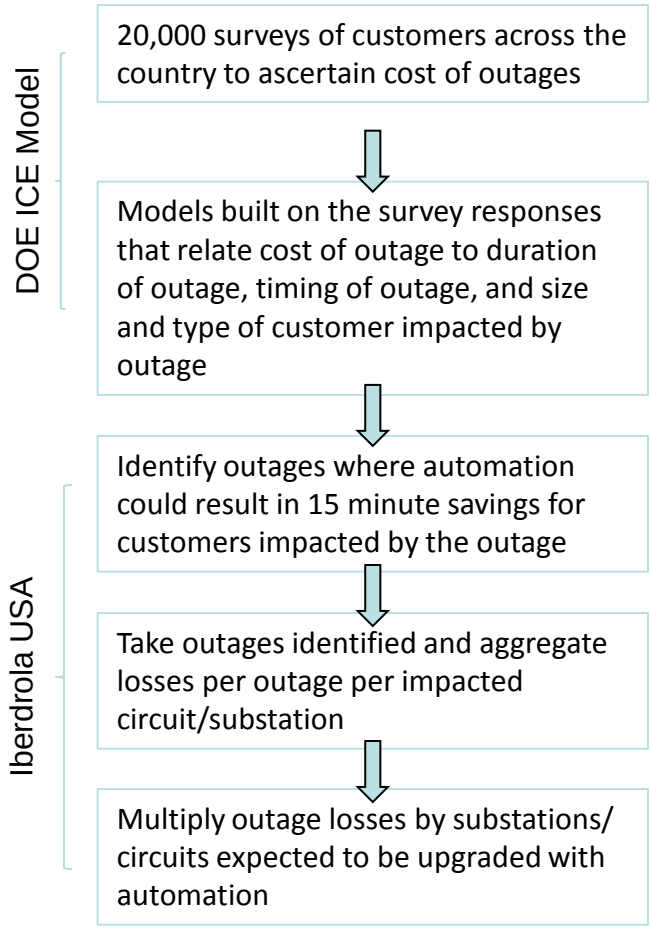
  Reliability investment value = # of outage minutes 'saved' based on reliability investments X number of customer (by customer type) X value of the cost of the outage

Case Study: CMP's Rate Case

- CMP's rate case proposed $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

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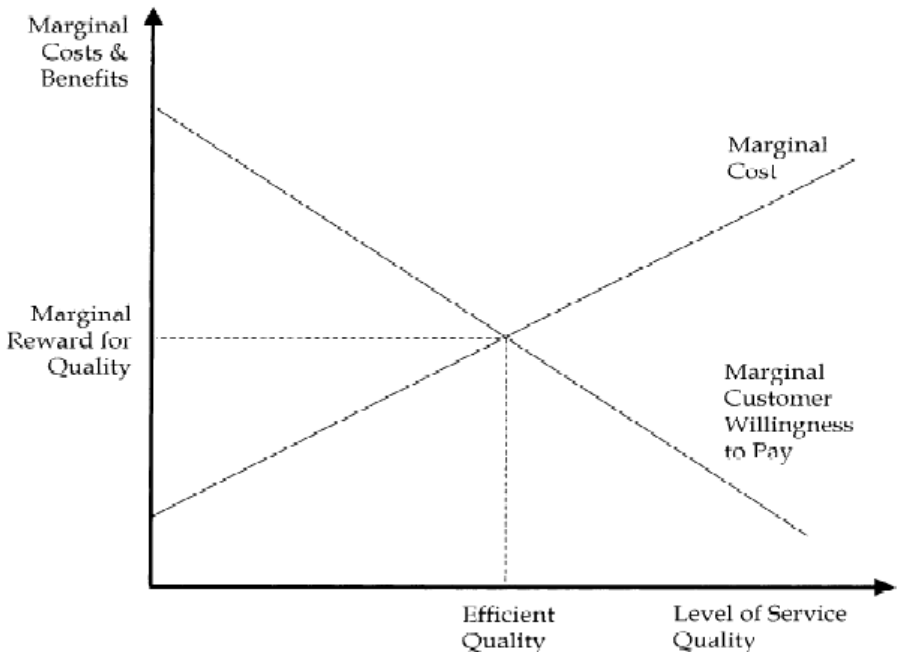
15 Minutes Saved per Outage Event with Distribution Automation Investments		
	Pre-Automation	**Post-Automation**
1	Customer calls with outage – assess impact and prioritize for dispatch	Two second event notification from an automated network device (recloser/switch) Faster time to dispatch
2	Line mechanic 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 Better data/faster damage assessment
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 Faster time to re-energize

Comparative Average Outage Cost per Hour

Example	Value of Service Outage Cost Value per hour(s)		
Hours	**0.5**	**1**	**4**
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

- Following Super Storm Sandy, Iberdrola USA developed a Hardening Investment Plan for its two NY operating companies
- 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:

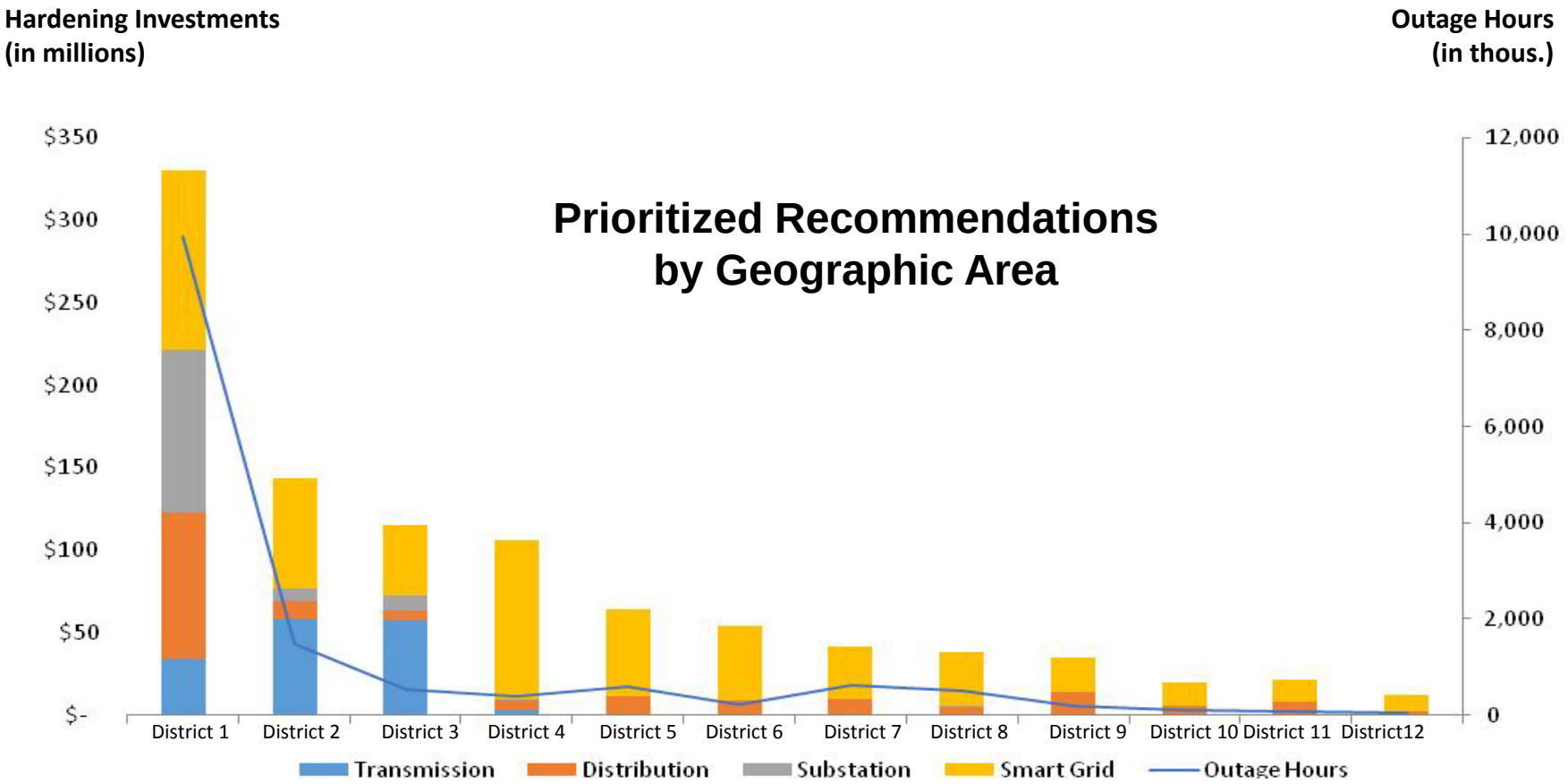
- Define anticipated % reliability improvement per hardening recommendation
- Determine breakeven threshold for investment recommendation, i.e., $25M investment will require 57k outage hour improvement to breakeven
- Assess if anticipated % reliability improvement meets or exceeds breakeven threshold
- 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	# of customers	$M investment	% Reliability to Breakeven	Reduced Outage Hours
Rebuild substations	82k	$23M	0.4%	51k
Substation automation	175k	$41M	0.9%	101k
Upgrade distribution circuits	243k	$64M	1.4%	151k
Transmission Pole Replacement	615k	$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



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**