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NATIONAL TOWN MEETING

Integrating DER with ADSM

May 28, 2015

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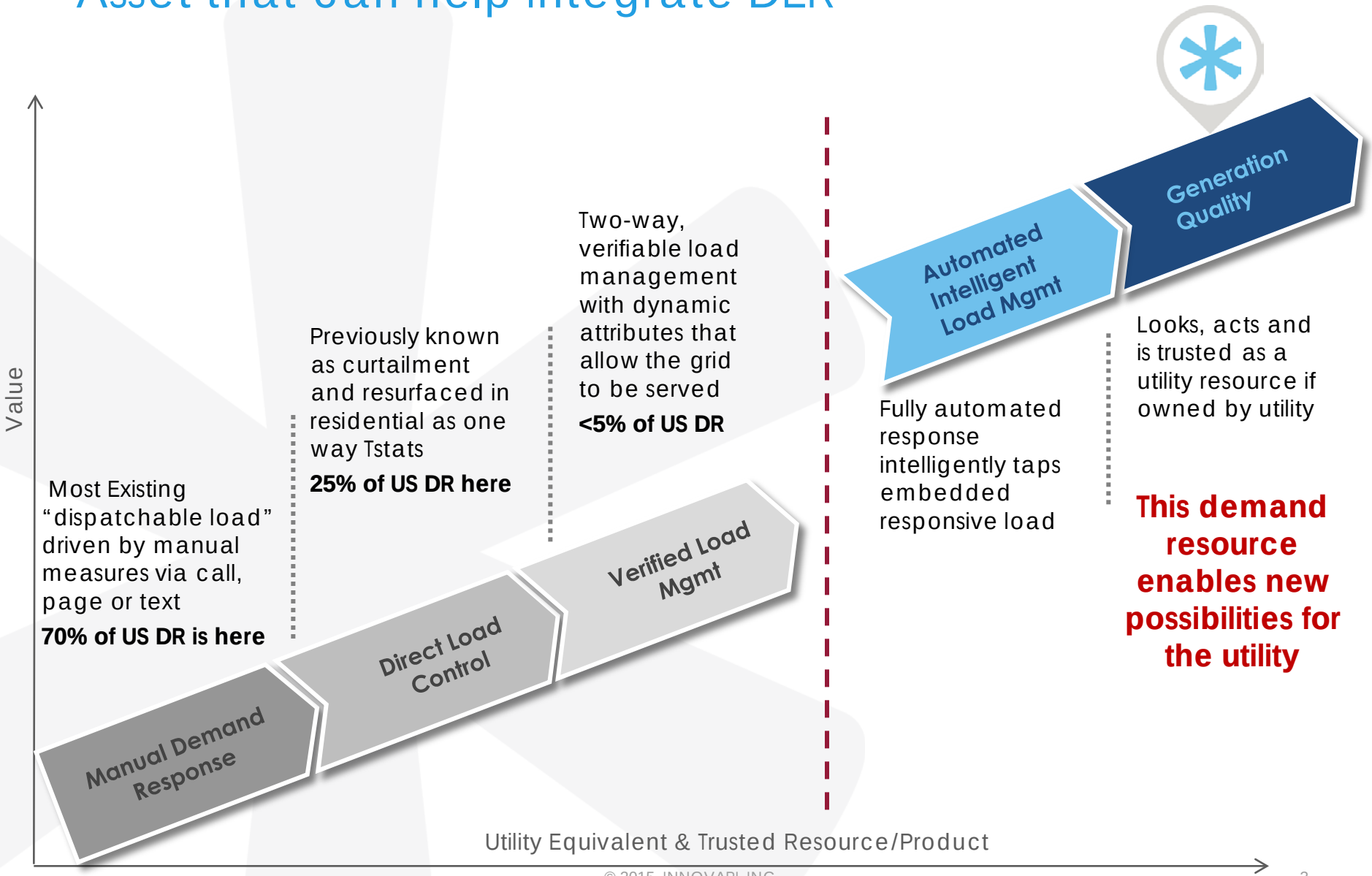
History: Learn from others what has and has not worked

- In the U.S. and Europe, DR is still used as an "emergency not as a "grid" resource.
- DR programs designed to operate for <80 hours/year.
- DR typically called <20 hours/year
- In the U.S., great things have been accomplished:
- But, the net result is that the Root Cause Problem of our Industry, the system load duration curve is **WORSE**!
- Grid is now even "peakier," causing lower system utilization, price separation from peak to base load and many other economic and reliablity problems
- Utilities forced to manage a more complexity, with even less flexibility



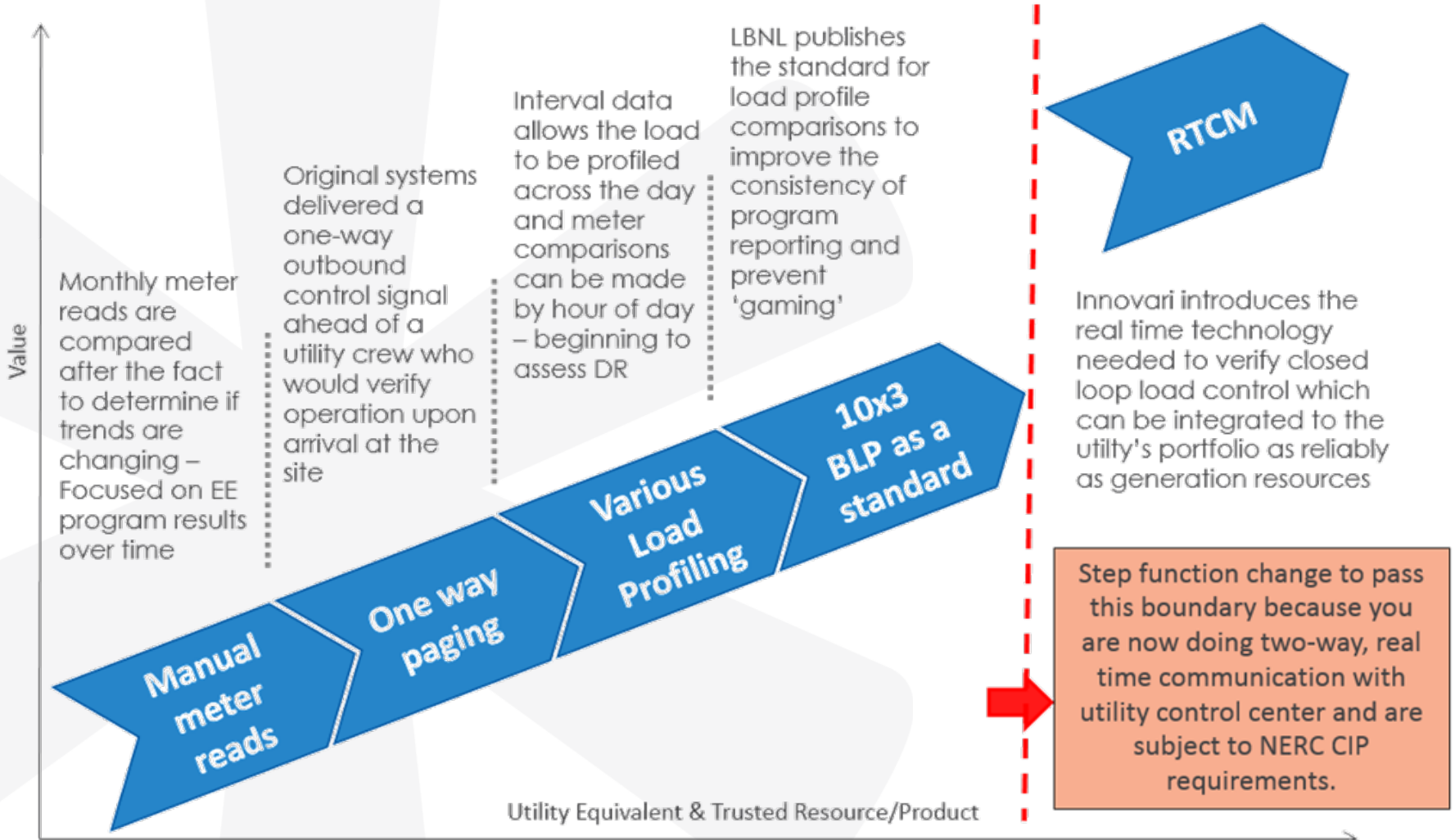
- ADSM is not DR, it's much more!
- ADSM is reliable, guaranteed >400 hour/year resource. Two way, verifiable by Grid Operator in real time
- ADSM is not one-way, not 80 hours, not just for emergencies

ADSM can be a Generation Quality Asset that can help integrate DER



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Evolution of M&V



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We can't manage the edge of the grid with "Dumb Response" we need a platform that enables Automated Demand Side Management!

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Traditional "Dumb Response"	Generation Quality ADSM
Not automated	Automated
1 way	2 way
High latency verification	real time latency ≤ 1 minute
System wide issues	System, substation, feeder and site issues
Accessed ≤100 hrs. per yr.	Accessed > than 400 hrs. per yr.
Programmatic	Part of comprehensive enterprise "edge of grid" platform

Edge of Grid Platform captures utility ecosytem benefits!

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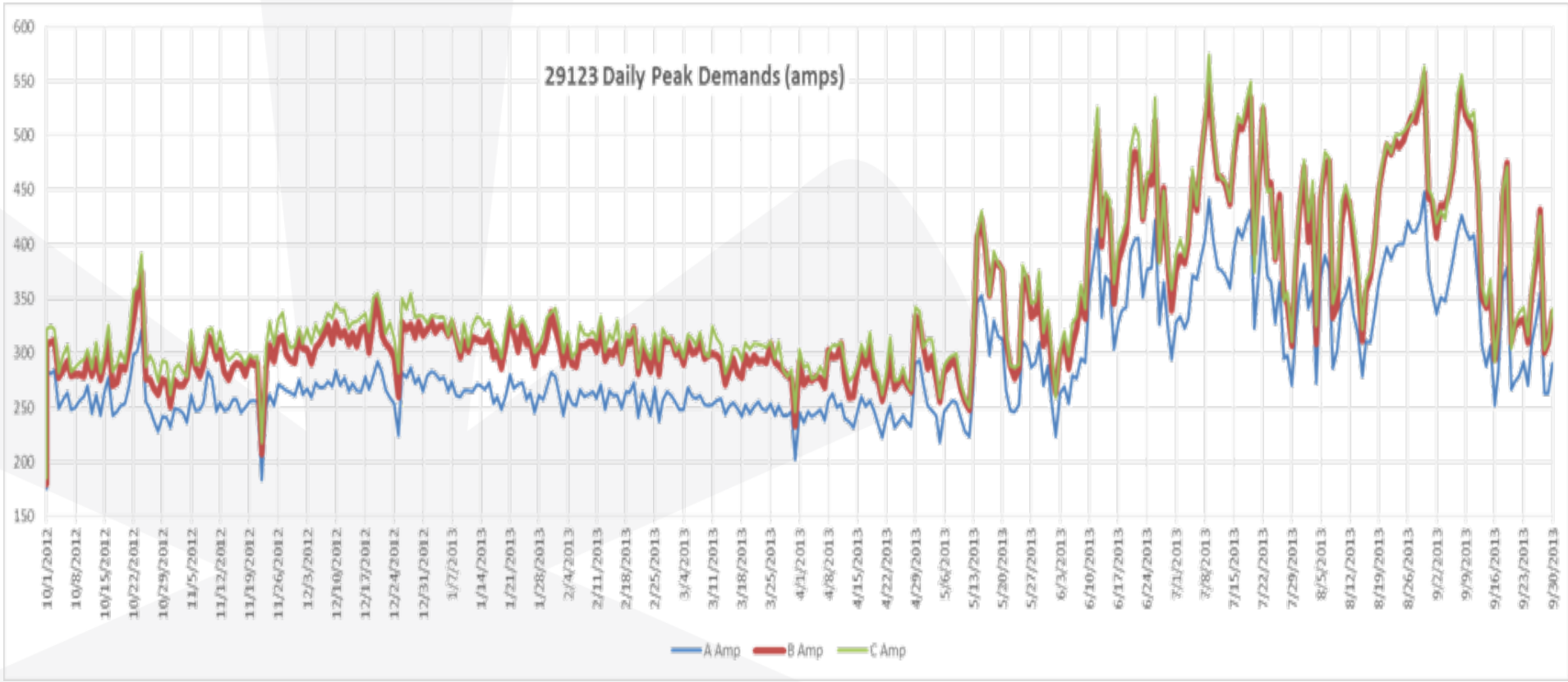
ENVIRONMENTAL	GENERATION
CO2 emission reductions	Peaker Generator Offset
Green branding	Shoulder Month Savings
BMS Energy Efficiency Savings	Distributed Generators
Water Savings	System Utilization
System Throughput	Distributed Energy Resources (DER) integration including renewables
OPERATIONAL	**ENERGY MARKET**
Feeder Deferral	Avoided Power Purchase
Substation Deferral	Energy Sales
System Loss Savings	Ancillary Services
Operating System Improvements	Return on Assets
Outage & Restoration	Lost Revenue Recovery

Introduction

CASE STUDY: SYSTEM OPTIMIZATION TO SOLVE OPERATIONAL CONSTRAINTS

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Start at the lowest system level – A single feeder

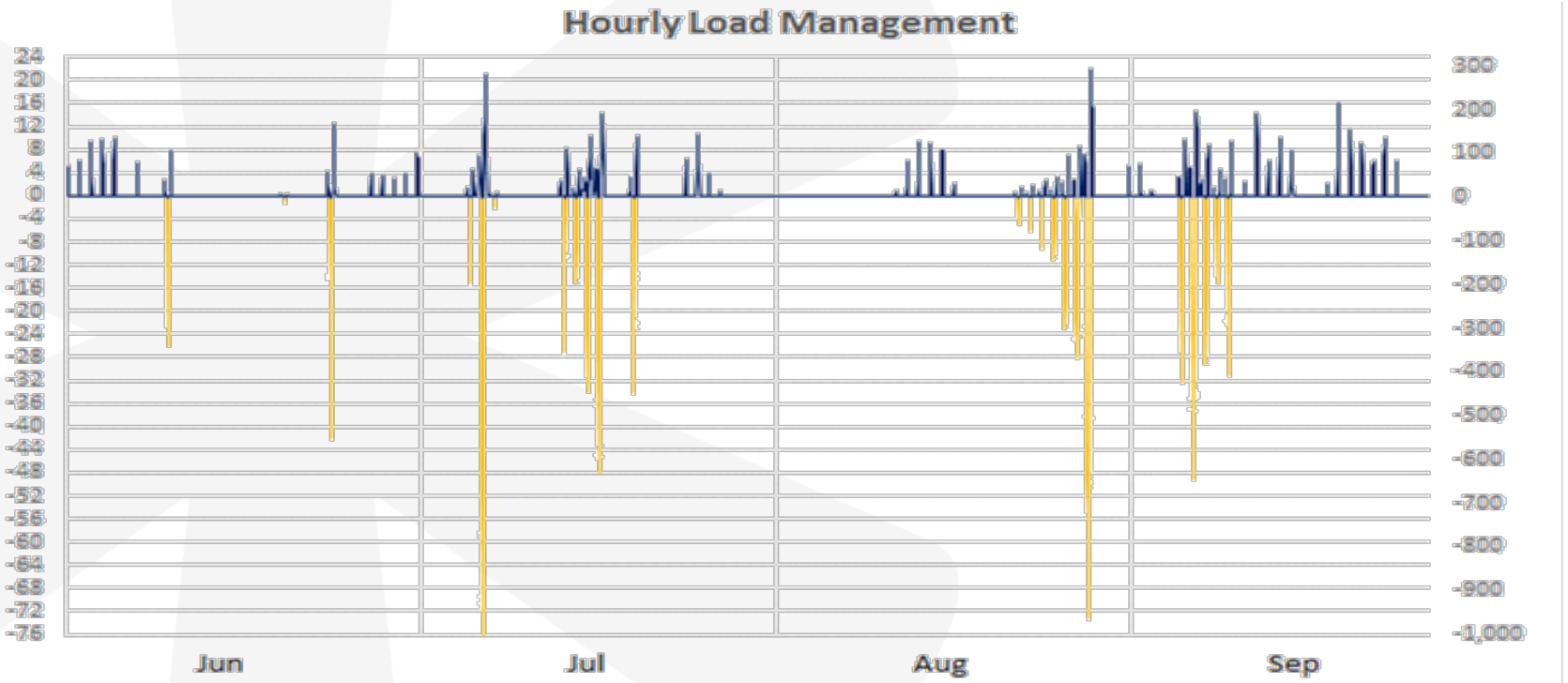


- Hourly load data on a single feeder illustrates many common characteristics of a typical utility distribution system

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Applying ADSM

A combination of operating objectives can be achieved including peak load management due to mitigate system constraints, load bury to optimize renewable energy resource production (in this example wind at night), and individual building management such as pre-cooling to shift load profiles

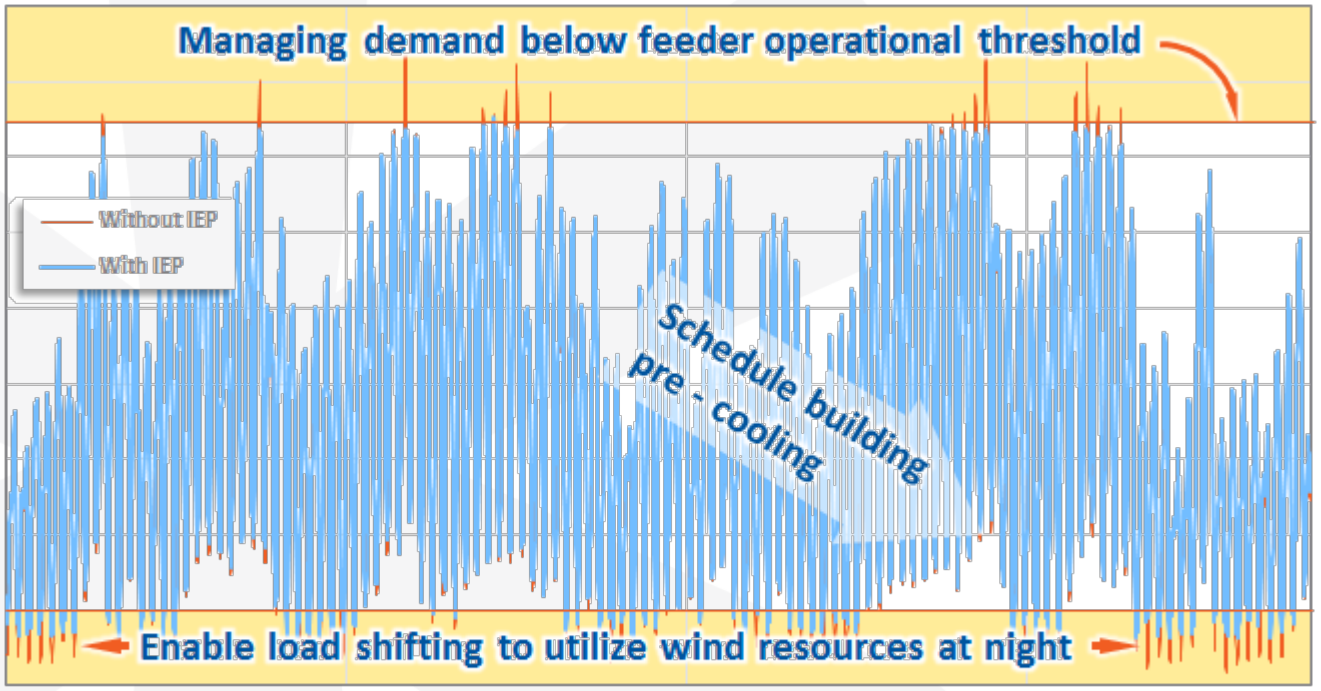


* Example illustrates 362 hours of dispatch on one feeder from a peak load reduction of 1MW to a peak load bury of 275kW

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Optimize Operational Goals

This utility was seeking to optimize feeder usage to meet equipment operating limits and defer or eliminate the need for feeder and substation upgrades as previously planned

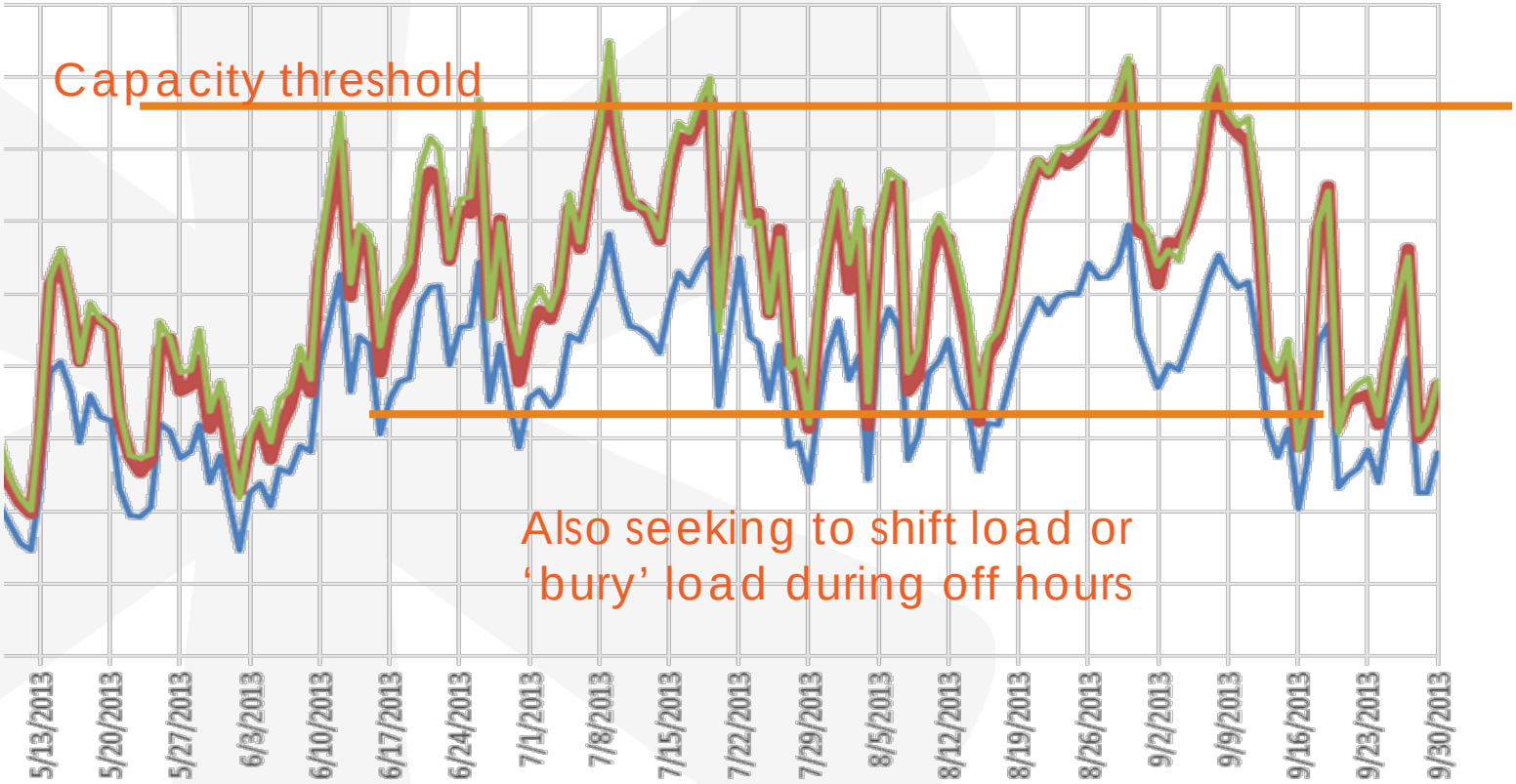


Resulting hourly load profile through the summer months using the Innovari Interactive Energy Platform™

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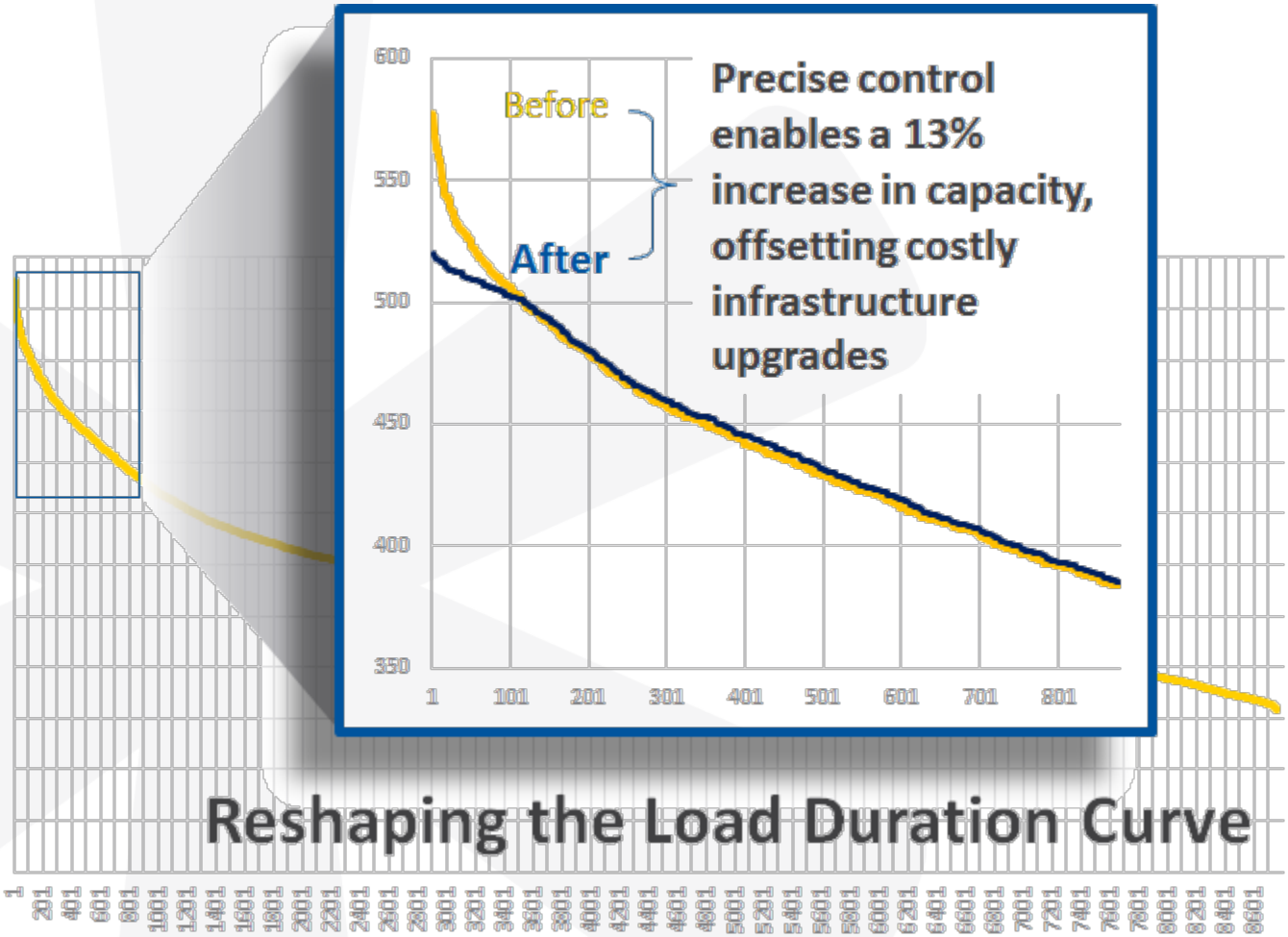
Use Case – Manage Multiple Operational Goals

- Overloaded feeder exceeding rating of equipment
- Integrated day ahead load forecast for load dispatch
- Combined off-peak objectives to include pre-cooling, pump storage and other load shifting opportunities



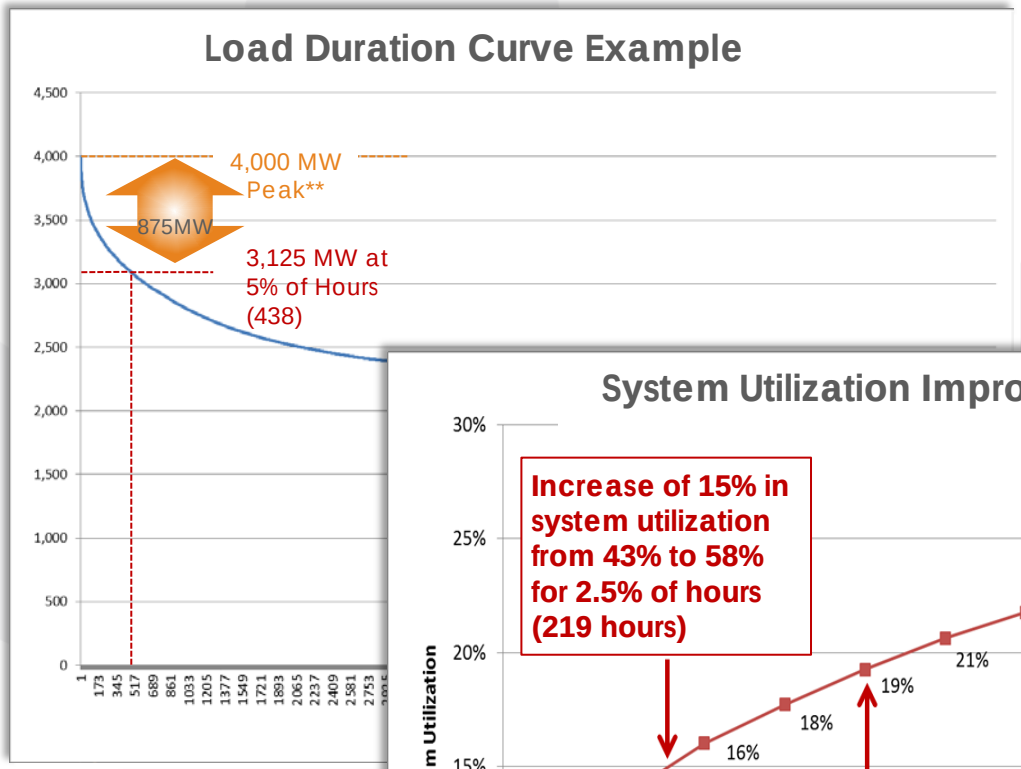
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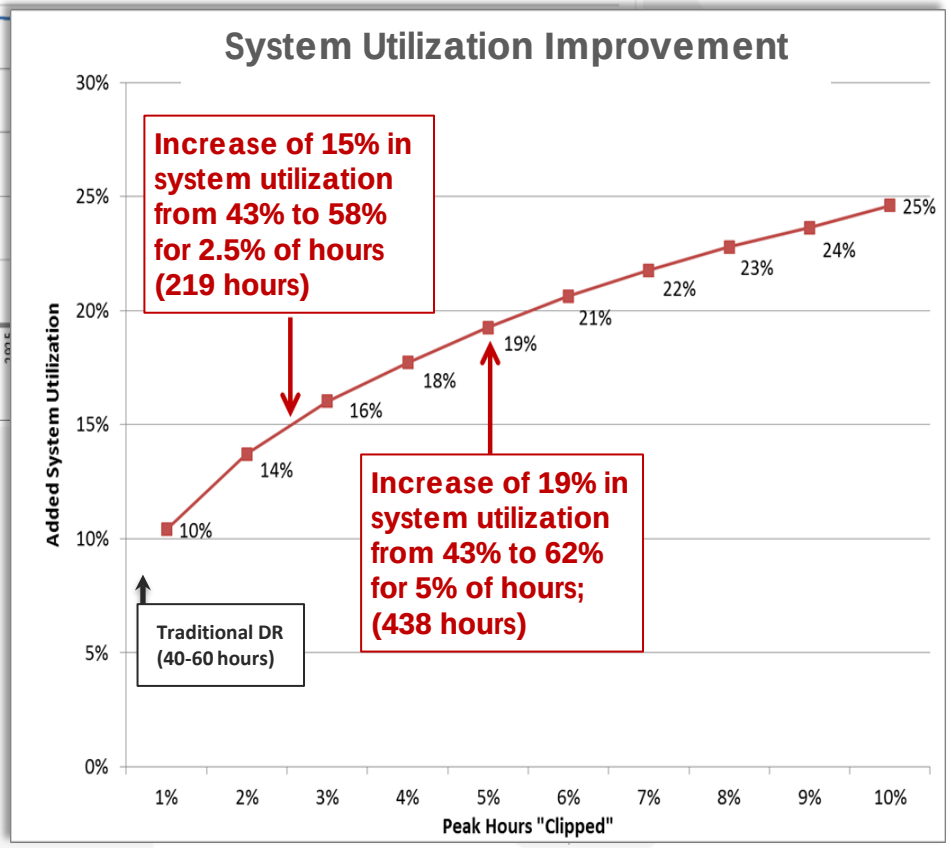
Delivering Tangible Results for Operations



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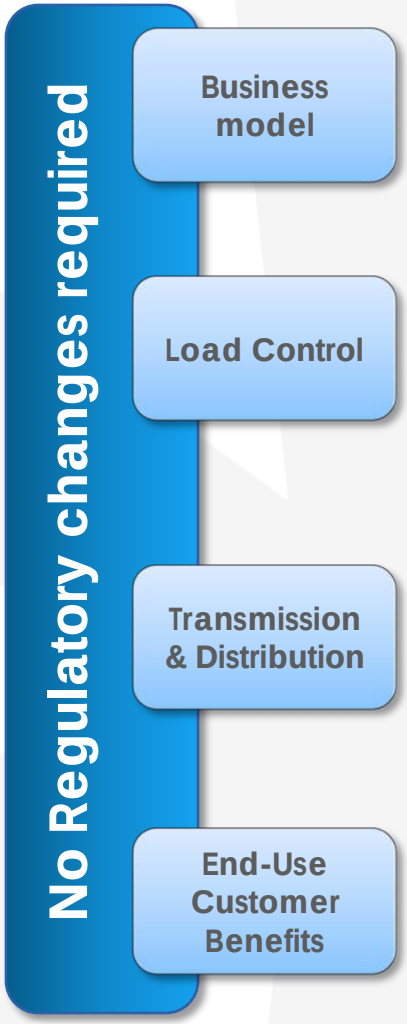
Our Mission:
Improving Overall System Utilization





- Modest improvements in load management results in large improvements in the system utilization of all existing traditional and new DER assets (generation, transmission, and distribution)
- Defers or eliminates costly T&D upgrades (feeder reconductors, substation retrofits, etc.)
- Helps improve total system reliability

Summary of our approach to ADSM



Utility owned assets

- Cost-competitive alternative to peaking power plants, feeder reconductors, substation upgrades and distributed generation
- Utility maintains and enhances the relationship with the customer

Generation quality load management -Two-way verifiable, secure method of managing all edge-of-grid resources

- Aggregated (as a resource) or targeted (feeder) dispatch
- Patented algorithms and dispatch engine ensure quality of end-use customer environment while meeting utility capacity needs

Distributed capacity and energy management

- Renewable energy integration and balancing
- System operational awareness far beyond the substation
- Detailed grid analytics including voltage, current, harmonics, fault recording and wave-form event analysis

Softer Touch Energy Management for Customers

- Improved energy-use technology and financial incentives
- Energy Management and monitoring system (alerts, etc.)
- Scheduling capabilities (lights and HVACs) via secure web portal

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Thank you!