American Council for an Energy-Efficient Economy

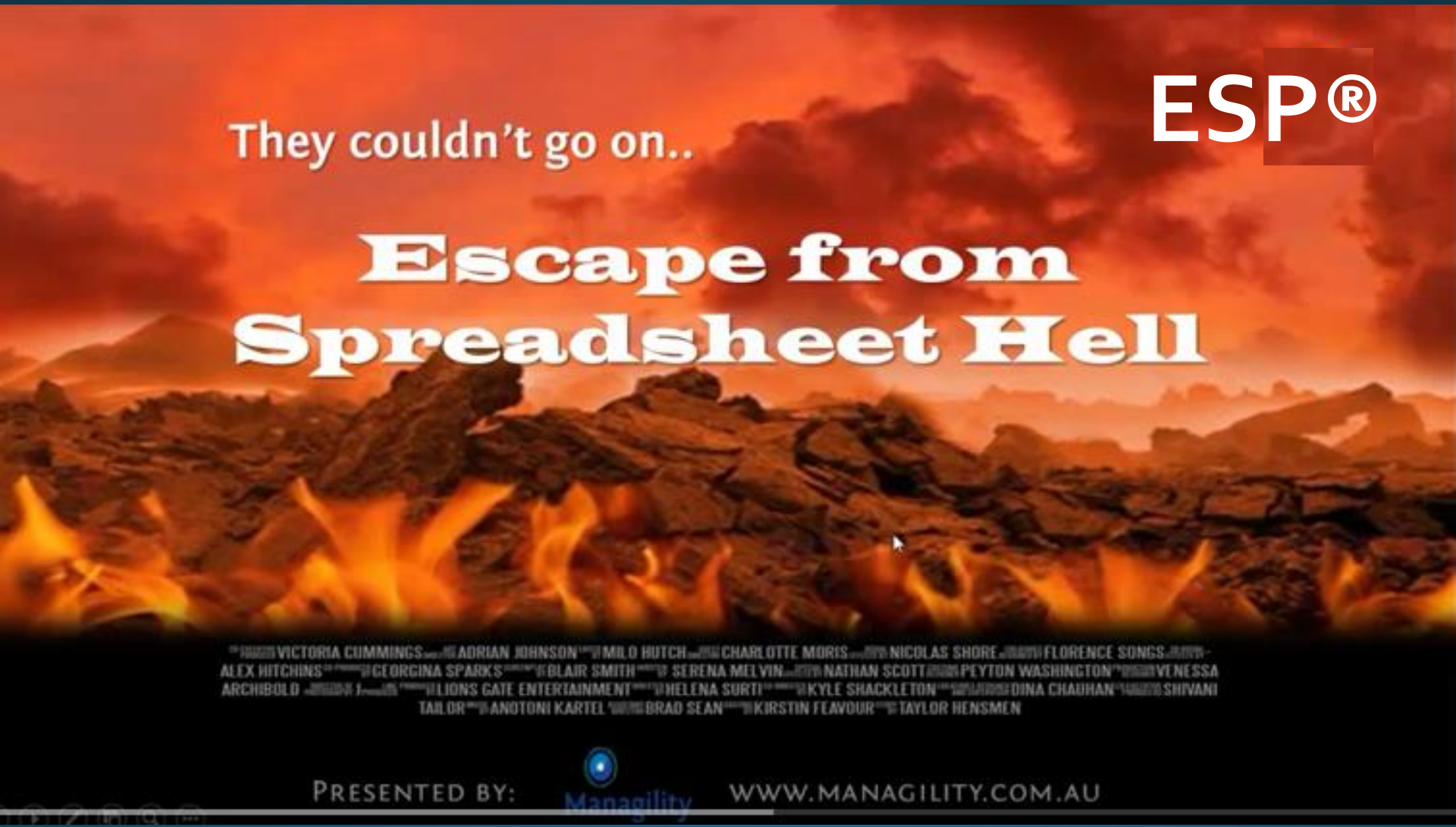
Trading Space

Intelligent Efficiency Conference

December 6th, 2016

Today's Line-Up

Presenter First Name	Presenter Last Name	Proposing Organization	Notes
Mike	Myser	ESP by Energy Platforms	Tuesday slot 1
Hal	Nelson	Res-Intel Software	Tuesday slot 2
Jamie	Peters	EnergySavvy	Tuesday slot 3
Danny	Parker	University of Central Florida	Tuesday slot 4
Luke	Scheidler	Itron	Tuesday slot 5
Suzanne	Watson	ACEEE	Tuesday slot 6
Scott	McClintock	FirstFuel	Tuesday slot 7
Reshma	Singh	LBNL	Tuesday slot 8
Megan	Partridge Wehler	PECO	Tuesday slot 9



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ESP®

Spreadsheets – Quick Fix

- Familiarity
- Ease-of-use
- Flexibility
- Easy to copy
- Easy to share
- Calculate anything

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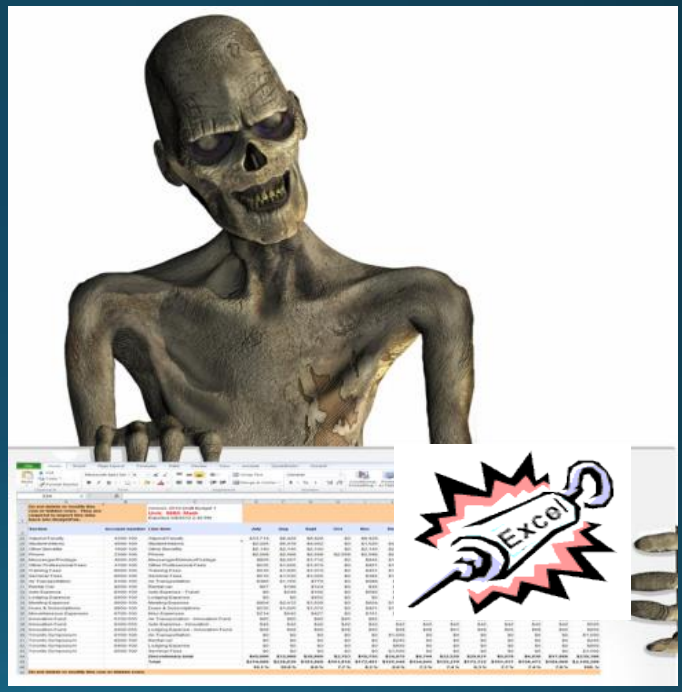
Spreadsheets = TL Damage!

- LEDCalculator.Final.xlsx
- Sharing spreadsheets
- Hard to understand
- Error prone – up to 88%
- Data trap



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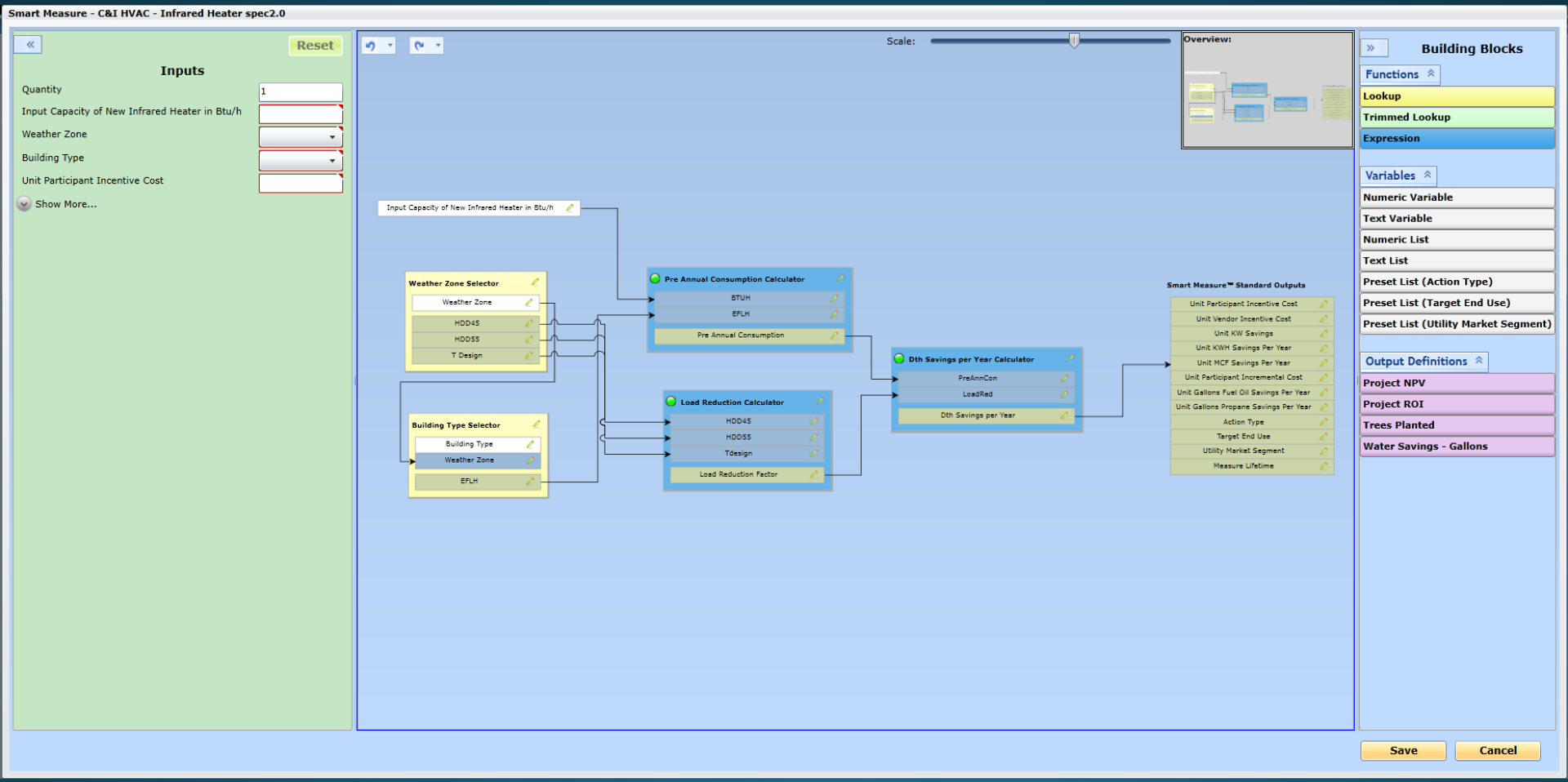
ESP®



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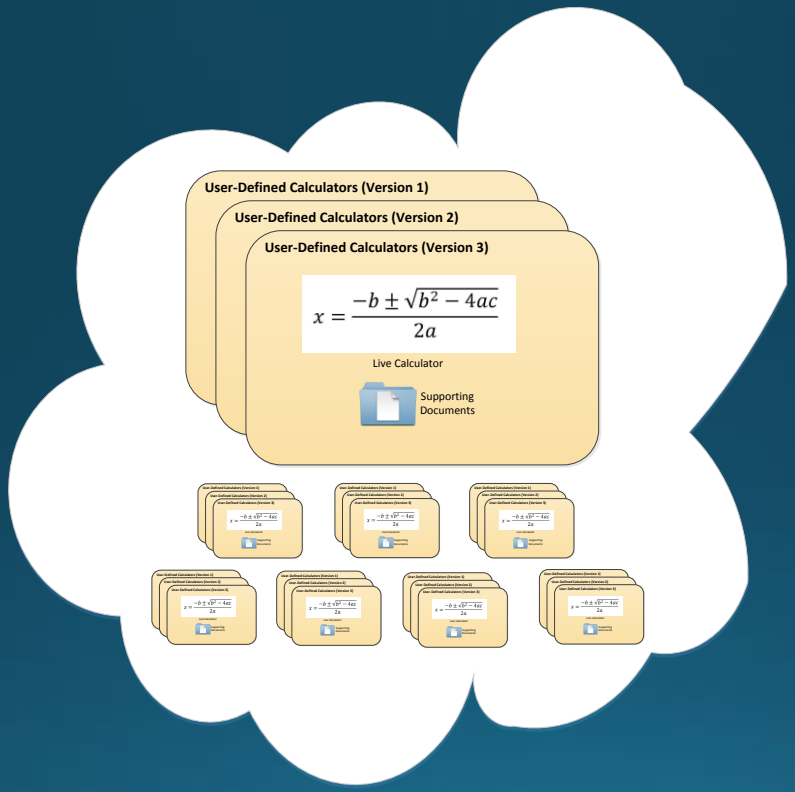
ESPCalcs - in the Cloud

Web & Portals

Tablets

Registries & Reporting Systems



Tracking Systems

Smart Phones

Laptops

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Do you need a helping hand to escape spreadsheet hell?

ESP®

- ESPCalcs™
  - Fresh program design
  - Best practice – data mgmnt
  - Lower engineering/IT costs

Mike Myser
- 651.341.5932
- mmyser@energyplatforms.com

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RES-INTEL

Business Intelligence for Smart Utilities

DSM Prescriptive Analytics

Mass-Scale Energy and Water Benchmarking

by Residential Energy and Water Intelligence (Res-Intel)

Partially funded under California Energy Commission
grant #58076A/14-09G and #57356A/11-12

ACEEE Intelligent Efficiency Conference

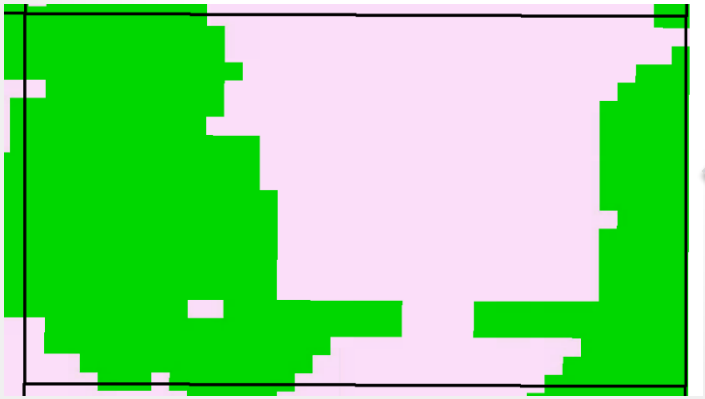
5 December, 2016

Sean Bjurstrom, CTO
Hal T. Nelson, Ph.D.
Founder and CEO
Hal.Nelson@Res-Intel.com

Confidential and Proprietary

Enabling Mass-Scale Building Benchmarking

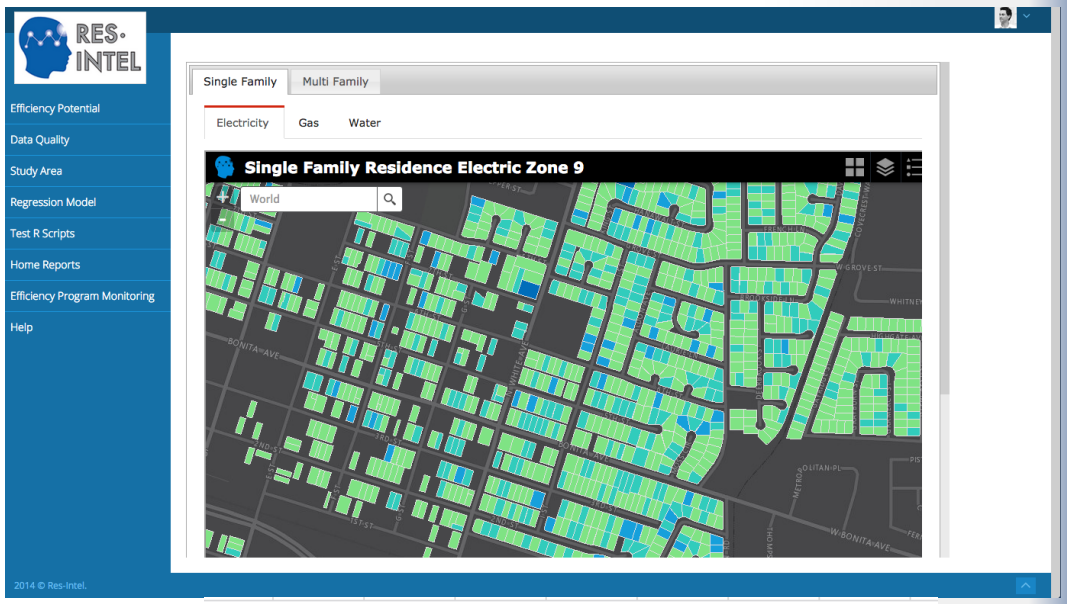
- Aggregates and QCs real estate and utility bill account data
  - Estimates energy-use intensity
- Data cleaning and upload to Energy Star Portfolio Manager



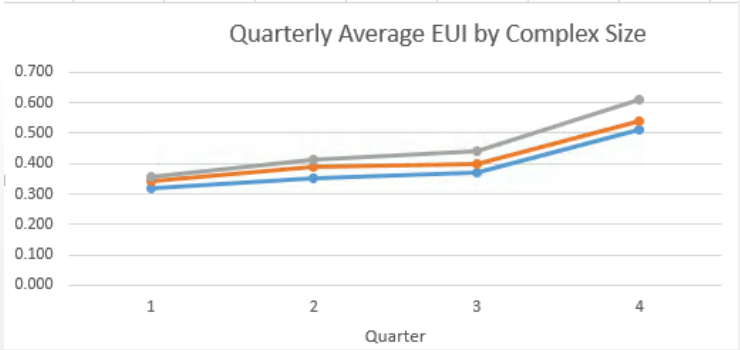
- Portfolio Analyst © performs building energy and water benchmarking:
- .56% average monthly difference between the two software tools

Data Dashboards

- Dashboard with data that is extractable from the map

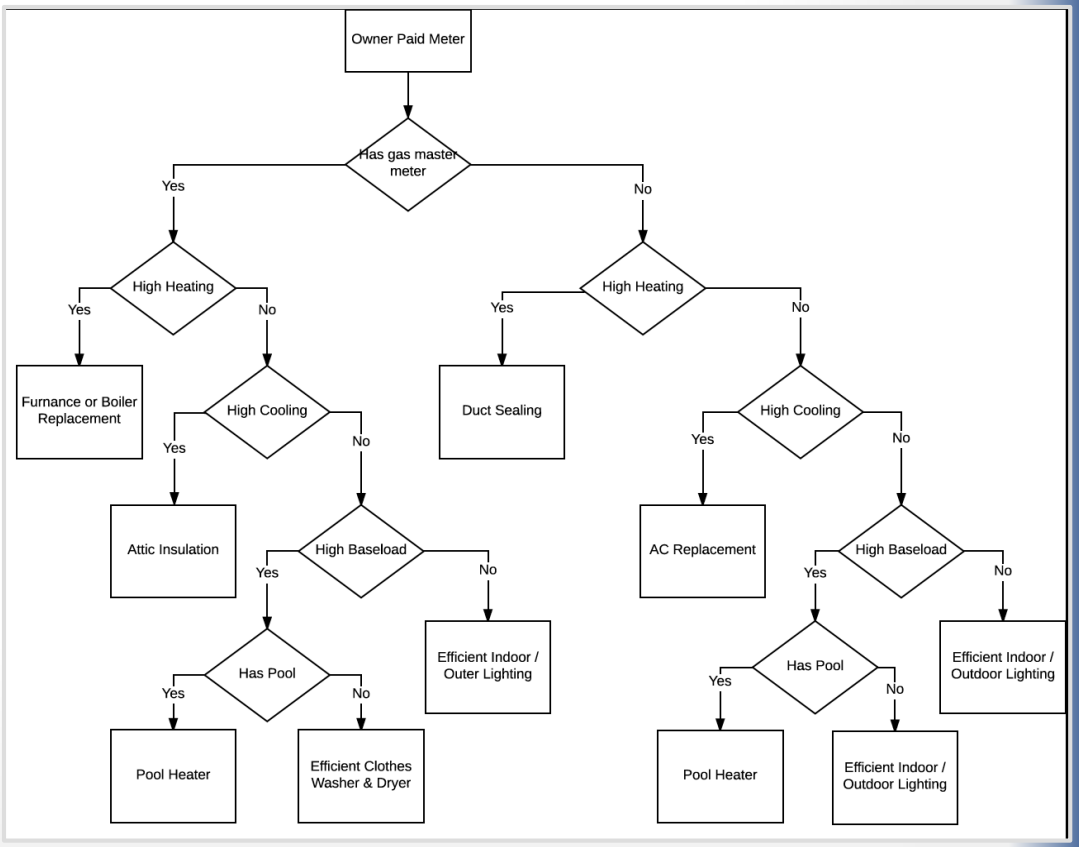


- Program EM&V dashboard with comparison groups



Micro-Targeted DSM Recommendations

- Building Energy Modeling estimates:
  - Heating
  - Cooling
  - Baseload energy uses
- Decision tree & data warehouse of recommendations:
  - Envelope
  - Prime movers
  - Appliances
  - Etc



RES·INTEL

Business Intelligence for Smart Utilities

DSM Prescriptive Analytics

- "Hard-to-reach" behavioral pilot in Southern California
  - 2,400 apartment complexes (~70,000 units)
  - Competition using benchmarking scores to reduce electricity, gas, and water-use
- Looking for partners with utility DSM networks
- More information at www.res-intel.com
  - And/or meet at Moonshine Patio Bar and Grill at 800 tonight

Questions and Comments?

EnergySavvy

Transform the utility-customer experience

Cloud Software & Services

Nearly 40 Utility Clients

$27M funding to date, including APS and KCP&L

Our Products & Services

CUSTOMER EXPERIENCE TRANSFORMATION

CUSTOMER INSIGHTS

CUSTOMER ENGAGEMENT

CUSTOMER OPERATIONS

CUSTOMER CLOUD

Our Impact

Proven results from utilities across the country

90%+ APS customers who started online audit, complete it

31% reduction in administrative time

500% year-over-year increase in online leads

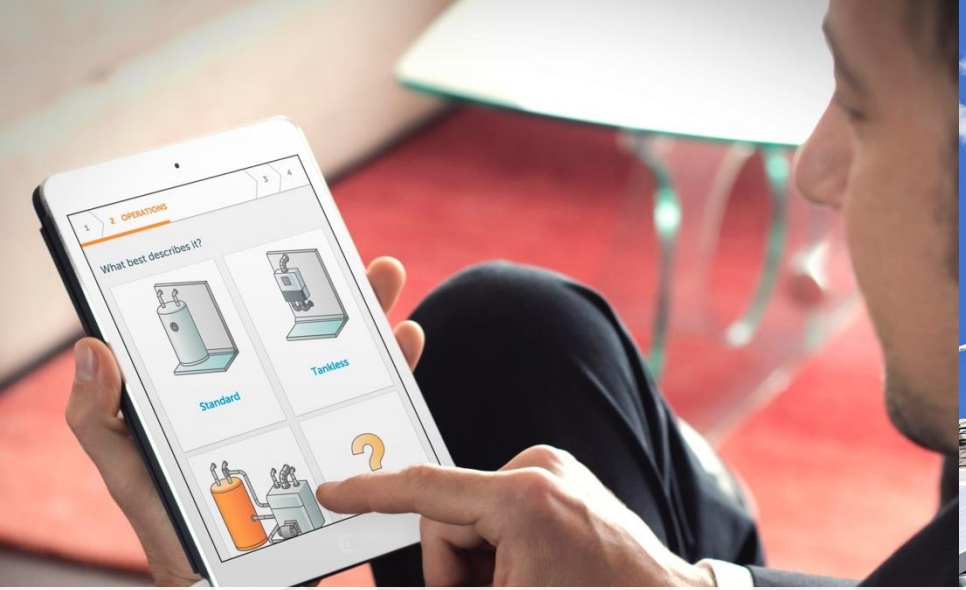
2.6x more retrofits completed

6x cheaper

57% more energy savings per retrofit

>40 hrs/week saved on fixing data entry errors

59% faster access to data for program staff



Contact me to discuss how we can help transform your customer experience, while managing costs and improving operations..

Thank you!

ENERGYSAVVY

Jamie Peters
Director of Client Solutions

jamie@energysavvy.com

FLORIDA SOLAR ENERGY CENTER™

Creating Energy Independence

Evaluation of the Space Heating and Cooling Energy Savings of Smart Thermostats in a Hot-Humid Climate

D. Parker: Dparker@fsec.ucf.edu

http://www.fsec.ucf.edu/en/publications/pdf/fsec-rr-647-16.pdf

ACEEE
American Council for an Energy-Efficient Economy

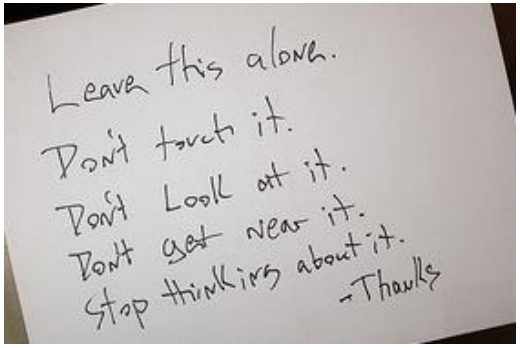
2016 Intelligent Efficiency Conference
December 2016

A Research Institute of the University of Central Florida

Installation Campaign

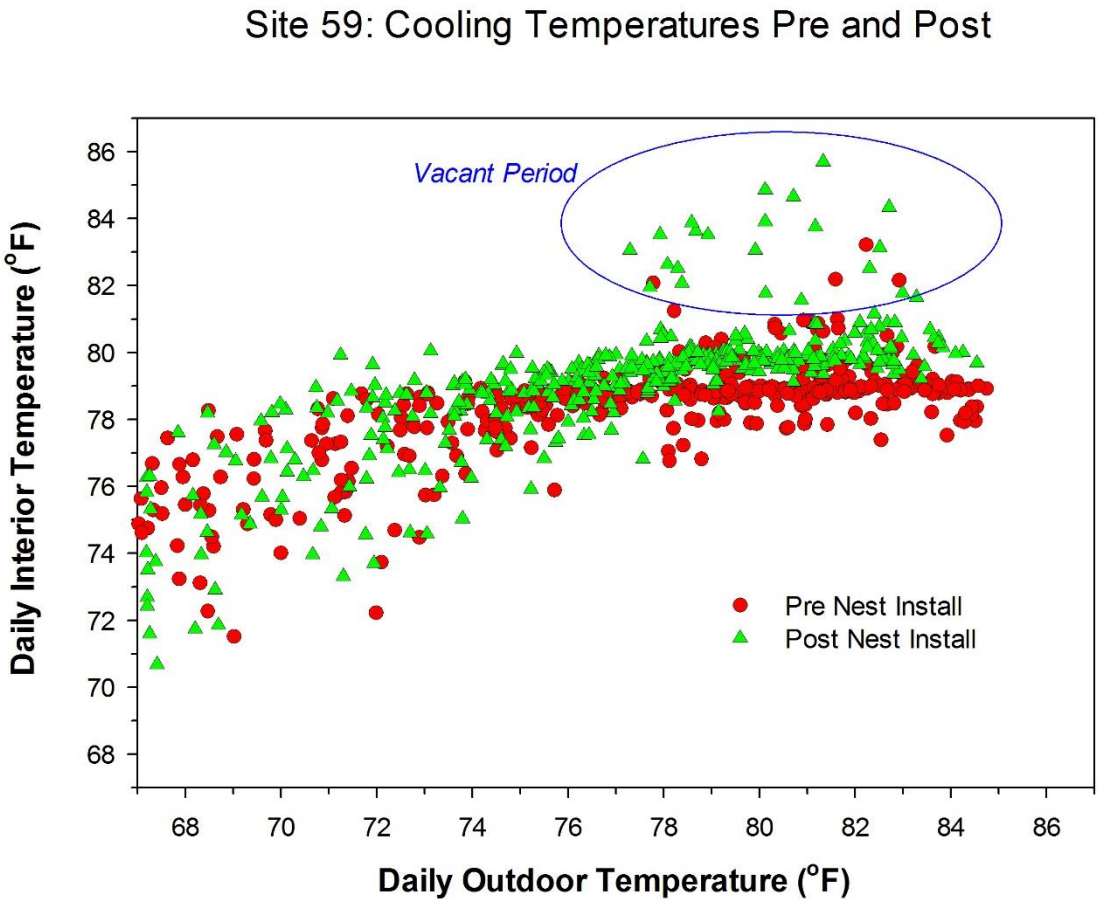
- 38 smart thermostats installed overall, but 27 only with no confounding measures
- 22 Nest sites and two Lyric sites in final evaluation
- Detailed characterization of each site; long term data temperature & sub-metered heat pump data (2-3 yrs)

Good Acceptance: Fewer Thermostat Wars



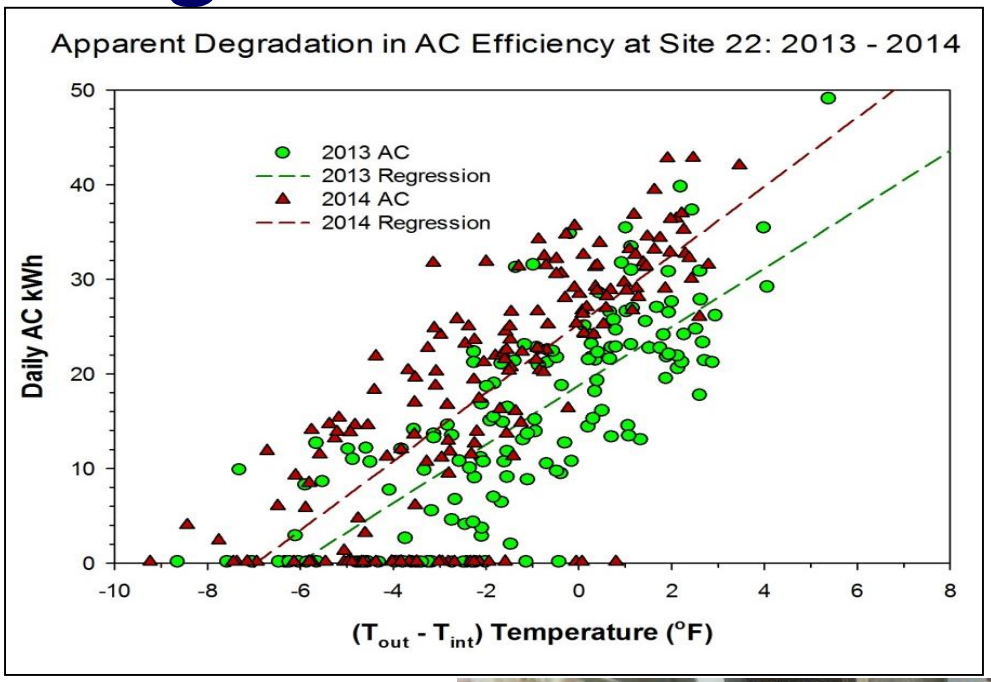
Smart Thermostats Sometimes Saved a Lot

- Occupancy sensing important to savings
- Vacancy periods = large savings
- Defeating AWAY function associated with lower savings



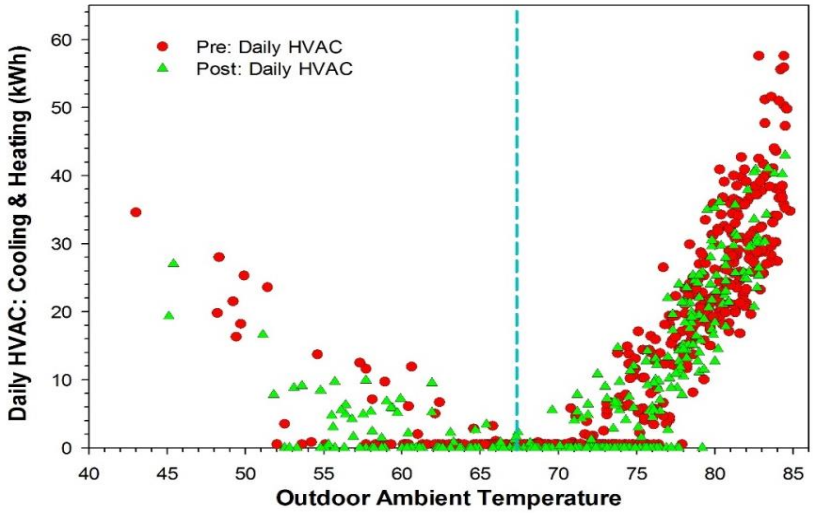
Surprise! Time-Related Degradation in Air Conditioning Performance

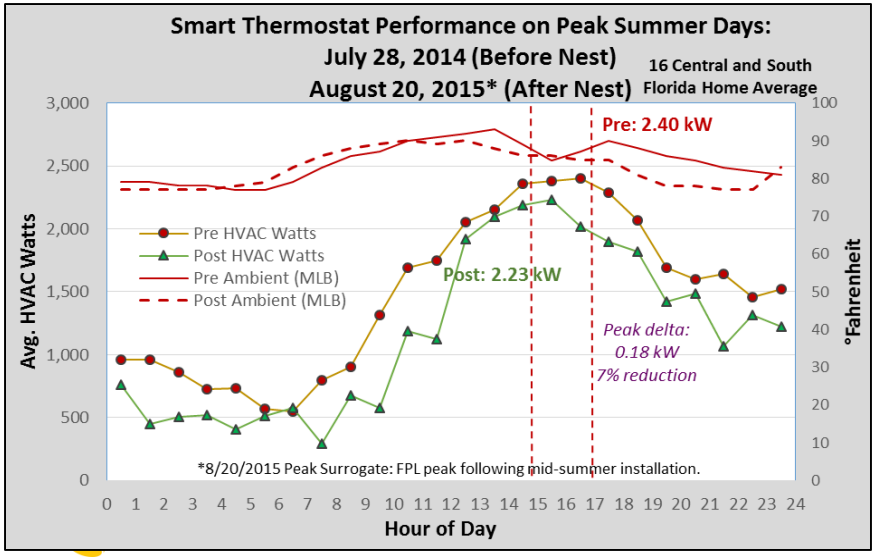
- Analysis complicated by changing AC efficiency over time
- Analysis technique allowed us to see how AC performance changed from one year to the next
- Initial plan: 2 years before Nest; 1 year after
- Introduced bias as performance often degraded over 2 year period; typically 1-4% drop in efficiency per year
- Why? Some ideas…..



Conclusions

- Evaluated 22 NEST thermostats with long-term pre and post temperature and sub-metered HVAC data
  - Avg. measured cooling/heating energy savings: 9.6%/9.5%
  - Utility coincident peak savings: 14% summer & 16% winter





- **Influences on savings**
  - Pre installation thermostat behavior
  - Willingness to use AWAY function
  - Household occupancy level

Economics very favorable in Florida with high cooling consumption; good retrofit option

Analytical methods can track falling heat pump performance & may be future opportunity


knowledge to **shape your future**

Itron Portfolio

Analyze

- » Forecasting
- » Distribution Design Suite
- » Itron Analytics
  - Smart Grid, Water, Gas
  - Services

Manage

- » Enterprise Meter Data Management
- » Network Management
- » Multi-protocol Deployment (RF, Cellular, PLC)
- » Fixed, Mobile & Hybrid Networks
- » Managed Services

Measure

- » Sensors
- » Meters – RIVA and SolarGate
- » Controls
- » Communications Modules

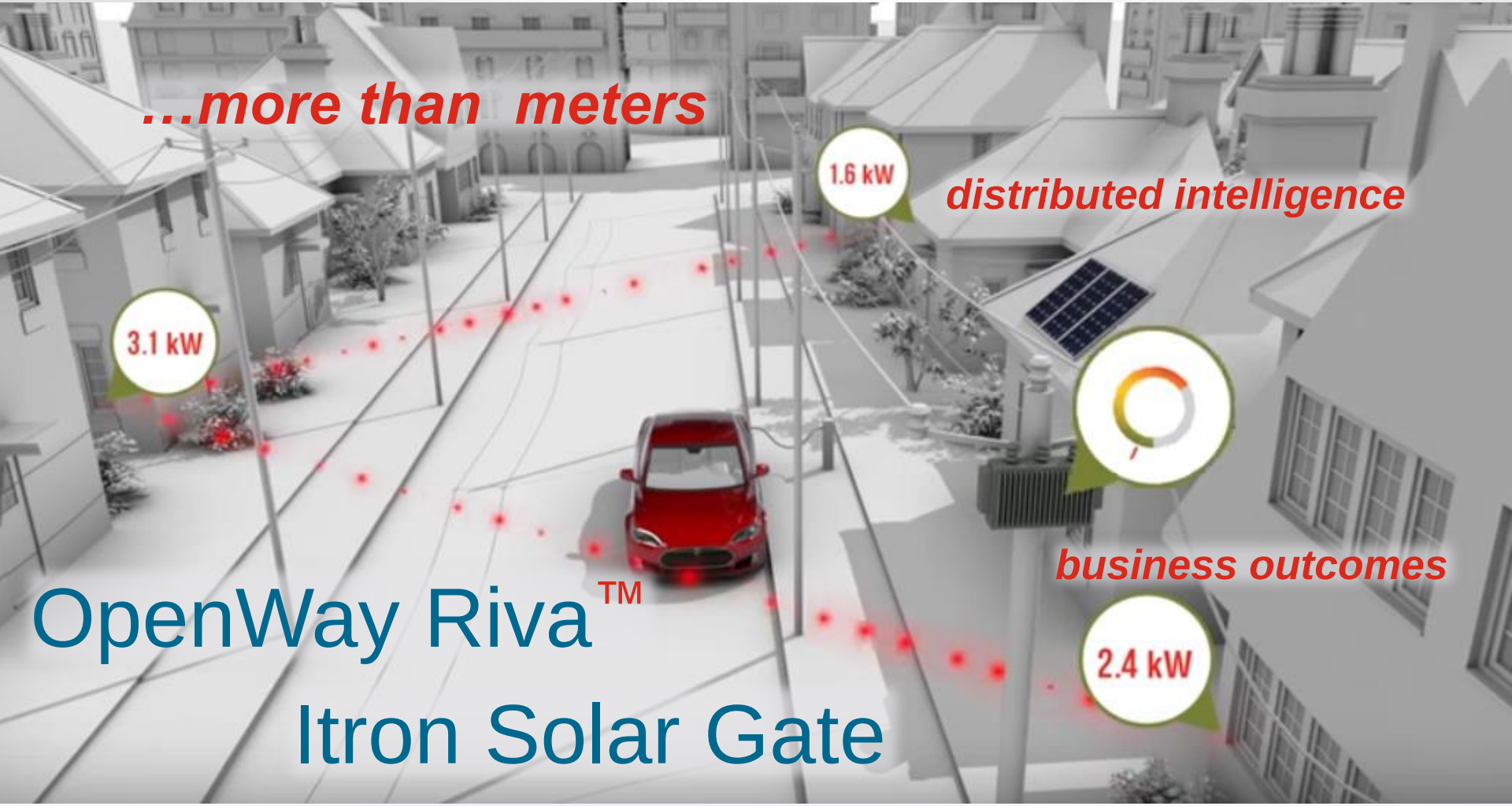
Itron Services

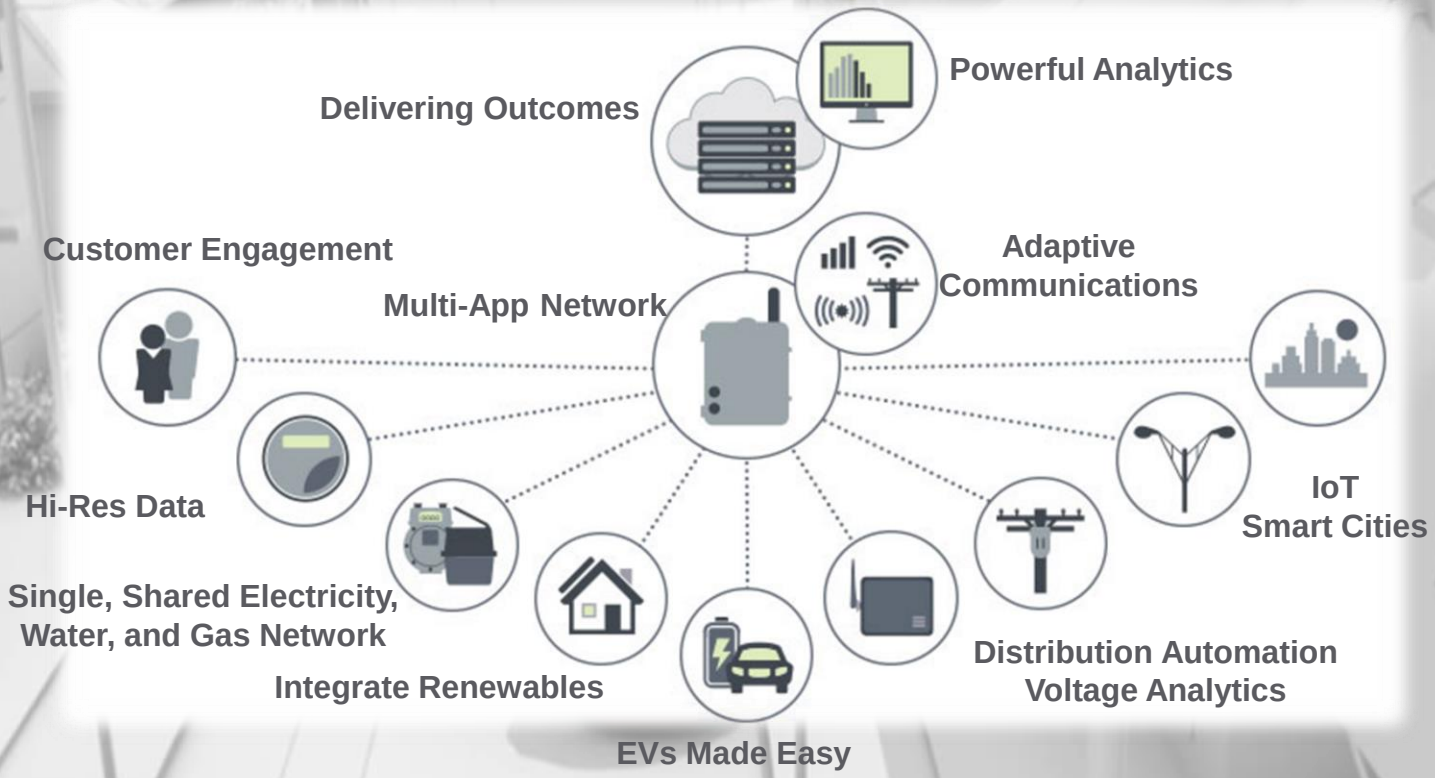
- » Consulting & Research
- » Supply & Demand Side Program Evaluation
- » BTM System & Solution Integration

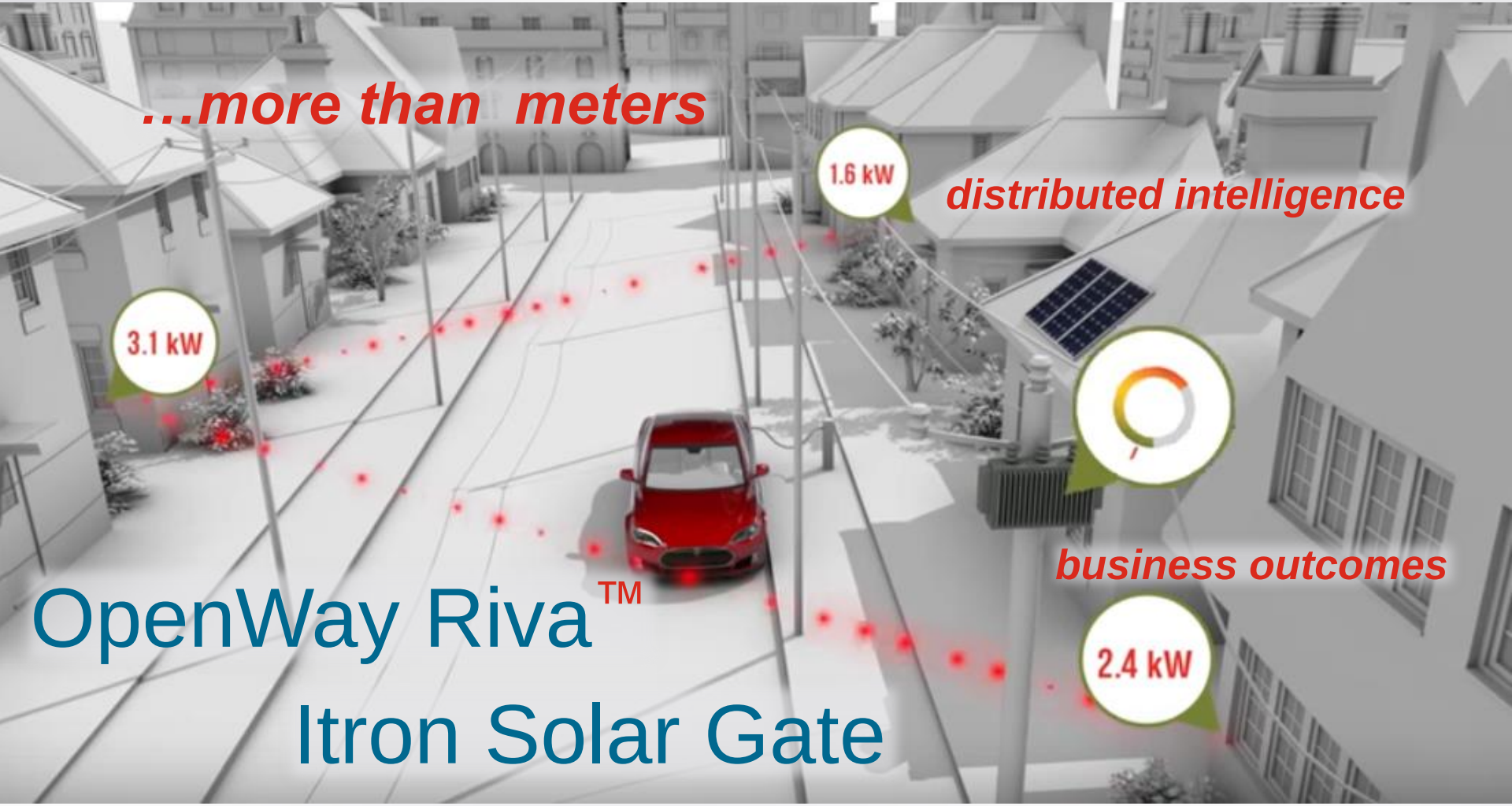
Energy Efficiency

Demand Response

Distributed Generation

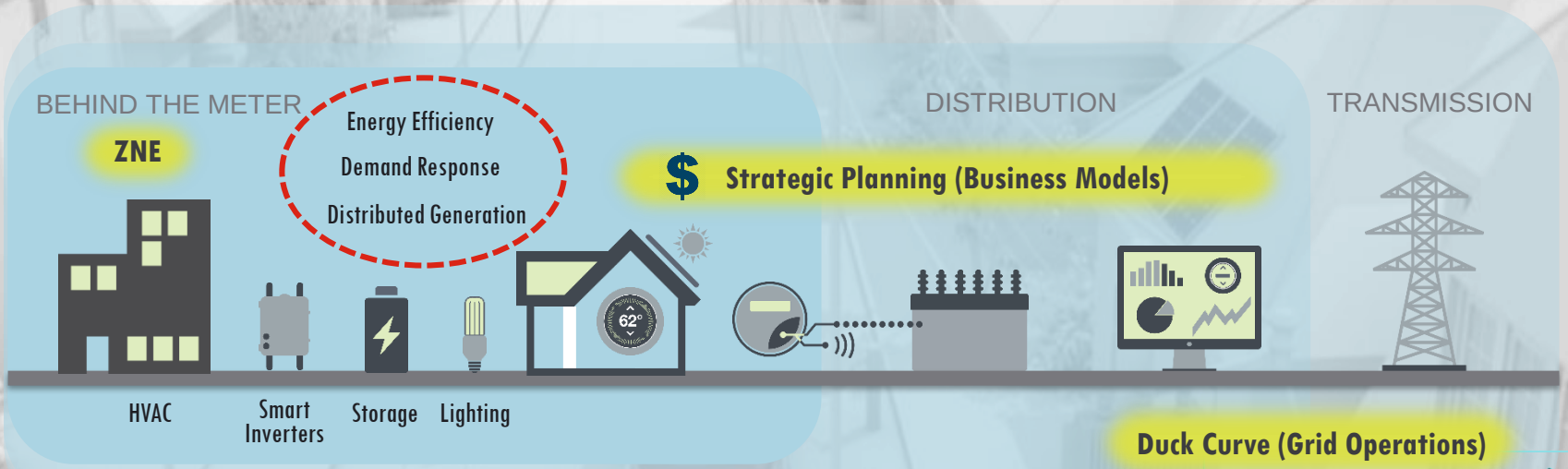

…more than meters
1.6 kW
distributed intelligence
3.1 kW
business outcomes
2.4 kW
OpenWay Riva™
Itron Solar Gate


Delivering Outcomes
Powerful Analytics
Customer Engagement
Multi-App Network
Adaptive
Communications
Hi-Res Data
IoT
Smart Cities
Single, Shared Electricity,
Water, and Gas Network
Integrate Renewables
EVs Made Easy
Distribution Automation
Voltage Analytics

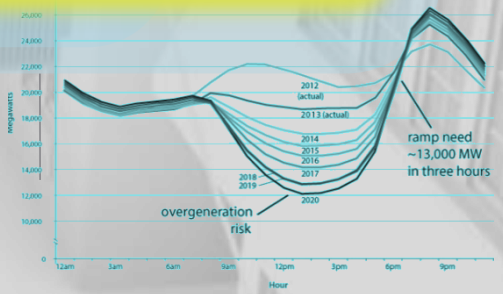

…more than meters
1.6 kW
distributed intelligence
3.1 kW
business outcomes
2.4 kW
OpenWay Riva™
Itron Solar Gate

Consulting and Analysis

…behind the meter insight …distribution level impacts



Duck Curve (Grid Operations)



Forecasting

…accurately forecasts nearly 90 percent of total electricity demand in North America alone

CONTACT US

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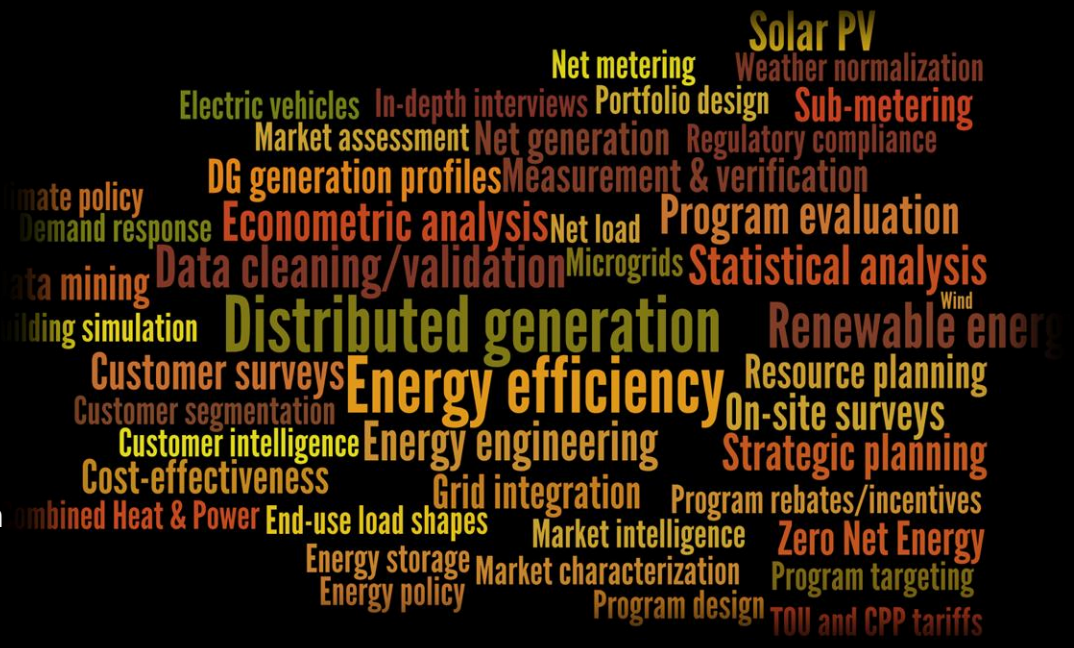
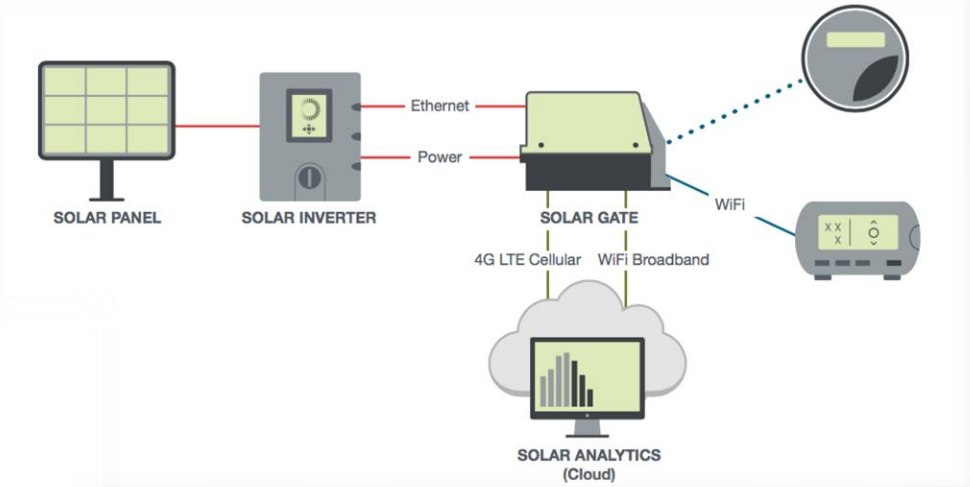


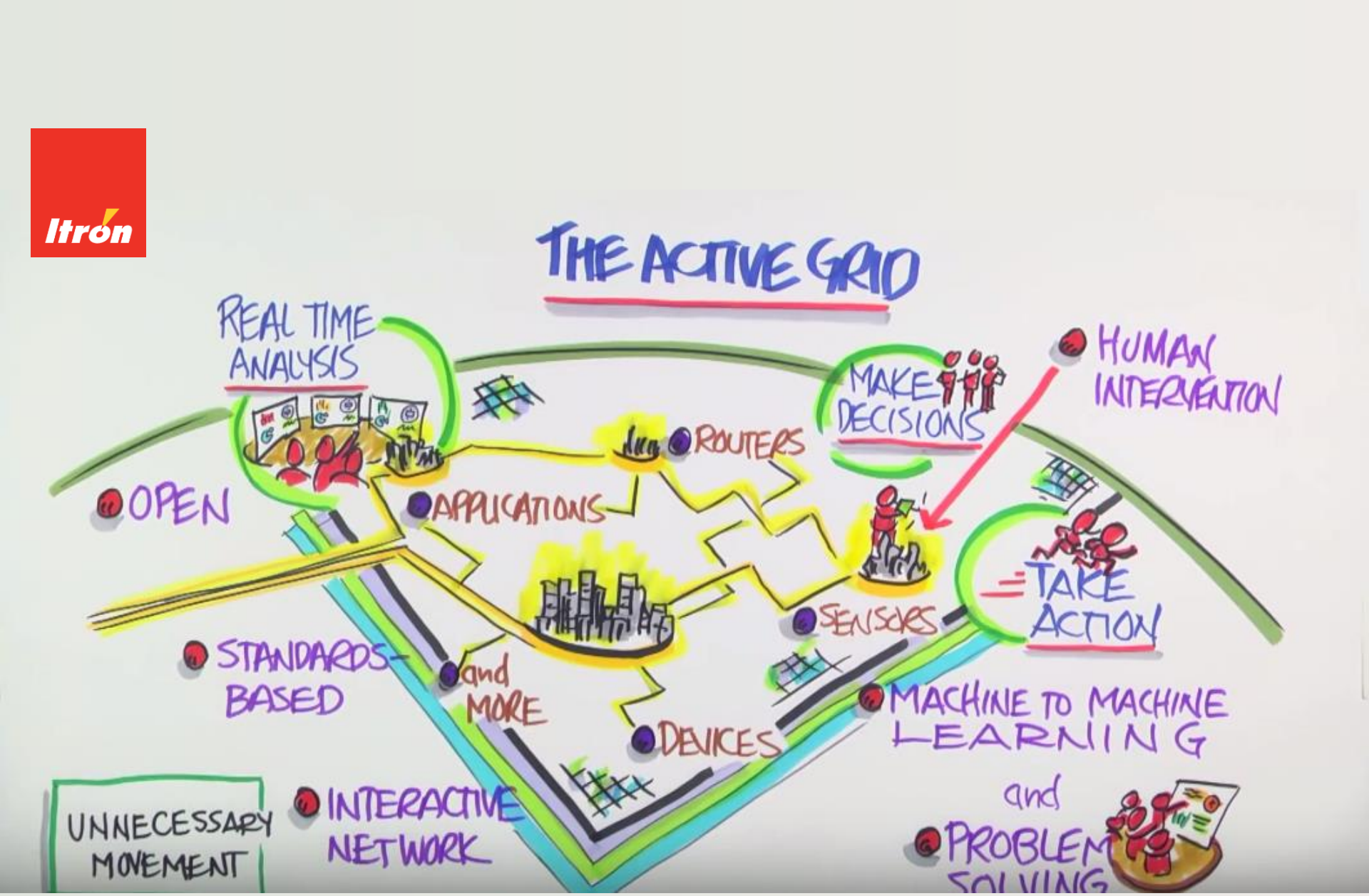
OpenWay Riva™

…***more than a meter***…enables true interoperability and ***distributed intelligence*** to deliver ***business outcomes*** for utilities and smart cities.

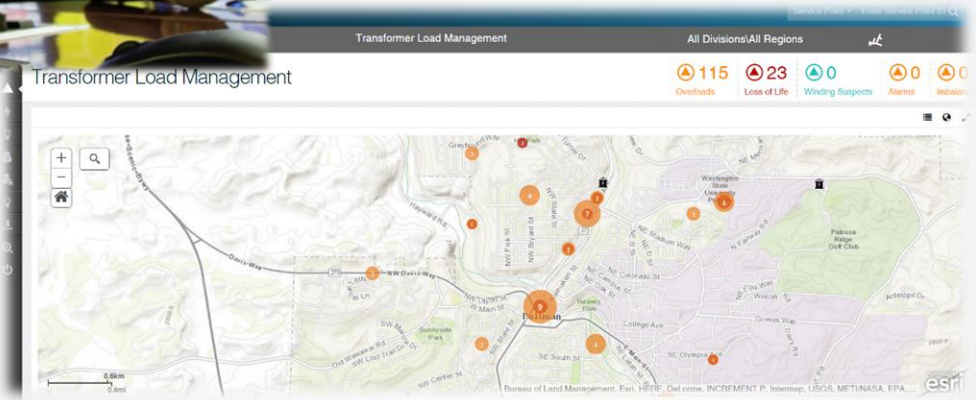


Solar Gate™

… distributed intelligence that brings together ***solar production data*** and ***premise consumption data*** while providing granular data on the health of the solar panel relative to its surrounding environmental variables.


Itron
THE ACTIVE GRID
REAL TIME ANALYSIS
MAKE DECISIONS
HUMAN INTERVENTION
ROUTERS
OPEN
APPLICATIONS
TAKE ACTION
SENSORS
STANDARDS-BASED
and MORE
MACHINE TO MACHINE LEARNING
DEVICES
and
UNNECESSARY MOVEMENT
INTERACTIVE NETWORK
PROBLEM SOLVING

- Voltage Analyst
- Reliability Analyst
- Transformer Load Mgmt
- Theft Investigator
- Connectivity and Phase Detection
- Customer Portal
- Performance Manager



Itron Analytics

ACEEE Ally Program

aceee.org/ally-program

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202-507-4006

ACEEE
American Council for an Energy-Efficient Economy

FIRSTFUEL

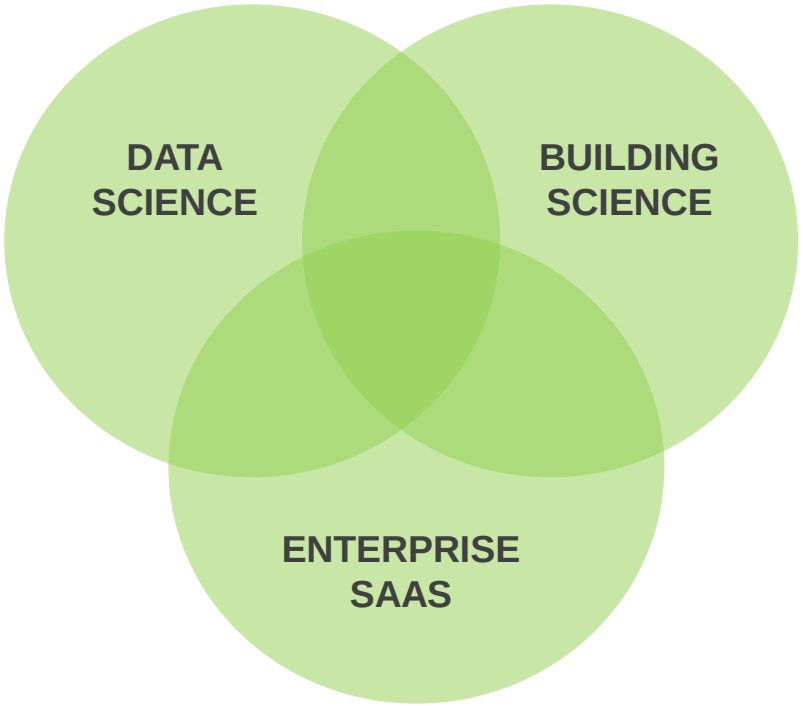
THE IMPORTANCE OF DATA & ANALYTICS:

HOW DATA CAN HELP ACHIEVE ENERGY SAVINGS & ENVIRONMENTAL GOALS

Presentation to ACEEE Intelligent Efficiency Conference – December 6, 2016

OVER 30 UTILITY & GOVERNMENT CLIENTS

Some Examples



conEdison

Los Angeles Department of Water & Power

Pacific Gas and Electric Company

DTE Energy

électricité de strasbourg

Duquesne Light

BGE An Exelon Company

ComEd An Exelon Company

PECO An Exelon Company

aps

EVERSOURCE ENERGY

WGL Energy A WGL Entity

SMUD

e·on

SOUTHERN CALIFORNIA EDISON

3M
Business Customer Meters

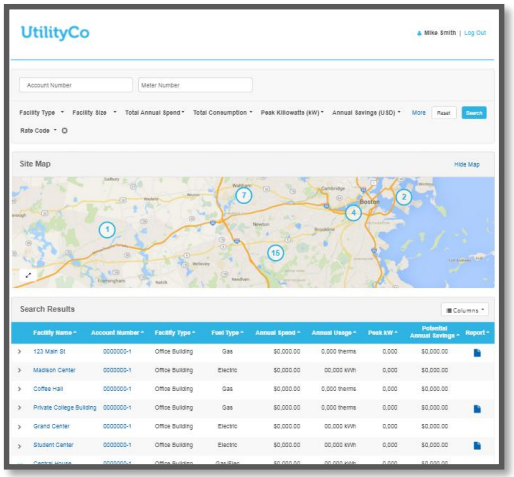
55M
Secure reads/day

AMI + Monthly

N. AMERICA + EUROPE

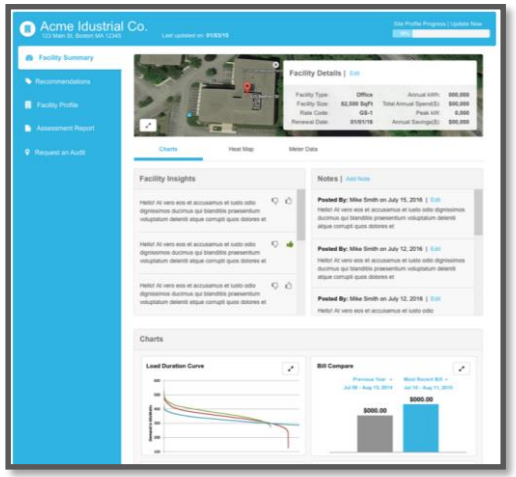
INTRODUCING FIRSTADVISOR: EE ACCOUNT PLANNING TOOL

PORTFOLIO PLANNING DASHBOARD



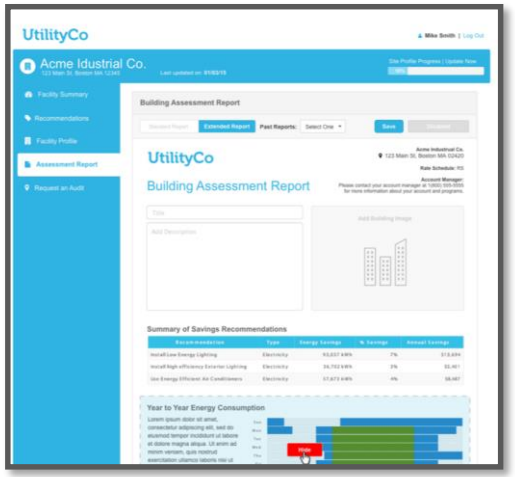
- For **account managers** to target customers and optimize time
- For **marketing** to segment customers to maximize spend

DETAILED CUSTOMER INTELLIGENCE



- For **account managers** to quickly understand customers before engaging and respond live to new information
- For **CSRs and phone-based reps** to rapidly understand customers calling in

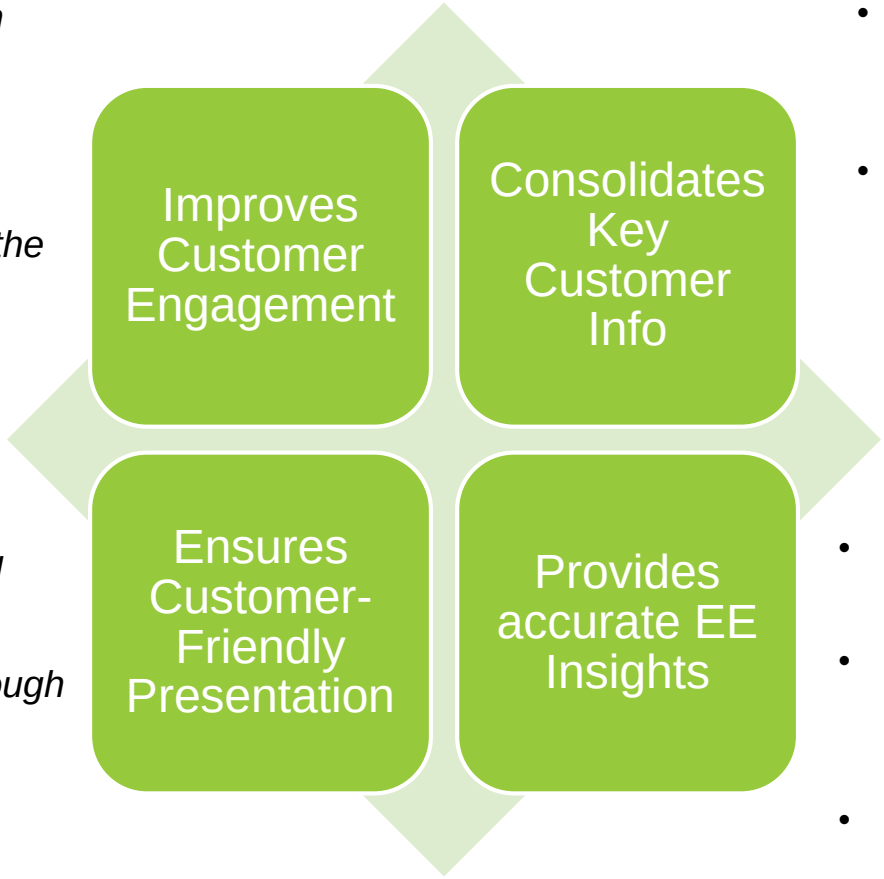
CONFIGURABLE PDF COLLATERAL



- For **account managers** to instantly generate personalized collateral
- For **CSRs and phone-based reps** to follow up and generate action

ENERGY EFFICIENCY ACCOUNT TEAM BENEFITS

- *Improves credibility with customers*
- *Respond faster and to more customers*
- *Good door-opener into the discussion*



- *Consolidates key information (usage, cost etc.); a one-stop shop*
- *Stores customer information in one place as personnel changes*

- *Chart visuals are useful*
- *Customer friendly, not intimidating, simple enough to promote a program/audit/etc.*

- *Can see and speak to customer's savings potential*
- *Includes recommendations & potential savings in the absence of a proposal*
- *Populates good-fit and low-cost ECMs*

IMPROVE PROJECT CONVERSION RATES

FIRSTFUEL CLIENT RESULTS

Large North American Utility		Large North American Utility
• Targeting mid-size customer segment (200kW-1MW) • Increase sales team productivity • Lift customer win rates	**Objectives**	• Target underserved segments: Schools & Municipalities • Drive retrocommissioning projects • Lift customer win rates
• Engage **200+** customers	**Project Scope**	• Engage **100+** customers
18%	**Previous Conversion Rates**	**20%**
50%+ improvement, at faster speeds • **25%** conversion rate • **3x** improvement in sales velocity • **70%** project commitment post-interaction	**FirstFuel Impact**	**50%+ improvement, at faster speeds** • **30%** conversion rate • **7GWh** identified savings • **50+** program incentive applications filed

THANK YOU

Scott McClintock
Vice President
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617-699-7034

Buildings Energy Information Systems: From the Basement to the Boardroom

Value proposition, selection, implementation & use by buildings stakeholders

Reshma Singh

Lawrence Berkeley National Laboratory, December 2016

Why EIS-in-a box?

The Solution

Energy information systems (EIS) defined as performance monitoring software, data acquisition hardware, and communication systems used to store, analyze, and display building energy data.

Market and Audiences :
For underserved small, medium and even large sized facilities in high energy use sectors in U.S. and India

EIS-in-a-box: Scalable and robust packages of meters, gateways and software with user interface

- Streamlined data architecture with right volume, variety and velocity of data
- Available at a lower cost, with simplified hardware and software
- Provides best practice guidance for actionable insights; dashboards targeted to cut across organizational siloes, and facilitate self-sufficiency

Hotels Healthcare Offices

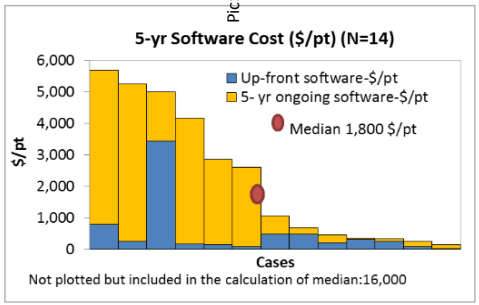
R&D approach

1. **Technical requirements** for a system that is packaged and standardized, with optimum, integrated components

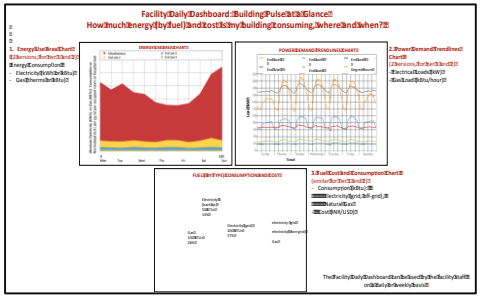
2. **Cost Reduction** through analysis of hard, and soft transaction costs, and offer strategies for reduction of process times and delivery of EIS

3. **Efficacy** by offering guidance for simple in-house data-driven actionability for relevant stakeholders through tailored dashboards, targeted alerts

Pic: cargocollective.com



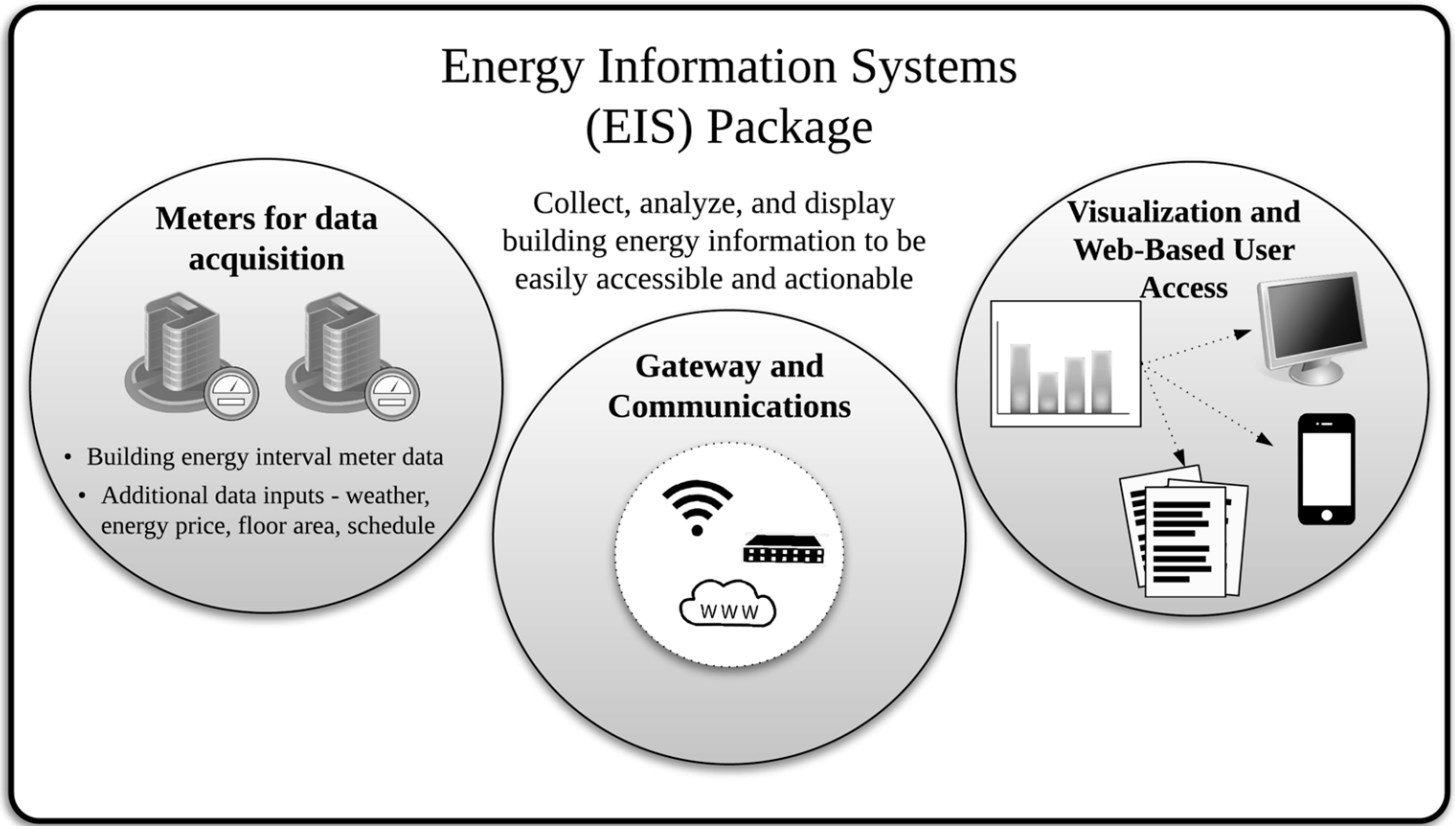
Wide cost range for a custom EIS solution
Hardware + software= $5K-$20K+ per year



R&D Approach:

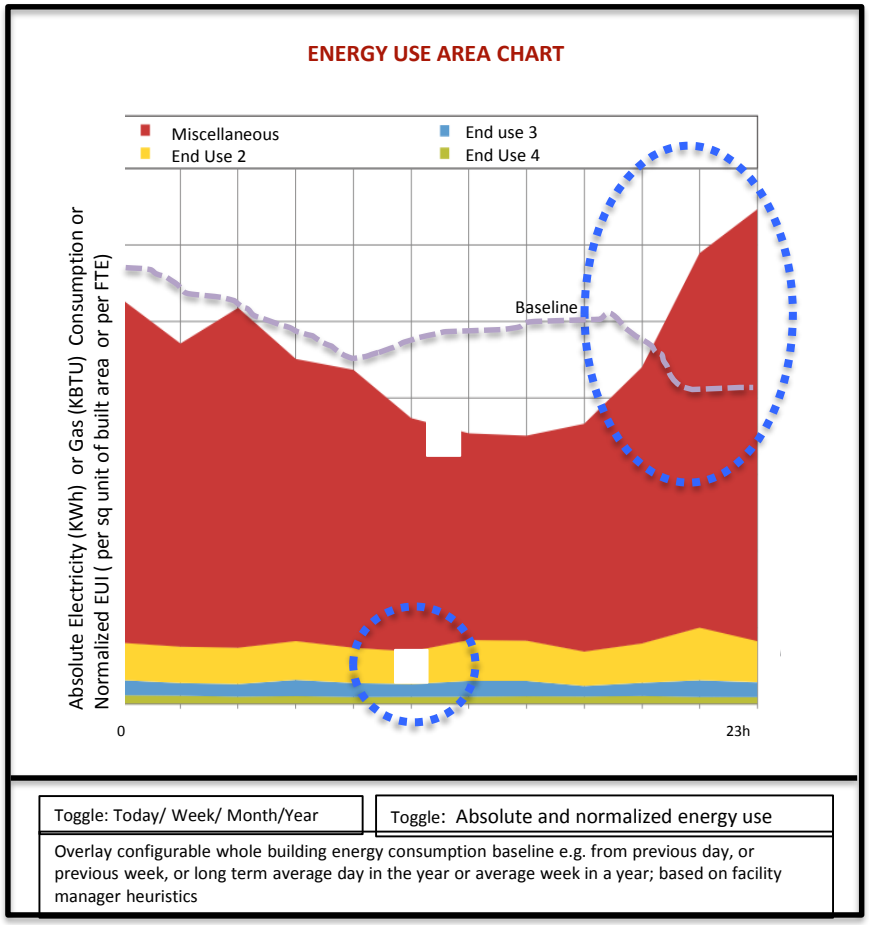
Technical requirements for commoditization:

Integration of 3 components within the box



R&D Approach

Enhanced usability with tailored pre-configured dashboards and charts



Qualitative insights:

- Shape: Expected use of building wrt occupancy, schedule
- Diagnostics: Missing data, measurement fault, broken equipment
- Disaggregation: Relative contribution of end uses

Quantitative information:

- Target consumption today: XX kWh/ kBtu
- Baseline (last week): XX kWh/ kBtu
- Actual consumption today: XX kWh/ kBtu

Quantitative rule-based alerts

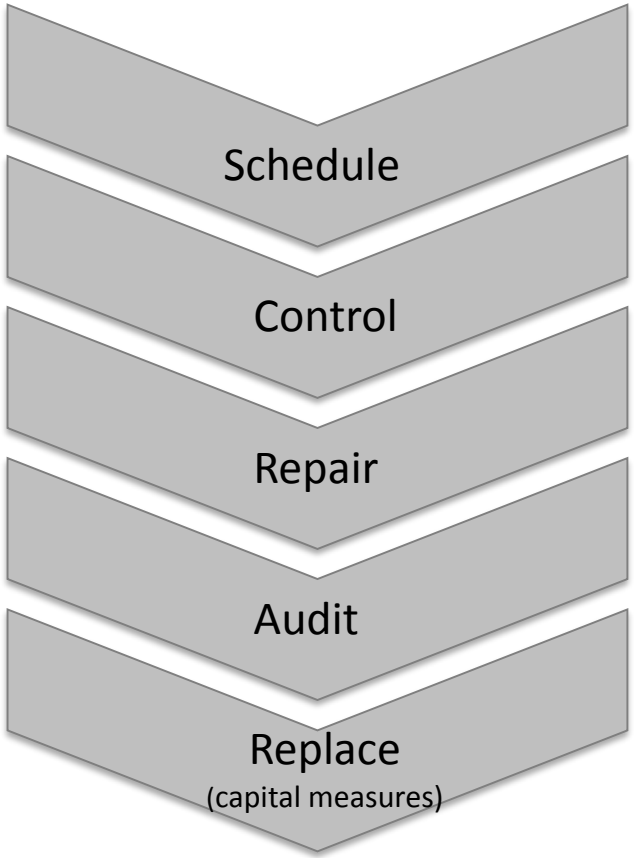
- Variance +/-% from target: Alerts
- Variance : +/-% from baseline: Alerts
- Variance beyond x%: Alarm

Facility Dashboard Chart #1: Energy Use Area chart

R&D Approach

Enhanced usability with recommendations for actions, facilitates in-house first order response

Custom EIS
All actions
vendor-provided



EIS in a box:
In-house

Vendor-
provided

Depends on organizational process, practice, and procedures implemented around the use of the technology.

EIS Tier 1 (Entry) Package: Office Facilities

Input: Interval data from Building Systems

- Whole building: electricity
- Whole building: gas (U.S. only)
- Whole building diesel/oil (India only)
- Submeter 1 e.g., Chiller Plant
- Submeter 2 e.g., Boiler/ Furnace (U.S. only)
- Submeter 3 e.g., Lighting energy

Monitored loads
- WB by fuel
- 2-3 submeters

Monitoring Interval:
Hourly

Gateway: Protocol integration, communications, security

One physical location

1. RS-485 between meters and gateway
2. Wireless through hospital modem/GSM
3. Pre-setup
4. Internal memory
5. Alarms/alerts

Output: Analysis software, user interface (UI), reporting

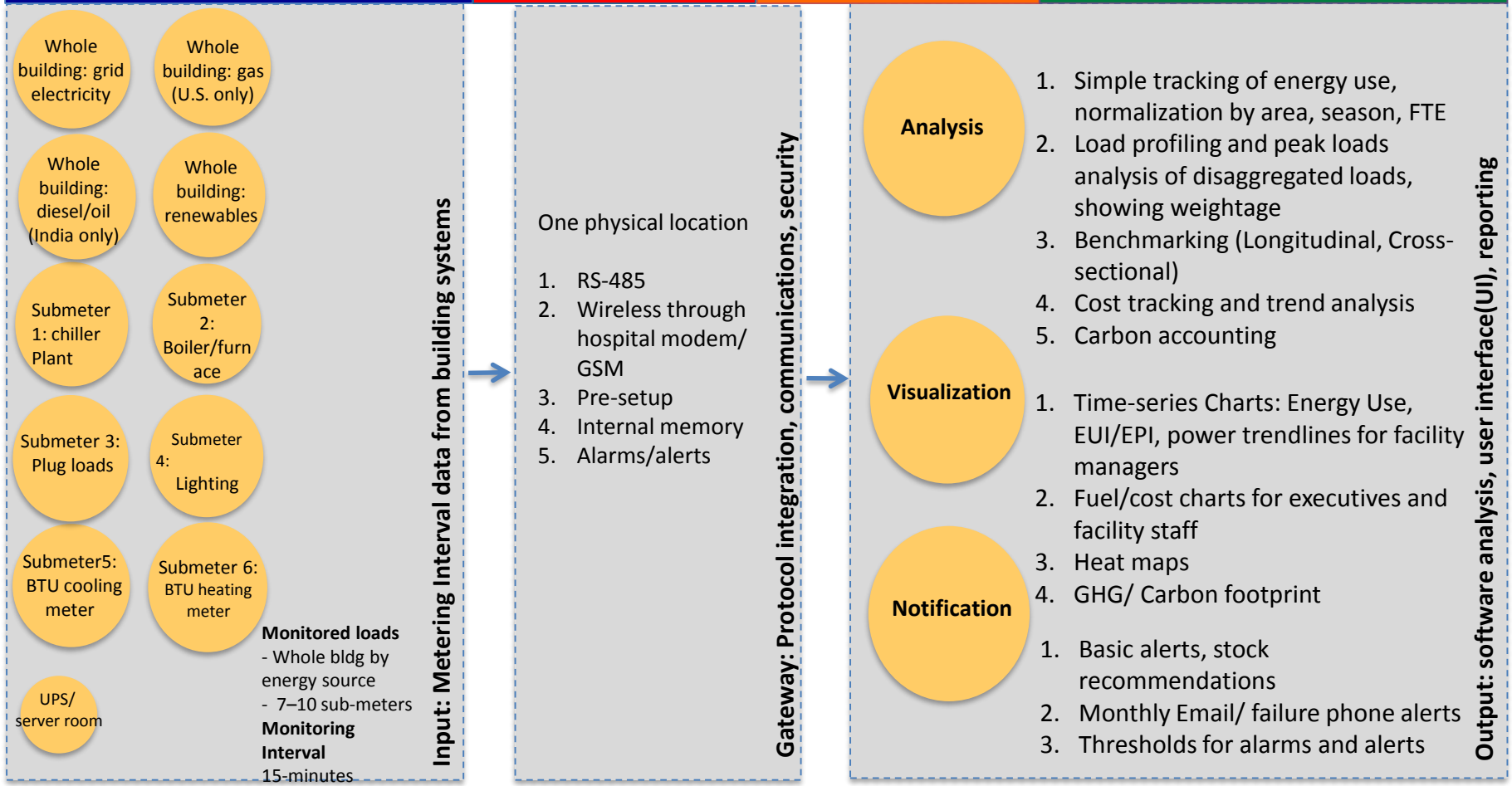
Analysis
1. Simple tracking of energy use
2. Load profiling and peak loads analysis
3. Benchmarking (Longitudinal)
4. Cost tracking

Visualization
1. Time-series Charts: Energy Use, EUI/EPI, power trendlines for facility managers
2. Fuel/cost charts for executives and facility staff

Notification
1. Basic alerts, stock recommendations
2. Monthly or quarterly email reports

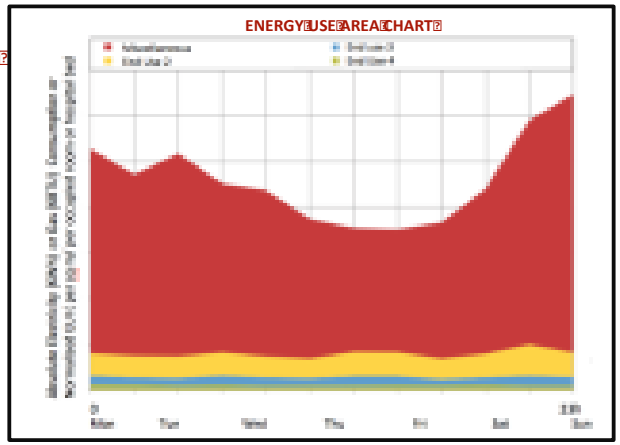
*As defined in Energy Information Handbook

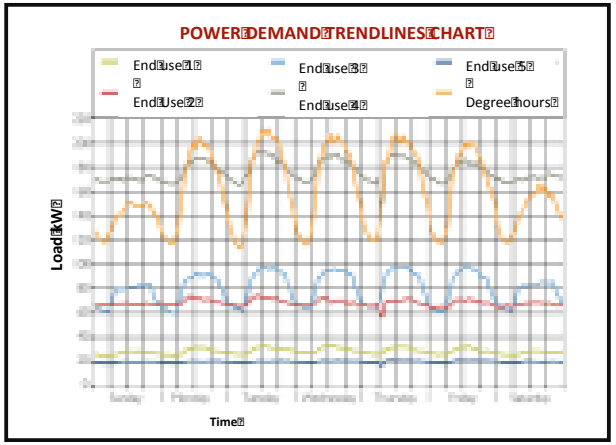
EIS Tier 2 (Advanced) Package: Office Facilities



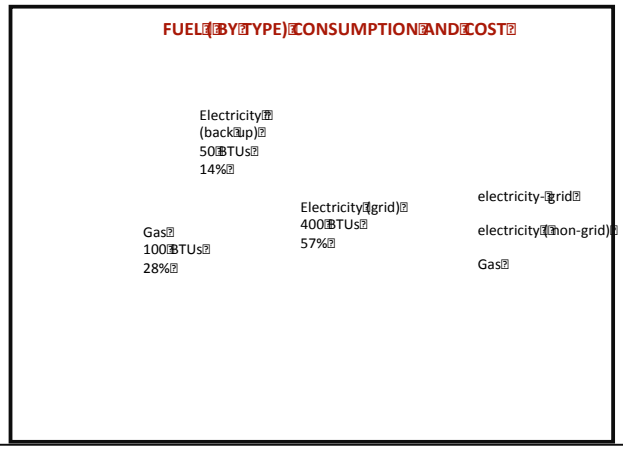
Facility Daily Dashboard: Building Pulse at a Glance
How much energy (by fuel) and cost is my building consuming, where and when?

1. Energy Use Area Chart
(2 versions, for tier 1 and 2)
Energy Consumption
- Electricity (kWh or kBtu)
- Gas (therms or kBtu)





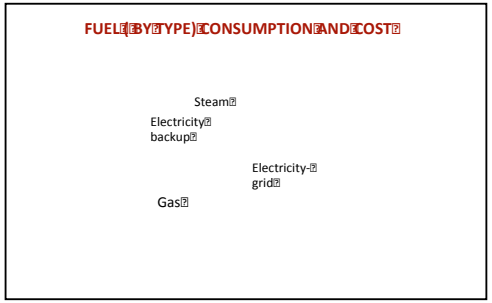
2. Power Demand Trendlines Chart
(2 versions, for tier 1 and 2)
- Electrical Loads (kW)
- Gas Load (kBtu/hour)



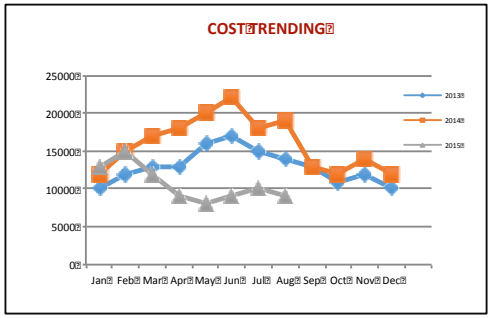
3. Fuel Cost and Consumption Chart
(similar for tier 1 and 2)
- Consumption (kBtu):
  Electricity (grid, off-grid),
  Natural Gas
- Cost (INR/USD)

The Facility Daily Dashboard can be used by the facility staff on a daily or weekly basis

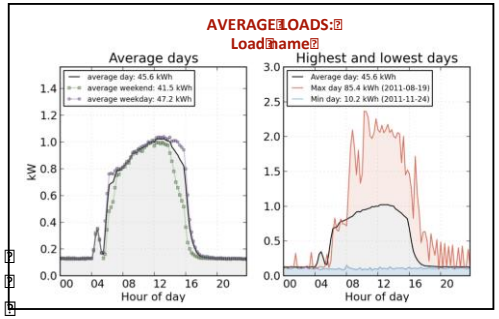
Monthly/Annual Dashboard



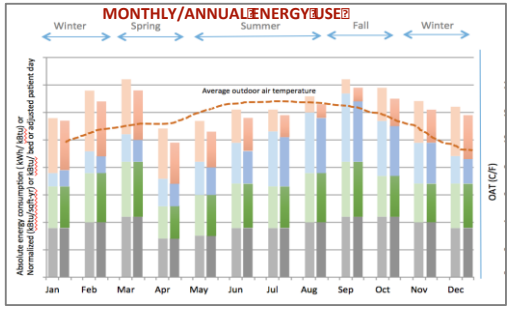
1. Consumption and cost per fuel type
(Similar for Tier 1 and 2)
USD/INR or kBtu/time period



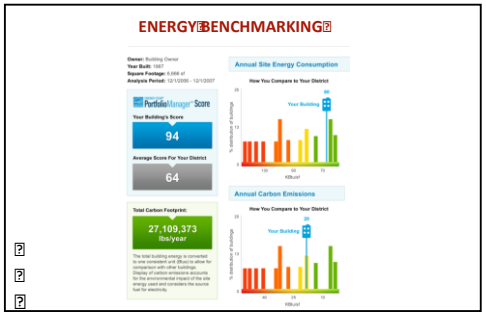
2. Cost trending
(Similar for Tier 1 and 2)
USD or INR/time period



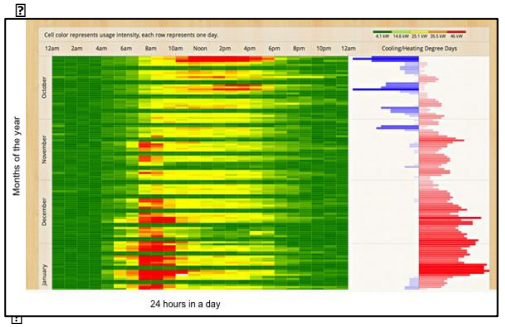
5. Average Loads line chart
(Similar for Tier 1 and 2)
- Electrical Loads (kW)
- Gas Load (kBtu)



3. Monthly/Annual energy use and longitudinal benchmarking
(Similar for Tier 1 and 2)
Electricity (kWh), Gas (kBtu)



4. Cross-sectional Benchmarking (Tier 2 only)
- Portfolio Manager score
- Carbon footprint
- Comparisons with peer buildings in the district or nation



5. Whole Building Heat Map: (Tier 2 only)
- Electrical Loads (kW)

Executive-level charts

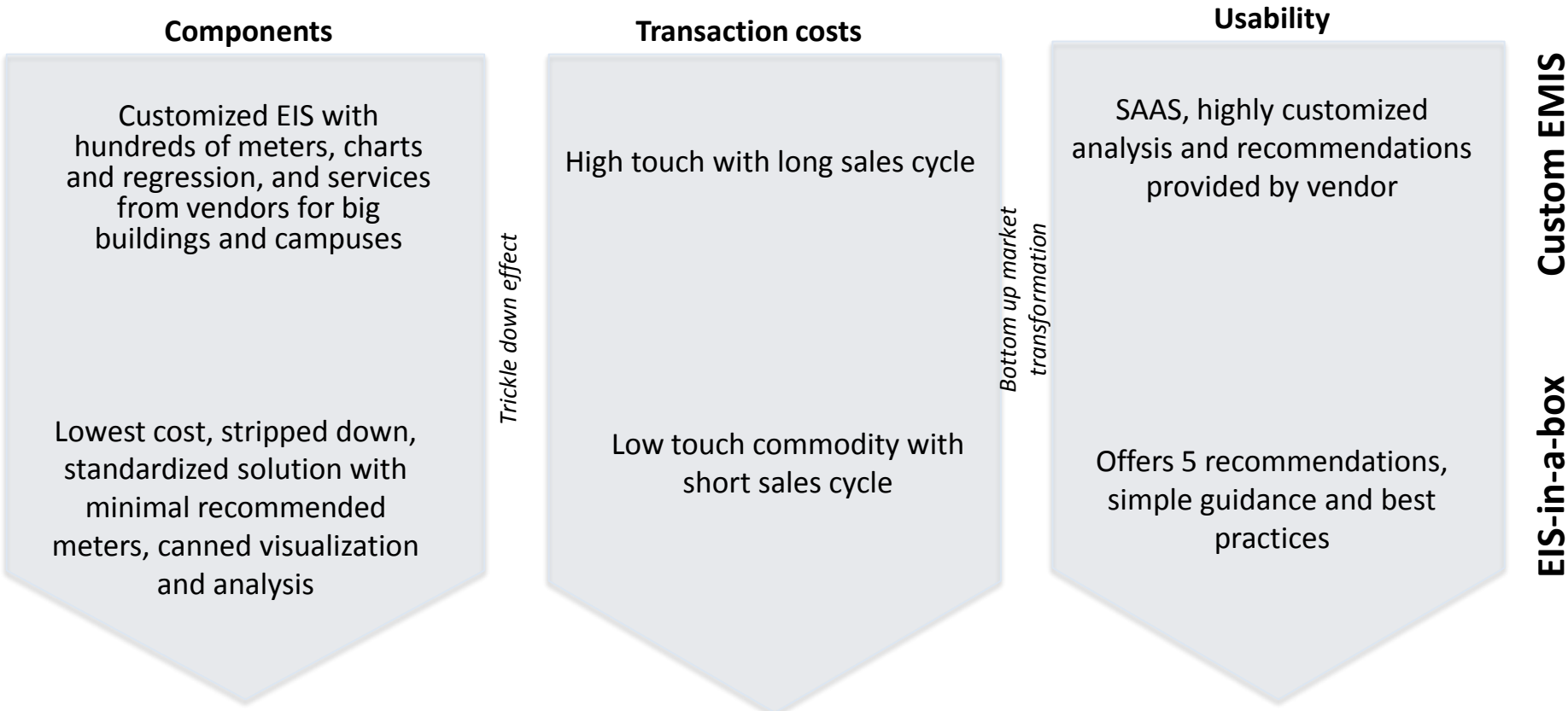
Facility manager charts

Conclusions and Next Steps

- Demos with existing partners in India, publish case studies
- Conduct “value of data” analysis
- Seeking U.S. partners to integrate EIS-in-a-box and pilots in the U.S.

Conclusions and Next Steps

Simpler Hardware and software for optimal cost and functionality



2016 ACEEE Intelligent Efficiency Conference: Trading Spaces

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Libraries Program

Megan Partridge Wehler

(not particularly unique)

Our ^Challenge: Finding Deeper Savings and Reaching the Harder-to-Reach Populations

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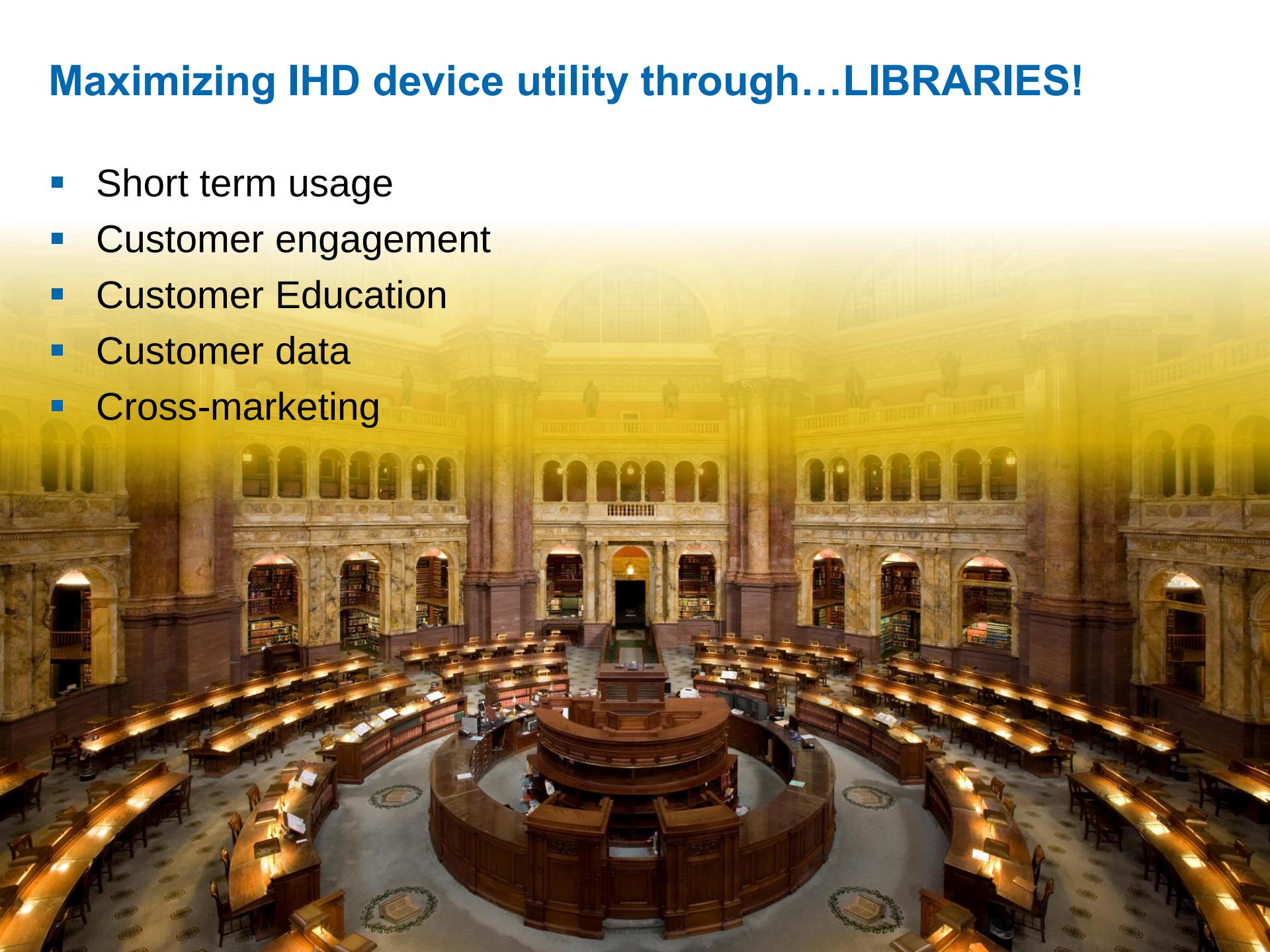
Maximizing IHD device utility through…LIBRARIES!

- Short term usage
- Customer engagement
- Customer Education
- Customer data
- Cross-marketing



My Ask

- Experience
- Data
- Best Practices
- Innovators
- Good Design

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