

DYNAMIC M&V AND EVALUATION



The Evolution to True High Value M&V

Gary Epstein
ERS

INDUSTRY CHANGES: NEW M&V DRIVERS

- ❑ Traditional: Tool for TA, Research, and Evaluation
 - Understanding Equipment Performance
 - Understanding Facility Operations
 - Understanding Program Performance
 - A Fundamental Tool for Traditional Impact Evaluation
- ❑ But What Are The New Drivers for M&V?
 - Lower M&V Costs
 - Immediacy of Insights
 - Truly Valuable Insights
 - Deeper Research Functionality (Buildings/Loads/Equipment)
 - EE as Capacity
 - Need to Compare to Supply/T&D Options with Confidence

COMPETITION WITH SUPPLY/RENEWABLES

- ❑ Is Energy Efficiency Real?
- ❑ As Real as Major Capital Supply Developments?
 - Traditional Power Generation
 - Renewable Energy Projects
 - T&D Upgrades



- ❑ How Real Is It If You Can't "Easily" Measure It?
- ❑ Can "New" M&V Solidify Value of EE as Capacity?

“TRADITIONAL” EX-POST EVALUATION

- ❑ Ex-Post = After the Fact; Based on Historical Data
 - Do We Capture All Necessary If We Only Do Post M&V?
 - Do We Capture Patterns of Changing Data?
 - Equipment Changes; Facility Changes; Operational Changes
 - Persistence? What Happened?
- ❑ Report Card: Scoring the Program Administrators
 - Just a Realization Rate
- ❑ Adversarial Relationship: Evaluators vs. Implementers
- ❑ Evaluation Results Often Come Very Late
- ❑ Approach Does Not Facilitate Continuous Improvement
- ❑ Poor RR Results Underscore Complexities of EE

THE ADVERSARIAL IMPACT EVALUATION



Evaluators:
"The results from your 1985 program year are horrible with an embarrassingly low realization rate. Your efforts were worthless. Your careers were nothing but a waste of rate base funds."

Retired
Program
Administrators



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DEEPER MANDATE FOR MORE DYNAMIC M&V

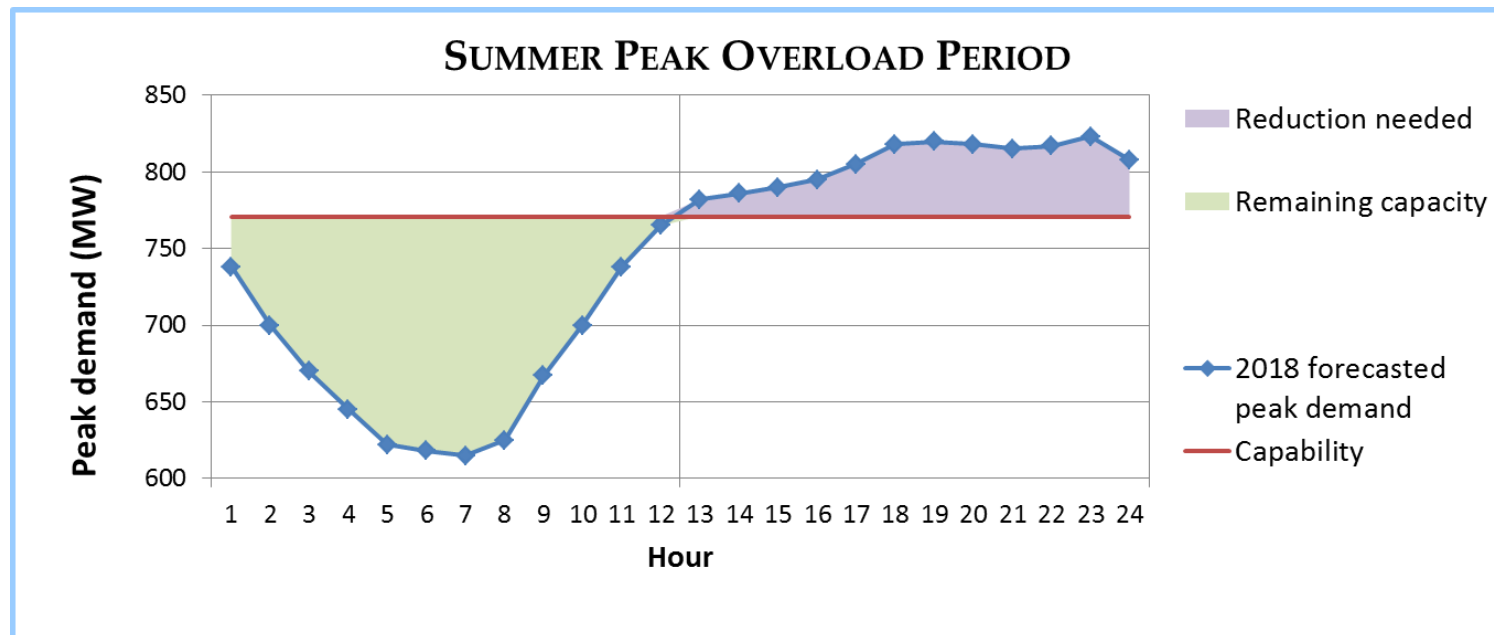
- ❑ Dynamic M&V
 - More Immediate Results
 - More Comprehensive Results
 - Continuous, On-going Results
- ❑ More Comprehensive Data Development
 - Not Just “Snapshot” of Measure Performance
 - Technology Insights (Performance and Potential)
 - Load Research: End Use Data; Load Shapes; Patterns of Use
 - Detailed Facility Insights
- ❑ New M&V Must Truly Demonstrate EE Savings
 - Continuous Monitoring
 - M&V for EE Must Be As Effective as Supply System Monitoring
 - Complete Data on the Availability and Benefit of the Diversified Energy Efficiency Load Resource

THE MOVE TO PRE-POST (CONCURRENT) M&V

- ❑ Ex-Post M&V or Evaluation Has Limitations
- ❑ Defining Pre-Post (Concurrent) M&V
- ❑ Benefits of Pre-Post M&V
 - M&V Team Present Throughout the Implementation Process
 - Third-Party Objectivity and Assessment is Maintained
 - M&V Team Works Closely with Implementers
 - Adversarial Relationships Are Avoided (Minimized)
 - Need for Progressive Program Improvement is Recognized
 - Continuous Improvement is a Mutual Success
- ❑ Comprehensive M&V Data Development
 - Beyond Basic Measure Performance
 - While You're at the Site, Develop Comprehensive Data

CON EDISON BQDM <>> ERS PRE-POST M&V

- ❑ Brooklyn Queens Demand Management
- ❑ Install \$200 million customer side resources to defer building a \$1 billion substation



REAL-TIME M&V: WHAT IS REAL?

- ❑ Real-Time and Its Value
 - Is It Truly Immediate or Just Faster Than It Used to Be ?
- ❑ How the New Technologies Work
 - Technologies Pass Data Packets at Specified Time Intervals
 - Tradeoffs Between Meter Power, Frequency, Data Packet Size
 - Raw Data Must Still Be Analyzed and Reviewed
 - Subject Matter Expertise Is Critical !!
- ❑ What's Really Valuable and Necessary?
 - More Immediate Results with Injected Subject Matter Expertise

M&V NEXT STEPS: THE INTERNET OF THINGS

□ Definition: What Is It?

- A World with Lots of Connected Sensors - Meters - Controls
 - Development of Lots of Data !!!
- These Things Listen to and Talk to Your Stuff
- These Things Listen to and Talk to You
- Wonderful Things Happen
- Some of These Things Might Even be Useful
- Some Things Happen Real Time (Maybe)
- Your Information is Sent to the Cloud (Somewhere)

□ Limitations or Challenges

- “Things” Might Not Speak the Same Language
- Someone knows a lot about you and your stuff (hmmm?)
- Someone makes lots of money because they know lots about ...

□ Implications for the New M&V

THE CHALLENGES OF BIG DATA

□ What Is Big Data?

- Is it a small amount of data with “big” analytics?
 - Example: Whole Building (plus weather and geo data)
- Or very granular data with dynamic and sensible analytics?
 - Whole Building Plus Many In-Building Sensors



□ Degrees of Data Granularity

- Internet of Things: Implies High Levels of Data Granularity?
- What Is Really Valuable?

□ Considerations for M&V

- Limitations with Whole Building Data?
- More and More Granular Data is Becoming Available !!
- Challenges with Data Organization and Automated Analytics
- Subject Matter Expertise is Critical

THE EMERGING LANDSCAPE OF DYNAMIC M&V

- ❑ The M&V Landscape Has Already Changed
 - Pre-Post, Concurrent M&V is Here
- ❑ Real Value of the New M&V
 - “Immediate” Reporting of Project Performance
 - Deeper Understanding of Equipment and Facility Operations
 - “Live” Reporting of Energy Use and Savings
- ❑ IoT–Big Data–Real Time: Great Opportunities Abound !!
 - Technology is Changing How M&V and Evaluation Will Be Done
- ❑ With Dynamic Monitoring, Presentation, Reporting:
 - The EE as Capacity Will Serve as the Highly Credible Demand Side Power Plant We Know It Is !!
- ❑ As Real as Supply Side ??
 - Yes, New M&V Is Demonstrating That !!