National Action Plan for Energy Efficiency

Guidebook on Model Energy Efficiency Program Evaluation

M. Sami Khawaja - Quantec LLC

samik@quantecllc.com

503-228-2992

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Evaluation

- Doing unto others that you don't want done unto you.
- A rigorous ***scientific process*** of examining programs as designed and as delivered, examining impacts as the difference between ***what happened*** and ***what would have happened***.
- Evaluation attempts to measure ***"what did not happen."***
- ***Things that are measured tend to improve.***
- Things that are measured ***accurately*** and ***consistently*** tend to improve.
- We do not want results to be function of the evaluator.

Evaluation Guiding Principles

- Realistic and manageable objectives
  - Balance costs with the expected improvement in results

- Independence

- Transparency/Consistency
  - Evaluation utilization
    - Regulatory requirements
    - Improving design,
    - Cost Recovery,
    - Planning/Forecasting
    - Emission calcs
  - Guidelines? Protocols?

Do We Need Protocols?

- Do we want energy efficiency to be taken seriously as a resource option? We must have a “common currency” that is credible and transparent (NEEP, 2006)

- No… “the establishment of an orthodox evaluation methodology is no different from establishment of state religion. Officially telling you what methods to use is only one step removed from telling you what results to find. At this point, utilization of findings will cease to be an issue, for there will be nothing to use, only orders to follow.”
  - Michael Patton

How Flexible Should Protocols Be?

- More Flexibility = Lower Consistency
- Lower Consistency= Less “Protocoly”
- Less “Protocoly” = Less Useful

- The trend in current protocols is to give the evaluator flexibility in choice of method.
- Flexibility is ok, as not all projects are identical
- The dilemma is that if you allow flexibility, then the choice of method will be a function of the evaluator, and eventually so will the results

National Action Plan for Energy Efficiency Recommendations

- Released on July 31, 2006 at the National Association of Regulatory Utility Commissioners meeting
- Goal: To create a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations
- Over 60 member public-private Leadership Group developed five recommendations and commits to take action
- Additional commitments to energy efficiency – exceeds 120 organizations
- Facilitated by US DOE and EPA

www.epa.gov/eeactionplan

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National Action Plan for Energy Efficiency Recommendations

- Recognize energy efficiency as a high-priority energy resource.
- Make a strong, long-term commitment to implement cost-effective energy efficiency as a resource.
- Broadly communicate the benefits of and opportunities for energy efficiency.
- Provide sufficient, timely and stable program funding to deliver energy efficiency where cost-effective.
- Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.

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The Participants

Technical Group

- Steve Schiller, Schiller Consulting (Principal Author)
- Derik Broekhoff, World Resources Institute
- Nick Hall, TecMarket Works
- M. Sami Khawaja, Quantec
- David Sumi, PA Consulting
- Laura Vimmerstedt, National Renewable Energy Lab
- Ed Vine, Lawrence Berkeley National Lab

Advisory Group

- Commissioner Dian Grueneich, California PUC (co-chair)
- Diane Munns, EEI (co-chair)
- Chris James, formerly of Connecticut DEP
- Rick Leuthauser, MidAmerican Energy Company
- Jan Schori, Sacramento Municipal Utility District
- Peter Smith, formerly of NYSERDA

Reviewers

- Comments received from about 25 organizations

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NAPEE: Impact Evaluation Guide

(published November 2007)

- This Guide describes a structure and several model approaches for calculating energy, demand, and emissions savings
- After reading this Guide, the reader should be able to:
  - define the basic objectives, structure and evaluation approaches that will be used for his or her program-specific, impact evaluation.
  - depending on level of experience, using this Guide and other documents referenced in Guide, may be able to prepare a complete program impact evaluation plan.

http://www.epa.gov/cleanenergy/documents/evaluation_guide.pdf

Why a *Program* Guide?

- *Programs* are different from *projects*
  - There are widely recognized protocols for the measurement and verification (M&V) of energy savings from single *projects* (e.g., IPMVP)
- Explicitly handles Emissions' Impacts
- Similar widely accepted protocols or guidance documents for measuring energy savings from programs do not exist
  - M&V protocols do not address issues unique to program evaluation
  - Utilities, program administrators, regulatory commissions, and policymakers need consistent guidance on best-practice evaluation approaches

More….

- Two recent surveys of the efficiency industry indicated a need for documents that foster best practices and promote consistent evaluations of ***programs***.
- This Guide was produced to meet these needs by providing:
  - A model impact evaluation process (procedure) that can be used by individual jurisdictions (states, utilities, etc.) to establish their own evaluation requirements
  - Basic descriptions and guidance of evaluation options and issues
  - List of other reference documents and resources
  - Information on calculating avoided emissions from energy efficiency programs.

Issues Addressed

- For planning an impact evaluation:
  - Defining evaluation goals and scale, including deciding which program benefits to evaluate
  - Setting time frame for evaluation and reporting expectations
  - Setting spatial boundary for evaluation (i.e., what energy uses, emission sources, etc. will be included in the analyses)
  - Defining program baseline, baseline adjustments, and data collection requirements
  - Establishing a budget in the context of expectations for the quality of reported results
  - Selecting impact evaluation approaches for gross and net savings calculations and avoided emissions calculations
  - Selecting who (or which type of organization) will conduct the evaluation
- However:
  - The Guide does not provide enough details to be sufficient on its own to fully plan or conduct evaluations of specific programs.

Contents

EM&V Issues Not Addressed (Yet)

- How will efficiency savings be documented as real
  - What is additional?
  - How does one attribute the savings to a particular activity?
  - How accurate, is accurate enough?

A review of Proposed Demand Response Protocols In California

Mike Messenger
Senior Consultant
Itron, Inc.

17th Annual National Energy Services Conference
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Clearwater, Florida

Acknowledgements

- The draft demand protocols discussed in this presentation were developed by Steve George, Michael Sullivan and Josh Bode of Freeman, Sullivan & Co. for investor owned utilities in California in response to an order from the California PUC. All credit for the work and proposed table and figure formats in this presentation belongs to them.
- My contribution was to provide suggestions for improvement of the draft protocols and identify key policy issues
- A draft of these protocols was released on September 10th , 2007. A final version with minor edits is expected to be adopted by the CPUC in February of 2008.

Key Issues in Demand Response Protocol Development

- Purpose - To increase precision, confidence or comparability of program load impacts?
- What to measure: Expected load Impacts from programs in the future or actual load impacts from existing programs?
- What to require; common outputs, evaluation planning process or analytical methods?

California DR Protocol

- Specifies outputs and formats, not required methods or confidence levels
- Heavy emphasis on evaluation planning and reporting of results in common format for comparability and match to intended use
- Focus on system level projections of impacts in future years, not estimates of load reduction at specific customer sites

What makes this DR Protocol Unique?

1. Explicit Treatment of Uncertainty in Impact estimates

- Most evaluations produce fixed point estimates of MW for demand response program impacts
- This protocol produce hourly kwh savings estimates for 10^{th}, 50^{th} and 90^{th} percentiles for a given weather profile. Evaluators must Explicitly treat uncertainty from:
  - sample selection and meter accuracy
  - weather conditions
  - customer behavior over time.

2. Focus on Planning choices, not advise on the best or preferred analytical methods

- CA protocol focuses on ensuring that evaluation planning carefully considers known threats to precision and bias in sample and selection of analytical methods

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Required Output Formats

- Ex post and ex ante hourly profiles for typical and extreme weather days
- Statistical measures of precision must be provided with each MW estimate
- Detailed reports required on key evaluation planning decisions and how they effected results.

Table 1-1
Reporting Format -Ex Post Impacts

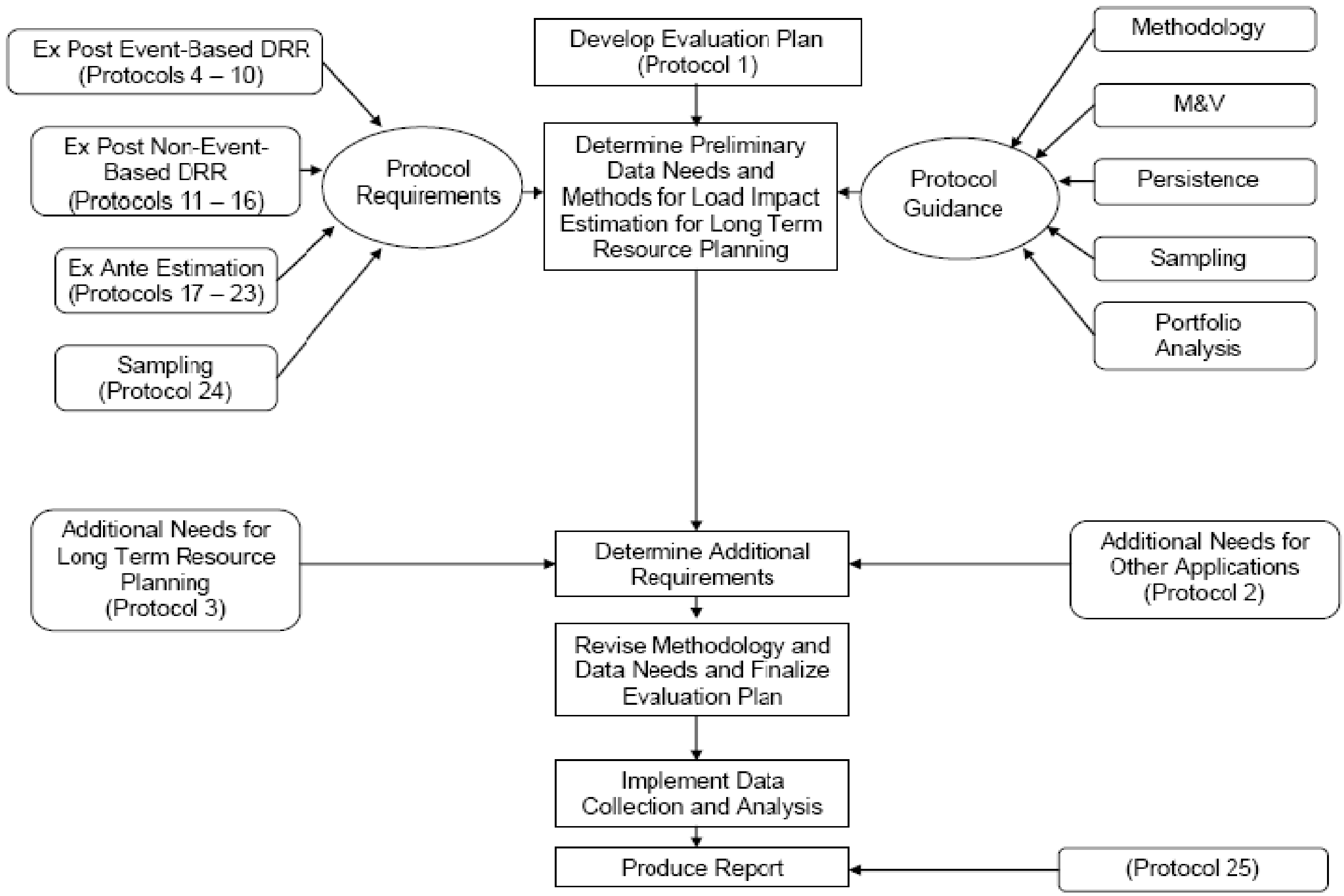
Hour Ending	Reference Load (kWh/hr)	Observed Load (kWh/hr)	Temperature (degrees F)	Uncertainty Adjusted Impacts		
				10th Percentile (kwh/hr)	50th Percentile (kwh/hr)	90th Percentile (kwh/hr)
1						
2						
3						
4						
…						
24						
Day total						

Source: S George et al, Load Impact Estimation for Demand Response: Prepared for PGE, SCE and SDG&E; September 10, 2007

Evaluation Planning Protocols

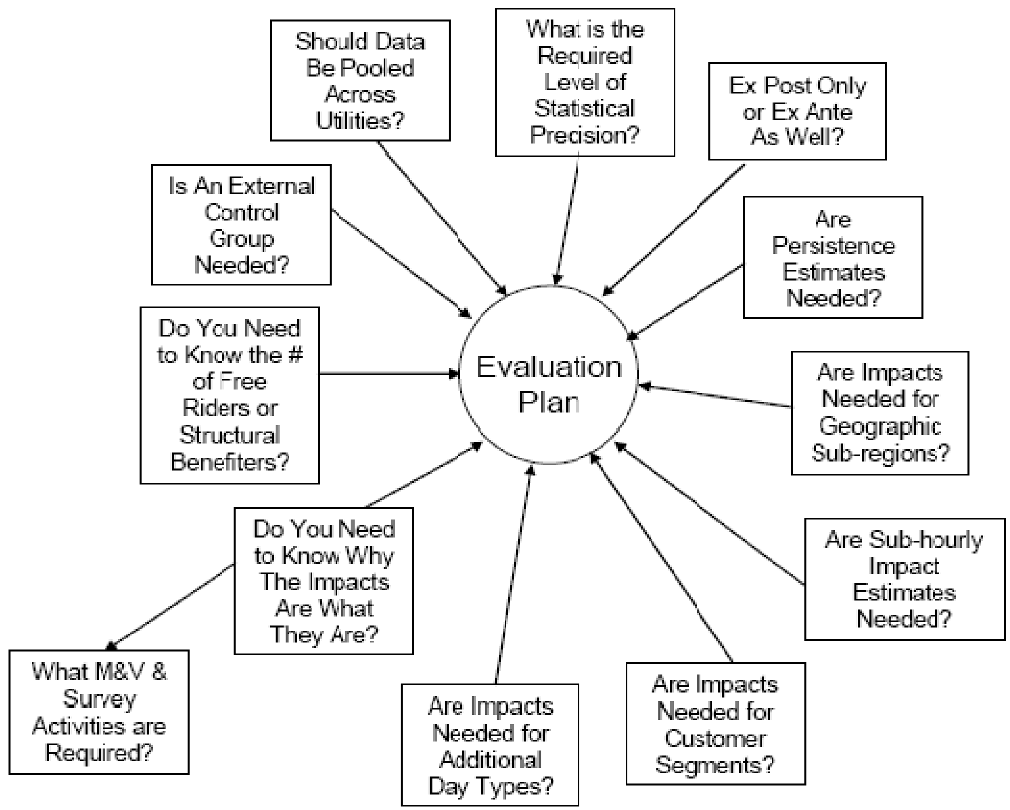
- Requires production of a plan before starting the evaluation project
- Need to think about future uses of impact estimates in different forums for different needs– Forecasting, program design, cost effectiveness analysis
- See Overview Figure 3-1 next page. (Source Steve George et al, Straw Proposal on Load Impact Estimation for Demand Response, September 10, 2007)

Figure 3-1
Stylized Evaluation Planning Process



Source: S George et al, Load Impact Estimation for Demand Response: Prepared for PGE, SCE and SDG&E; September 10, 2007

Figure 3-2
Additional Requirements Associated With Protocol 3



Source: S George et al, Load Impact Estimation for Demand Response: Prepared for PGE, SCE and SDG&E; September 10, 2007

Likely Policy Impacts and Challenges

- More frequent evaluations of the impacts of existing and future DR programs
- Better understanding of the uncertainties inherent in forecasts of Demand response program impacts
- Improvements in the accuracy of short term forecasts (next day, next week) of callable demand response programs

Measurement and Verification of Demand Resources in New England's Forward Capacity Market

Eric Winkler, *Ph.D.*
ISO New England
www.iso-ne.com
ewinkler@iso-ne.com

January 31, 2008

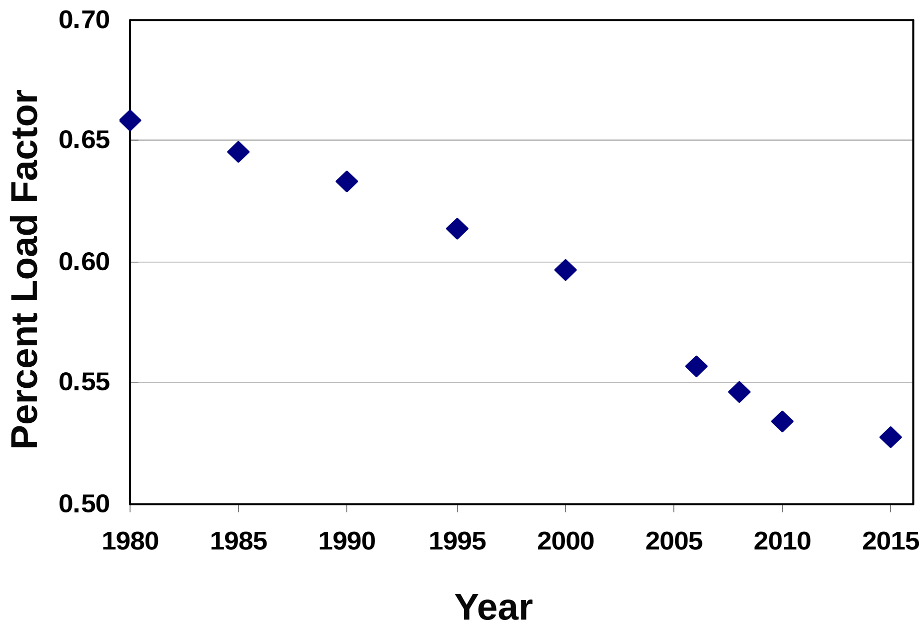
ISO new england

Demand Participation in Markets is Needed

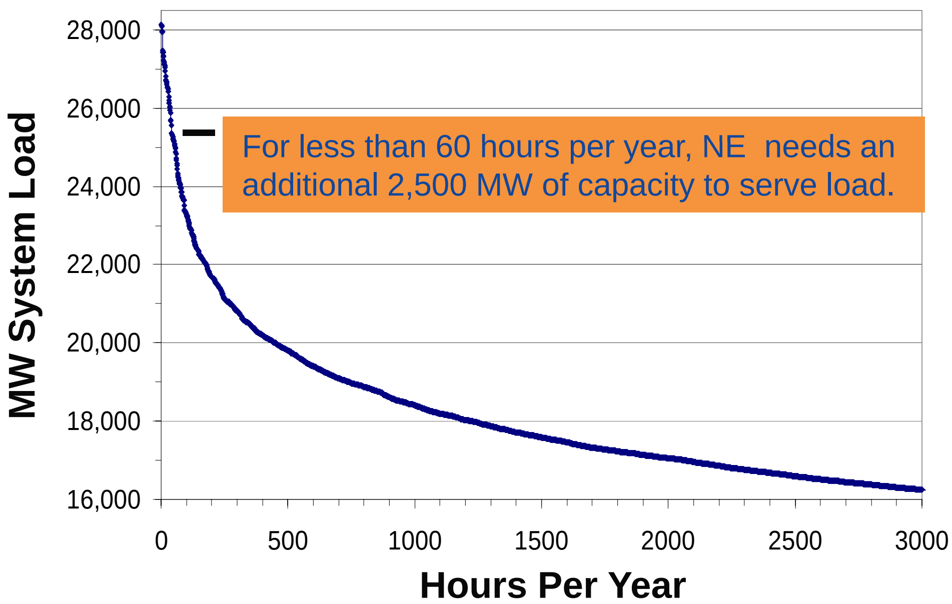
- A small amount of demand participation in markets can go a long way in mitigating peaks, lowering costs, and ultimately lowering electricity prices to final consumers.
- The load factor of the New England electricity system has been steadily declining over time resulting in:
  - Peaky loads, higher energy and capacity costs, and higher average rates.
- Markets are the most efficient way to encourage the development of cost-effective Demand Resources.
- Used Stakeholder Process to develop M&V requirements incorporating comments from Energy Service Companies, Utility Program Managers, and State Regulatory Officials.

System Utilization Declining - Peak

ISO Summer Peak Load Factors
History 1980-2006, Forecast 2007-2016



New England Load Duration Curve (2006)



New Demand Resources Qualified for FCA #1

MW by Load Zone and Demand Resource Type

	Resource Type					
Load Zone	Critical Peak	On-Peak	Real-Time Demand Response	Real-Time Emergency Generation	Seasonal Peak	Grand Total
Connecticut	101.1	53.8	137.0	175.5	129.4	596.8
Maine	23.3	27.8	148.8	37.0		236.9
NEMA	114.8	133.3	137.0	148.4	7.2	540.7
New Hampshire	13.6	32.2	34.7	48.7	3.4	132.6
Rhode Island	7.7	39.5	56.2	93.7	1.6	198.7
SEMA	87.2	78.3	88.4	92.8	2.4	349.1
Vermont	7.6	56.6	16.8	18.8	0.8	100.6
WCMA	36.5	68.1	117.8	99.0	15.0	336.4
Grand Total	**391.8**	**489.5**	**736.6**	**714.0**	**159.9**	**2491.8**

Note: Qualified Capacity (MW) includes T&D and Reserve Margin gross up, mandatory de-list for Summer vs. Winter capacity differences, and effects of Composite Offers.

ISO new england

Demand Resources by Measure Type

Non Dispatchable | Dispatchable

LOAD ZONE	DG Fossil	DG Renewable	Energy Efficiency	Load Management and RTDR	RTEG	Total
CONNECTICUT	19.6	0.0	161.1	240.7	175.5	**596.8**
MAINE	0.0	0.0	27.8	172.1	37.0	**236.9**
NEMASSBOST	0.0	0.0	133.3	259.0	148.4	**540.7**
NEWHAMPSHIRE	7.0	0.0	32.2	51.7	48.7	**139.6**
RHODEISLAND	0.0	0.0	39.5	65.5	93.7	**198.7**
SEMASS	5.6	0.2	72.5	178.0	92.8	**349.1**
VERMONT	0.0	0.0	56.6	25.3	18.8	**100.6**
WCMASS	12.6	0.0	67.1	157.6	99.0	**336.4**
Grand Total	**44.8**	**0.2**	**590.2**	**1149.7**	**714.0**	**2498.8**

Note: Qualified Capacity (MW) includes T&D and Reserve Margin gross up, mandatory de-list for Summer vs. Winter capacity differences, and effects of Composite Offers.

Demand Resource Performance

- The Forward Capacity Market rules were developed to recognize:
  - Differences among Demand Resource types, and
  - The needs of the system in meeting Installed Capacity Requirements.
- Different Demand Resource technologies – i.e., Energy Efficiency, Load Management, and Distributed Generation – reduce load in different ways.
  - Passive versus active (i.e., dispatchable)
  - Weather sensitivity
  - Demand reduction versus energy output
- Demand Resources must reduce load so as to reduce the need for generation capacity.
  - Five Demand Resource types were defined, each with a specific set of performance hours. Reduced load during such performance hours would reduce the need for generation capacity.
  - On-Peak, Seasonal Peak, Critical Peak, RTDR, RTEG

Qualification Process Overview

- New Demand Resources must make two major information submittals:
- **Show of Interest Application**
  - Contains sufficient information to perform preliminary analysis of the effect of the proposal on the New England system, and to schedule ISO resources to review Qualification Packages.
- **Qualification Package**
  - Contains sufficient information to assess the viability of the project.
    - Measurement & Verification Plan
    - Customer Acquisition Plan
    - Project Description
    - Source of Funding
    - Critical Path Schedule
    - Capacity Commitment Period Election
    - Intention to Offer Below 75% of the Cost of New Entry
    - Consistency with Show of Interest Form

Demand Resources Need Measurement and Verification Plans

- All Demand Resources that participate in the Forward Capacity Market are required to demonstrate performance during specified performance hours in a manner that provides electrical capacity to the New England Control Area.
- To qualify for the Forward Capacity Market, Demand Resources must have an ISO-NE-approved Measurement and Verification Plan that complies with the applicable Measurement and Verification standards.
- The measured and verified electrical energy reductions during performance hours are the basis of capacity payments to Demand Resources participating in the Forward Capacity Market.

M&V Highlights and Challenges

- Qualification, Testing, Auditing
  - Market design requires forecasting performance 3 years in advance.
  - Current data systems do not have ISO-NE auditing processes.
- Data Reporting – Frequency and Monitoring
  - Reporting Requirements are Complex (Near Real-Time and After the Fact).
  - Impacts on Operations and Planning
  - Systems are not built yet for tracking data.
  - VEE standards
- Meter and Equipment Standards
  - Balance cost with precision and accuracy requirements
  - Non-metered loads

M-MVDR: http://www.iso-ne.com/rules_proceds/isone_mnls/index.html

M&V Challenges (continued)

- Performance Baseline
  - New or Replacement of Existing measures
  - Use of State Code, Federal Efficiency Standards or Standard Practice
  - Pre and Post installation measurements
  - Capacity factors
  - Seasonality
- Statistical Sampling of non-interval metered loads
  - Use of minimum statistical Precision and Accuracy requirement
  - Population variation control
  - Control of Bias
  - Sampling methodology (survey vs analytical measurements.)