

ENERGY

Measurement and Verification: Making AMI Data Smart for Demand Response

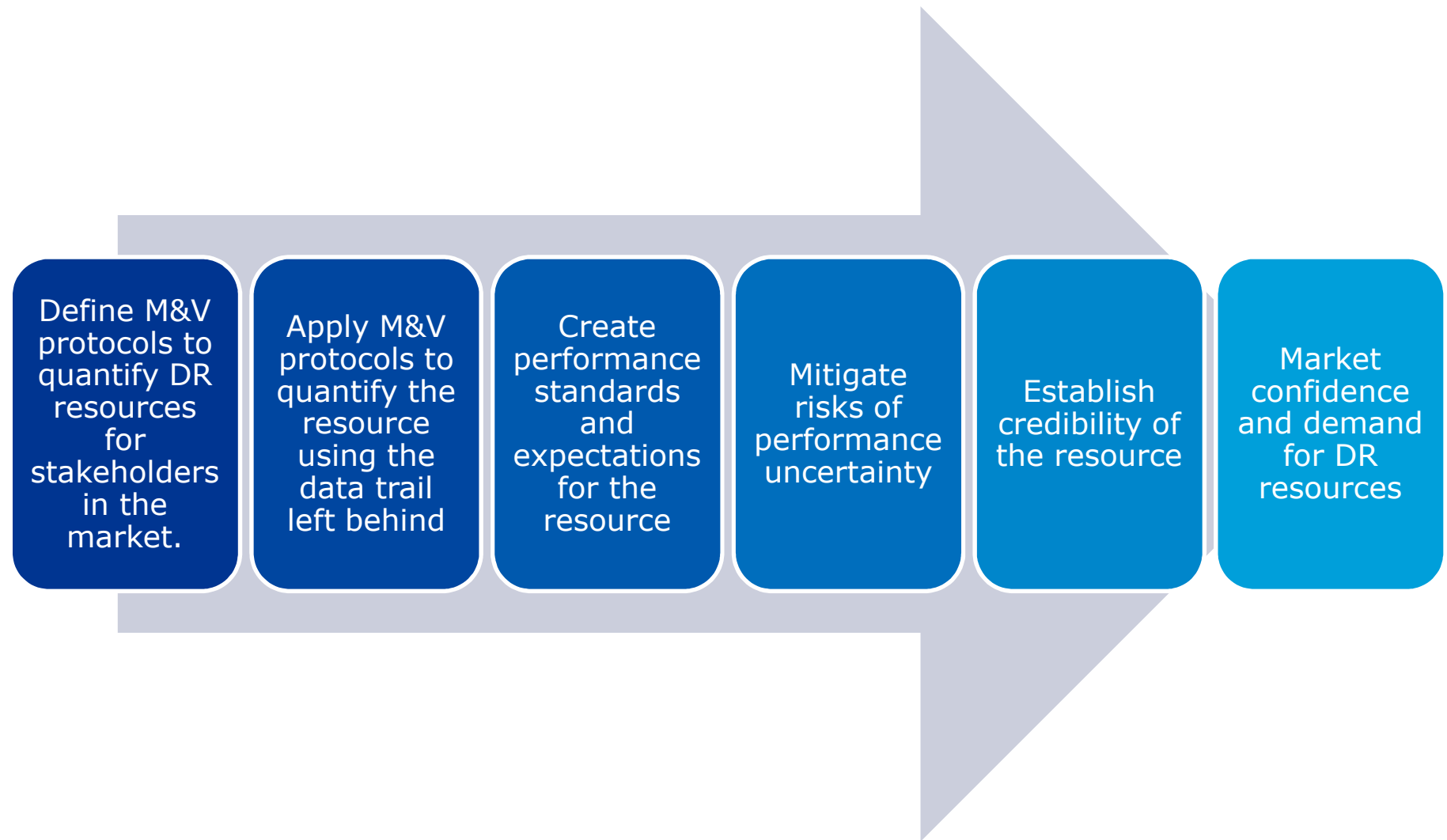
Will Gifford - IEPEC Conference, Berlin

10 September 2014

Purpose of Measurement and Verification for Demand Response

To mitigate the risk of imbalance in the costs and benefits of the DR resources among the stakeholders which are impacted.

Measurement and Verification Makes Demand Response Work



Objectives of the Paper

- Highlight existing M&V protocols for DR in the U.S.
- Discuss some similarities and differences between DR in the U.S. and Europe
- Present an overview of best practice M&V methodologies for DR from the U.S.
- Discuss the role of smart meter interval data in M&V for DR
- Provide recommendations for M&V of DR generally and in the European context

Please check out the paper for a more complete treatment!

What is the current state of DR in Europe?

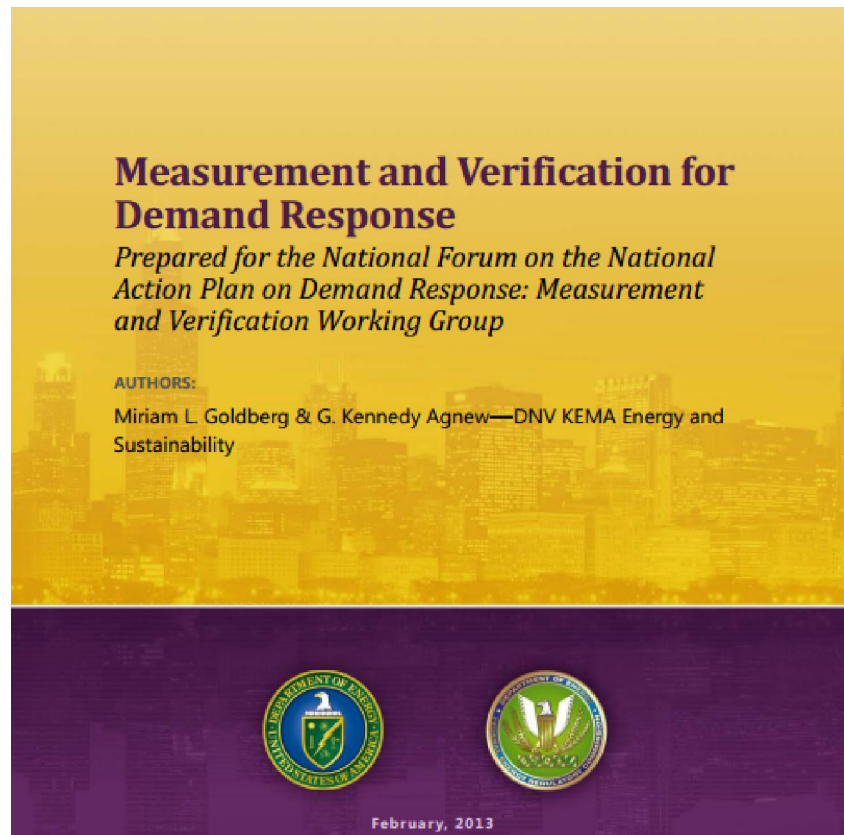
- The European Commission Energy Efficiency Directive, Article 15.8 requires member state regulators and Transmission System Operators (TSOs) to allow consumer access to markets for DR, to enable participation by aggregators and to enable and encourage program development.
 - However, by 2014 only Belgium, Great Britain, Finland, France, Ireland, and Switzerland had reached a level where DR was a viable commercial offering (SEDC, 4).
- Protocols for M&V in Europe are currently lacking or uncoordinated in many regions. In some cases TSOs will have one set of criteria, the BRP will have another, and the retailer will maintain a third (SEDC, 5).

- Reference:

Smart Energy Demand Coalition (SEDC). 2014. Mapping Demand Response in Europe Today; Tracking Compliance with Article 15.8 of the Energy Efficiency Directive. http://sedc-coalition.eu/wp-content/uploads/2014/04/SEDC-Mapping_DR_In_Europe-2014-04111.pdf

Some Measurement and Verification for DR Protocol Resources

- Measurement and Verification for Demand Response (2013, prepared for FERC/DOE)
- Load Impact Estimation for Demand Response: Protocols and Guidance (2008, Prepared for the CPUC)



ATTACHMENT A

Load Impact Estimation for Demand Response: Protocols and Regulatory Guidance



California Public Utilities Commission
Energy Division

April 2008

Applications of Measurement and Verification for DR

Settlement: Determination of applicable payment for DR event performance

- Used to compensate entities that provide load curtailment to entities that benefit from those curtailments
 - Market-to-Program
 - Program-to-Participant

Impact Estimation: Determination of DR event performance achieved or projected to be achieved

- Used for ongoing program valuation and planning; can also feed into settlement calculations
 - How do weather and other conditions relate to load impacts for the program?
 - Where is the program over- and under-performing versus expectations?
 - Is the program cost effective?

Some Differences Between the U.S. and Europe With Respect to DR



Program
administration
complexity



How electricity
is priced



Role of
regulatory
bodies



Customer end-
use profiles?



DR M&V Needs of Stakeholders in European Markets

European Market Participant	Market Role	Value of DR	M&V Needs
Customers	End users of electricity	DR offers direct compensation in return for having flexibility to shift or curtail load during designated periods	Facilitate fair compensation for performance to encourage participation in DR programs
Distribution Network Operator (DNO)	Manages the distribution grid, providing security of supply and maintaining power quality	Capacity resource in localized areas of distribution	None directly. Needs DR resources integrated into markets to be as reliable as supply-based resources
Retailer	Supplies electricity to customers through contracts with suppliers	Can offer competitive advantage, as DR may be more cost effective in certain times than generation resources	None directly. Needs DR to not increase cost of providing service to customers over that of generation
Aggregator	Contracts with DR providers and sells the resource as a balancing or capacity service	Market value of the coordinated resource sold to markets	Critical for determining settlement with participating customers and for settlement of aggregate resource with markets
Generator	Supplier of electricity to the grid through contracts with retailers	Competitor to DR resource providers	Ensure DR aggregators or direct participants are subject to the same metering and telemetry requirements as generators, and are subject to penalties for non-performance
Balance Responsible Party (BRP)	Resource scheduler to meet electricity demand with electricity supply	May use DR as a resource to schedule along with generation	Facilitate accurate telemetry so that scheduled resources meet expectations
Transmission System Operator (TSO)	Manages the transmission grid, ensuring a means for adequate supply at the required power quality levels	Maintains balancing and capacity markets, which DR resources can participate alongside generation resources	Facilitate resource valuation for a fair and efficient market when both DR and generation resources are integrated

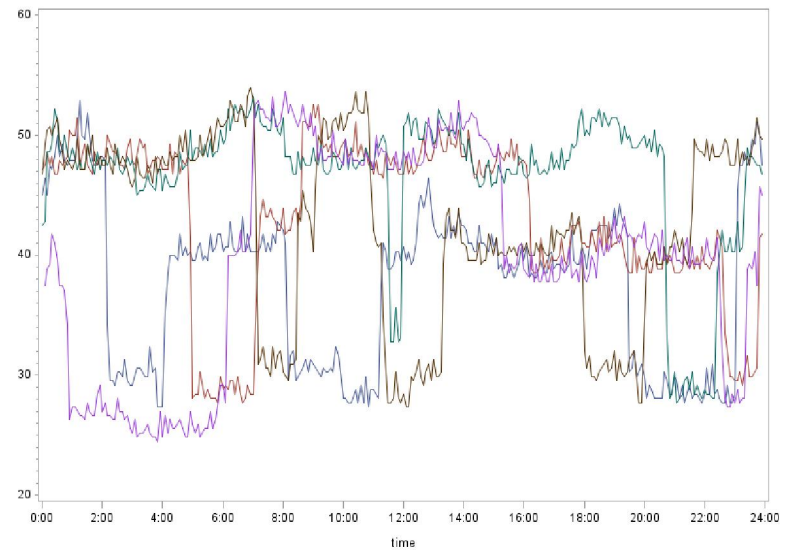
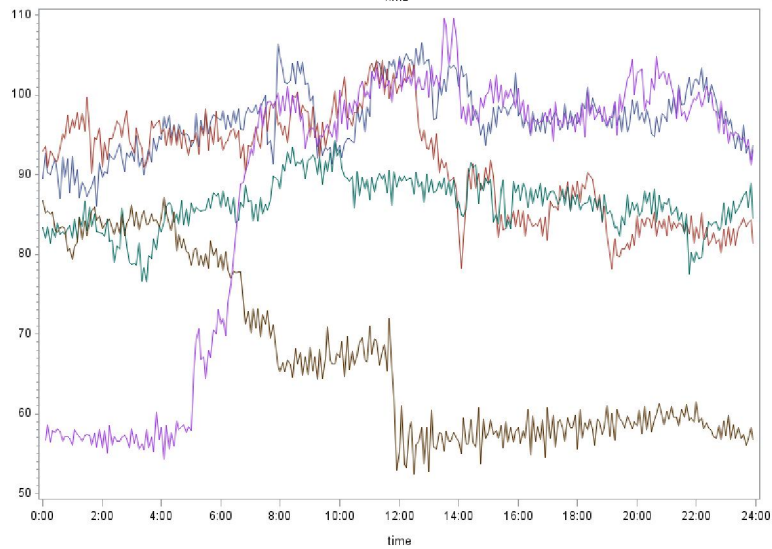
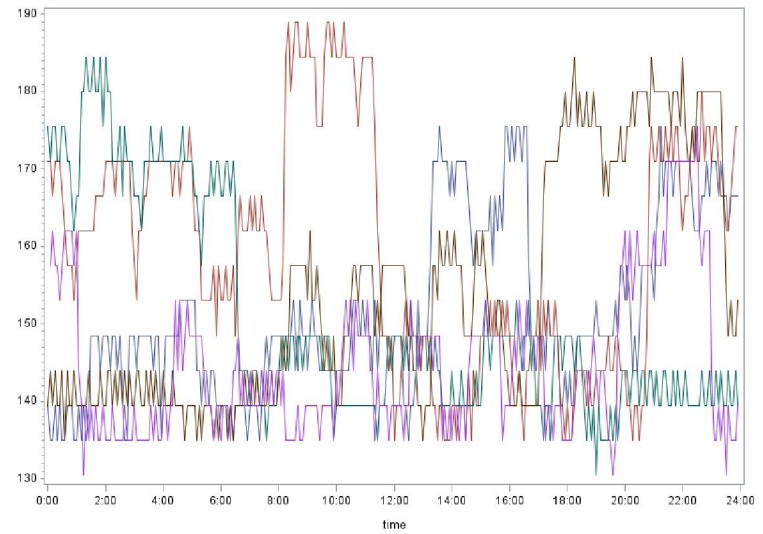
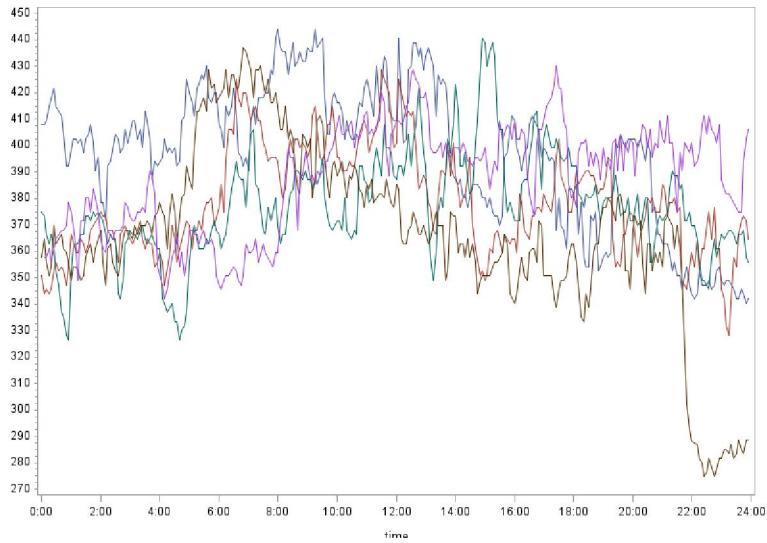
Baselines

Represent what the load would have been for single participants or groups of participants, had the DR event not occurred.

What Should Baselines Control For?

- Factors that affect customer or program load profiles from day-to-day
 - E.g., weather, day type, process schedules, economic factors
 - Many of these are very difficult or impossible to control for
 - Account for them with:
 - Regression modeling
 - Control groups of customers
 - Day-matching of load profiles
 - Event day adjustments

Challenging Issue: Highly Variable Loads



Advanced Metering Infrastructure (AMI) and M&V

- 22% penetration of smart meters in Europe at the end of 2013
 - Goal of 80% by 2020
- Smart meter data can facilitate M&V of DR resources
 - Does not replace M&V of DR resources
 - AMI data management system connected to the meters must have the necessary horsepower
- Expanded AMI penetration can enable expansion of DR to aggregations of smaller loads



Recommendations

M&V Protocols: Establish M&V protocols for DR resources that balance participation opportunities with performance standards for the markets

- Leverage existing protocols being used in U.S. markets where appropriate

Program Design: Regulators should consider mandating administration of cost-effective programs consisting of aggregations of smaller customers where AMI is in place for ongoing M&V

Program Evaluation: Regulatory bodies should establish budgets to evaluate existing programs to support continuous improvement and the development of new programs

- Would need to do a broad evaluation preventing disclosure of certain individual CSP program data

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Please Contact

will.gifford@dnvgl.com

+1 703 631 2823

www.dnvgl.com

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