

Comparison of Smart Grid Clearinghouse Information Requests to United States Department of Energy Guidebook for ARRA Smart Grid Program Metrics and Benefits dated December 7, 2009.

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Purpose

This document compares the metrics and benefits described in the U.S. Department of Energy Guidebook to the information requests made by: 1) the NARUC/FERC Smart Grid Collaborative in March 2009 and 2) the Regulators/Standards Organizations participating in the Smart Grid Information Clearinghouse User Group meeting in December 2009.

Background- ARRA and Smart Grid Clearinghouse

On February 17, 2009, Congress passed the American Recovery and Reinvestment Act of 2009 (ARRA or The Recovery Act). The purpose of the Recovery Act is to jump-start the economy to create and save jobs. The Act specifies appropriations for a wide range of federal programs, including grants totaling \$4.5 billion for Smart Grid projects and programs. The Act called for the creation of a Smart Grid Information Clearinghouse to make data from Smart Grid projects and other sources available to the public, and it required grant recipients to provide data to the Clearinghouse as specified by the U.S. Department of Energy.

On March 6, 2009, the U.S. Department of Energy's National Energy Technology Laboratory issued a Funding Opportunity Announcement for developing, populating, managing, and maintaining a Web-based Smart Grid Information Clearinghouse. The purpose of the Clearinghouse is to consolidate public technical, legislative, and other information on Smart Grid development and practices and direct website users to additional information sources both in the U.S. and internationally. The goal is to facilitate coordination and collaboration among all Smart Grid stakeholders, ranging from end users to technology developers, to support the advancement of the program for the benefit of the entire Nation (U.S. Department of Energy, 2009). The Virginia Polytechnic Institute and State University (Virginia Tech) was awarded the \$1.3 million initiative to develop and maintain the Clearinghouse website. Virginia Tech is leading the project, which is a cooperative effort with the University, the Institute of Electrical and Electronics Engineers (IEEE) Power & Energy Society, and EnerNex Corporation.

Guidebook

The Department of Energy recently issued a Guidebook for ARRA Smart Grid Program Metrics and Benefits. The Guidebook describes the type of information to be collected from each of the award recipients, referred to as "Project Teams," and how the information will be used to communicate to the public the progress of Smart Grid implementation and the resulting impacts.

Recommendations to the Clearinghouse, DOE Guidebook and Gap Analysis

In March 2009, the NARUC/FERC Smart Grid Collaborative sent a letter to the Department of Energy with recommended criteria for Smart Grid projects in order to receive funding under the Recovery Act. Included in these recommendations were suggested data and detailed documentation that funding recipients should be required to provide to the Clearinghouse.

The Clearinghouse established a User Group to identify the type of information of interest to various Smart Grid stakeholders, test the initial Web site design, and provide ongoing feedback to the Clearinghouse team. The first User Group meeting was held in December 2009. Meeting participants were divided into stakeholder groups, including Regulators and Standards Organizations. Each provided a Top 10 list of information it would like to see the Clearinghouse provide. (See “Information Requests for Clearinghouse,” below.).

The following analysis reviews whether gaps exist when comparing these information requests and the information requirements in the Guidebook. In other words, does it appear that the information requirements in the Guidebook match the Collaborative’s prior information requests for the Clearinghouse? If not, how would such a gap be filled? This gap analysis will assist the Collaborative in determining whether and how to update its information requests, including the use of the specific metrics and benefits included in the Guidebook and the terminology used

Metrics Structure

The Department of Energy will gather information from the Smart Grid projects funded under the Recovery Act, analyze the information and communicate the results to the public. Impacts of the projects will be communicated within six topic areas:

1. Job Creation and Marketplace Innovation
2. Peak Demand and Electricity Consumption
3. Operational Efficiency
4. Grid Reliability and Resilience
5. Distributed Energy Resources and Renewable Energy
6. Carbon Dioxide Emissions

Build Metrics and Impact Metrics

The Guidebook defines two categories of metrics: build metrics and impact metrics. Build metrics track what the Project Teams spend their money on and measure progress toward a Smart Grid. Build metrics refer to the monetary investments, electricity infrastructure assets, policies and programs, marketplace innovation and jobs that are part of Smart Grid projects [p.3]. Impact metrics measure how, and to what extent, a smarter grid is affecting grid operations and performance, or how it is enabling customer programs and behavior changes.

Understanding this categorization helps stakeholders find the information they want. For example, information on project designs will be contained largely in key build metrics. Information on improvement in the accurate measurement of energy efficiency, one must connect to will be under impact metrics.

WORKS CITED

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- U.S. Department of Energy. (2009, March 18). *U.S. Department of Energy News 3-18-09*. Retrieved February 2, 2010, from U.S. Department of Energy: <http://www.oe.energy.gov/1223.htm>
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INFORMATION REQUESTS FOR CLEARINGHOUSE

From March 2009 Collaborative letter to U.S. Department of Energy (Funding Criteria No. 6):

- a) Internal and third party evaluation, ratings and reviews including all primary source material used in the evaluation
- b) Detailed data and documentation explaining any improvement in the accurate measurement of energy efficiency, energy conservation, price responsive demand, or demand response resources
- c) Detailed data and documentation explaining the expansion of the quantity of energy efficiency, energy conservation, price responsive demand, or demand response resources that resulted from the project and the resulting economic effects
- d) Detailed data and documentation that show reduction in both electric demand and energy consumption associated with the project
- e) Detailed data and documentation for any improvements in the availability to integrate non-dispatchable renewable generation resources
- f) Detailed data and documentation that show any achievement of greater system efficiency through a reduction of transmission congestion and loop flow
- g) Detailed data and documentation showing how the information infrastructure supports distributed resources such as plug-in electric vehicles
- h) Detailed data and documentation that shows how the project resulted in enhanced utilization of energy storage
- i) Detailed data and documentation that show how the project encouraged new business models, market innovation, and third party and private capital participation
- j) All data on project results must be publicly available while protecting individual customer privacy and commercially sensitive data

Top 10 List From December 2009 Clearinghouse User Group meeting - Breakout Session for Regulators/Standards Organizations (in order of importance):

1. Detailed cost/benefit analysis plus supporting documentation
2. Standards and other specifications used for the smart grid project
3. Cyber-security conformance provisions/best practices
4. Project description (technology enabler, expected results)
5. Actual results (e.g., case studies, market impact, price changes)
6. Anonymous lessons learned
7. Dynamic operational information -- i.e., reporting of actual experience over time (detailed events, reliability impact, mitigation plans, actual costs and benefits)
8. Planning and assessment data (demand forecasting, maintaining privacy, future upgrades, integration, generation, transmission and distribution)
9. Business models/market information and third-party capital participation
10. Metadata (i.e., data about data -- see Wikipedia definition at <http://en.wikipedia.org/wiki/Metadata>)

Initial Gap Analysis and Notes - any errors are my own /s BAS

	Information Requests (Collaborative Letter)	DOE Metric or Guidebook Reference	Gaps?	Notes
a)	Internal and third party evaluations, ratings and reviews including all primary source material used in the evaluation	<ul style="list-style-type: none"> • Impact Metrics measure how, and to what extent, a smarter grid is affecting grid operations and performance, or how it is enabling customer programs and behavior changes • See Appendix D- Evaluation of Consumer Behavior 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • Impact metrics should serve as tool for review • No mention of third party evaluation • Requirement for primary source material used in the evaluation not explicitly mentioned
b)	Improvement in the accurate measurement of energy efficiency	<ul style="list-style-type: none"> • Not mentioned 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • Unclear on specific metrics to be reported that would indicate improvement in measurement
b)	Improvement in the accurate measurement of energy conservation	<ul style="list-style-type: none"> • Not mentioned 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • Using equipment to measure energy consumption at specific end uses, and advanced metering infrastructure or other communication systems to convey the data, is not explicitly mentioned • Need more information about measurement methodology
b)	Improvement in the accurate measurement of Price Responsive Demand	<ul style="list-style-type: none"> • Not mentioned 	<ul style="list-style-type: none"> • No gaps 	
b)	Improvement in the accurate measurement of Demand Response Resources	<ul style="list-style-type: none"> • Impact Metrics Table (p. 13) • Reduced Peak Load and Consumption (p. 15) • Data Reporting (p. D-2) 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Unclear on specific metrics to be reported that would indicate improvement in measurement • DOE strongly urges all Project Teams to include in their evaluation plan the estimation of a fully-specified consumer demand model from which elasticity estimates can be derived. • DOE should require Project Teams to specify measurement methodology and assumptions of the methodology
c)	Detailed data and documentation explaining the expansion of the quantity of energy efficiency	<ul style="list-style-type: none"> • Energy Efficiency Resource Standards (build metric, p.9) • other efficiency related investments (op efficiency on p. 21) • defined as an economic benefit (Table C-2, p C-4) 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Standards are discussed in the context of state requirements that Project Teams must meet, not for measuring energy efficiency. • Other efficiency related estimates refers to operational efficiency of the electricity infrastructure. • Benefits include Reduced Electricity losses. • Unclear whether reporting requirements will include metrics on expanded energy efficiency programs and participation (number of customers, customer classes)

	Information Requests (Collaborative Letter)	DOE Metric or Guidebook Reference	Gaps?	Notes
c)	Detailed data and documentation explaining the expansion of the quantity of energy conservation	<ul style="list-style-type: none"> • Customer Electricity Usage (Table 8, p. 13) • Table D-1. Dynamic Pricing Impact Metrics • Impact Metrics related to economic benefits (p. A-4); • Customer Electricity Use Optimization (Table C-1, p. C3) 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Load data by customer class, including tariff and SIC code. This data may include hourly load data by customer. This could be translated into conservation. • Hourly and monthly consumption information (may reflect conservation)
c)	Detailed data and documentation explaining the expansion of the quantity of Price Responsive Demand	<ul style="list-style-type: none"> • Table D-1 (p. D-3) includes various dynamic pricing impact metrics • Impact metrics: Elasticity of Substitution, impact on system coincident peak, impact on future reliability requirements, etc. Must connect well with policy build metrics (Table 5 p. 9; Table A-1.2 AMI and Customer Programs) 	<ul style="list-style-type: none"> • No gaps 	<ul style="list-style-type: none"> • DOE will work with Project Teams to identify data requirements for each project
c)	Detailed data and documentation explaining the expansion of the quantity of Demand Response Resources	<ul style="list-style-type: none"> • Build Measures of enabling technologies (Table A-1.1, p A-2) • Build metrics are included for advanced metering infrastructure (p. 7), customer systems, and other like investments. 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Detailed reporting requirements are unclear – e.g., incremental MW of load reduction achieved, improved duration and frequency of load reduction, and expanded participation (number of customers, customer classes)
d)	Detailed data and documentation that show reduction in electric demand and energy consumption	<ul style="list-style-type: none"> • Reduced Peak Load and Consumption (p. 15) • Dynamic Pricing Impacts Metrics (Table D-1, page D-3) 	<ul style="list-style-type: none"> • No gaps 	<ul style="list-style-type: none"> • Reduction in demand and energy consumption appears to be a focus.
e)	Detailed data and documentation for any improvements in the ability to integrate non-dispatchable renewable generation resources	<ul style="list-style-type: none"> • Distributed Generation Metrics- yes/no value (p. A-5) • Energy Supplied from Renewable Resources (Table 8, p. 14) • Energy Supplied from Distributed Resources (Table 8 p. 14) 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • Integration with distributed generation resources (p. A-5) is a yes/no value. • Many measures seem to reference quantity, and are NOT focused on integration. • No metrics on reduction in estimated wind integration costs or wind imbalance costs (\$/MWh)

	Information Requests (Collaborative Letter)	DOE Metric or Guidebook Reference	Gaps?	Notes
		<ul style="list-style-type: none"> • Build Metric- Distributed Energy Resources Interconnection Standards (Table 5, p. 9) 		
f)	Detailed data and documentation that show any achievement of greater system efficiency through a reduction of transmission congestion and loop flow	<ul style="list-style-type: none"> • Congestion Cost (Table A-3.2, p. A-9) • Improved Asset Utilization (Table C-2, p. C-4) 	<ul style="list-style-type: none"> • No gaps 	<ul style="list-style-type: none"> • Total transmission congestion cost during the reporting period. Requires a baseline for the purpose of comparison.
g)	Detailed data and documentation showing how the information infrastructure supports distributed resources such as plug-in electric vehicles	<ul style="list-style-type: none"> • Table 4. Build Metrics- Electricity Infrastructure Assets 	<ul style="list-style-type: none"> • No gaps 	
h)	Detailed data and documentation that shows how the project resulted in enhanced utilization of energy storage	<ul style="list-style-type: none"> • Table 3 Build Metrics- Monetary Investments in Energy Storage (p. 6) • Table 4 Build Metrics- Stationary Electricity Storage • Table 6 Build Metrics- Marketplace Innovation- Energy Storage 	<ul style="list-style-type: none"> • No gaps 	
i)	Detailed data and documentation that show how the project encouraged new business models, market innovation, and third party and private capital participation	<ul style="list-style-type: none"> • Marketplace innovation measures (one focal point is job creation and marketplace innovation) 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • May not focus on specific business models

	Information Requests (User Group December 2009-Regulators/Standards Organizations)	DOE Metric or Guidebook Reference	Gaps?	Notes
1	Detailed cost/benefit analysis plus supporting documentation	<ul style="list-style-type: none"> •Nothing explicit 	<ul style="list-style-type: none"> • Gaps 	<ul style="list-style-type: none"> • Cost/benefit information needed
2	Standards and other specifications used for the smart grid project	<ul style="list-style-type: none"> •Build metric standards in Policies and Programs (Table 5, p.9) •Build Metrics- Transmission Systems (Table A-3.1, p. A-8); Distributed Energy Resources Standards (Table 5, p. 9) 	<ul style="list-style-type: none"> • No gaps 	<ul style="list-style-type: none"> • Standards for interoperability are still in process. • Standards via policy may be preconditions to a project and are documented in build metrics. • Other standards (e.g. industry standards) are contained in build metrics
3	Cyber-security conformance provisions/best practices	<ul style="list-style-type: none"> •Build Metric- Security Measures for Transmission System Assets (Table A-3.1, p. A-8) 	<ul style="list-style-type: none"> • Gaps 	<ul style="list-style-type: none"> • Some measure of tamper protection, but there is not a cybersecurity focus in Guidebook
4	Project description (technology enabler, expected results)	<ul style="list-style-type: none"> •Build metrics- Table 4 (p. 7): AMI Systems; Customer Display Device or Portal; Distribution Automation, etc. 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Build metrics may tell this story implicitly • ARRA grant application may inform description
5	Actual results (e.g., case studies, market impact, price changes)	<ul style="list-style-type: none"> •Impact measures, use cases •Table A-3.2 Impact Metrics: Electric Transmission Systems- Annual Generation Cost; Hourly Generation Cost; Congestion Cost •Table D-1. Dynamic Pricing Impact Metrics (p. D-3) 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Impact measures will provide this information • Some measures (i.e. Table A-3.2) require baseline measures • The DOE approach should “provide the information that leads to insights, not just data to be warehoused” (p. 2)
6	Anonymous lessons learned	<ul style="list-style-type: none"> •Not mentioned 	<ul style="list-style-type: none"> • Gaps 	<ul style="list-style-type: none"> • The objective of this information request is to allow members of the Project Team to anonymously share valuable lessons learned to benefit future Smart Grid work, recognizing the difficulty in advertising failures for specific projects.
7	Dynamic operational information -- i.e., reporting of actual experience over time (detailed events, reliability impact, mitigation plans, actual costs and benefits)	<ul style="list-style-type: none"> •Table 8. Impact Metrics (pp. 13-14) •Appendix A Impact Metrics (pp. A-7 to A-10) •Table A-2.3 Impact Metrics- Metrics Related Primarily to Reliability Benefits; Environmental Benefits) 	<ul style="list-style-type: none"> • No gaps 	<ul style="list-style-type: none"> • Baselines are not explicitly mentioned. • Reporting timelines not explicit
8	Planning and assessment data	<ul style="list-style-type: none"> •Table 4. Build Metrics- 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • Demand forecasting, privacy, future upgrades are not specifically mentioned

	Information Requests (User Group December 2009-Regulators/Standards Organizations)	DOE Metric or Guidebook Reference	Gaps?	Notes
	(demand forecasting, maintaining privacy, future upgrades, integration, generation, transmission and distribution)	Electricity Infrastructure Assets (p. 7)		
9	Business models/market information and third-party capital participation	<ul style="list-style-type: none"> • Table 6. Build Metrics- Marketplace Innovation (p. 10) 	<ul style="list-style-type: none"> • Some gaps 	<ul style="list-style-type: none"> • Third party capital participation not explicitly stated in build metrics. • Business models may evolve and factor into lessons learned, but this information does not look to be explicitly required. Check against Appendix B
10	Metadata (i.e., data about data -- see Wikipedia definition at http://en.wikipedia.org/wiki/Metadata)	<ul style="list-style-type: none"> • Guidebook is a metadata guide 	<ul style="list-style-type: none"> • Unknown 	<ul style="list-style-type: none"> • Templates and definitions should provide this information