



U.S. Department of Energy

Office of Electricity Delivery and Energy Reliability

SGIG Data Plan Objectives & Overview

Metrics and Benefits Team

March 5, 2010



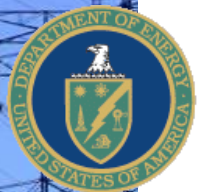
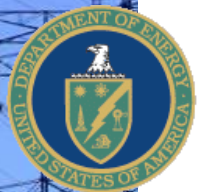


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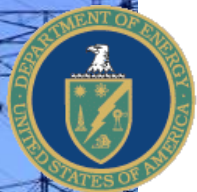
1	Introduction
2	Objectives
3	Process and Schedule
4	Metrics & Benefits Reporting Plan Development
5	Metrics & Benefits Discussion Document
6	Smart Grid Data Hub
7	Highlights and Take-Aways
8	Q&A



Presenters

- Joe Paladino, Senior Advisor, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy
- David Walls, Managing Director, Energy, Navigant Consulting Inc.
- Debbie Brodt-Giles, Digital Assets Manager, National Renewable Energy Laboratory
- Russell Lee, Distinguished R&D Staff Member, Oak Ridge National Laboratory





To ask questions:

- Use the LiveMeeting Q&A function to text in your questions during the webinar
- Questions should be of a general nature and should not pertain to the specifics of your project
- For questions following the webinar and for questions specific to your project, contact your Technical Project Officer at DOE



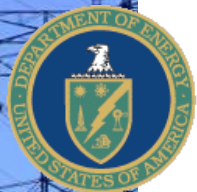


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Purpose of Collecting Data for the Smart Grid Investment Grant Program

- **Investment Tracking** – Account for Build Metrics that represent the deployment of infrastructure, equipment, software, systems and people that make up the Smart Grid
- **Impact Determination** – Quantify the Impact Metrics of Smart Grid technologies against baseline conditions to modernize the electrical grid and enable active customer participation
- **Aggregation and Analysis of Program Results** – Analyze metrics, calculate benefits, communicate system-wide results and progress through SmartGrid.gov
- **Business Case Analysis** – DOE is interested in forming working relationships with Grant recipients to advance the business case for smart grid technology



Key Metrics and Benefits Topics That Will be Covered Today

- **Process & Schedule** – Explain the process and timeframe recipients to develop, review, and approve Metrics and Benefits Reporting Plans
- **Data Plan Requirements** – Discuss the core data, metrics, and analysis needed to develop a robust data plan.
- **Metric Types & Analysis** – Review approaches to determine build metrics, baseline data, impact metrics and overall program benefits
- **Relevant Examples** – Illustrate relevant examples to ensure consistent approaches are utilized by all recipients when determining metrics and benefits

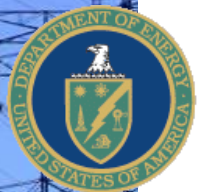
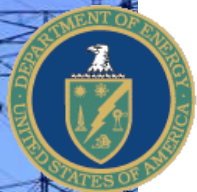


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Metrics and Benefits Reporting Plan Development and Data Input Process

Metrics and Benefits Discussion Document

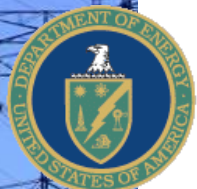
- Developed by DOE Metrics and Benefits Team
- Based on reviews of project proposal
- Starting place for discussion of Metrics and Benefits Reporting Plan

Metrics and Benefits Reporting Plan

- Developed by each project team for their specific project
- Based on proposed project metrics and benefits
- Draft Plan to be submitted to DOE within 60 days of project award

Project Input Forms for Metrics & Benefits

- Forms for metrics and benefits data collection and input to data hub
- Designed to provide flexible reporting processes inputting project data to Smartgrid.gov



A Draft Metrics and Benefits Reporting Plan is Due to DOE 60 Days Following SGIG Award

Metrics and Benefits Reporting Plan Schedule*

DATA PLAN ACTIVITIES	30 d	60 d	90 d
SGIG Award	◆		
Discussions with Metrics and Benefits Team			
Draft and Submittal		◆	
Review / Edit			
DOE Approval			◆

* Actual Schedule Dates Based on SGIG Award Finalization

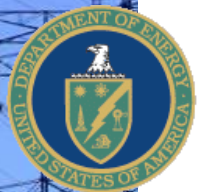
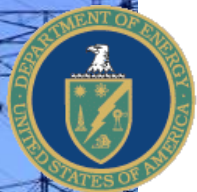


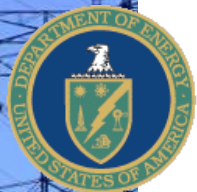
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Metrics & Benefits Reporting Plan Development

- Each SGIG recipient will develop a data plan that describes the methods and resources used to gather build metrics, gather data and calculate impact metrics and overall project benefits
- The Metrics and Benefits Team will provide Data Discussion Documents to each of the SGIG recipients
- The Discussion Document will identify the DOE's data reporting expectations based on initial review of submitted applications
 - Project Objectives
 - Features and Equipment
 - Smart Grid Functionality
 - Assets or Build Metrics
 - Impact Metrics
- Recipients should meet the intent of the Data Discussion Document or resolve any open issues with DOE regarding the Data Plan



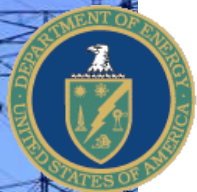
“Project” vs. “System” Level Metrics Need to be Determined and Reported by Recipients

Project Level Data

- "Project" data is defined as the build and impact metrics that pertain to the specific scope of DOE and applicant cost share. To the extent possible, it will be the objective of DOE to track the metrics and benefits as they pertain to the defined scope of the project
- However, some of the impact metrics and benefits will be difficult to measure and calculate directly for the "project" because they are typically only tracked at the "system" level (e.g., emissions reductions). In these cases, it is the desire of DOE to track the "system" level impact metrics and benefits and from this information, provide estimates for the "project" based on calculations and estimates

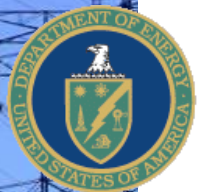
System Level Data

- In addition, DOE desires to obtain information regarding the build and impact metrics as they pertain the "system". This information will be used to establish the baseline and also be used for tracking overall US progress regarding smart grid metrics



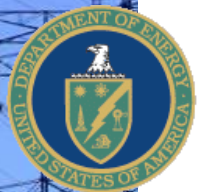
Build Metrics Overview

- **Build Metrics are the investments recipients and the government make in the form of infrastructure, hardware, software & systems, policies, programs, and jobs that make up the Smart Grid project**
- **These metrics extend beyond specific units of equipment and include:**
 - **Number of customers enrolled in a dynamic pricing program**
 - **Capacity of distributed energy resources enabled by Smart Grid**
 - **Percent of transmission system covered by phasor monitoring**
 - **Application or system integration**
- **The attributes or capability of specific Build Metrics (equipment) will be required to determine the applicable Smart Grid functionality**
- **For example, the capabilities and features of AMI meters utilized by the recipient will determine the types of impact that will be achieved:**
 - **Interval Reads, Remote Service Switch, Outage Reporting, PQ monitoring, etc.**



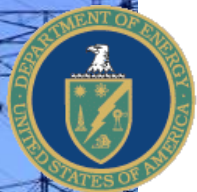
Impact Metrics Overview

- Impact Metrics measure how, and to what extent, the investment is affecting grid operations and system performance, or how it is enabling customer programs once the project is operational
- Determination of Impact Metrics require recipients to observe and calculate the change in performance derived from specific Smart Grid functionality. Often the Impact may be indirectly linked to the Build Metric
- For example, Automated Switching reduces distribution O&M costs through reduced truck rolls, miles driven, and gasoline consumed. It also may optimize feeder loading, reduce equipment failures and restoration costs
- Impact Metrics are diverse and wide-ranging due to the amount and types of functionality that are enabled by Smart Grid technologies:
 - Reliability
 - Deferred T&D Capacity Investment
 - Energy Supplied from Distributed Resources
 - CO₂ Emissions



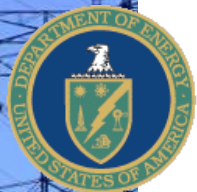
Baseline Metrics Overview

- The Baseline should reflect the parameter values of the recipient's Smart Grid initiatives without SGIG program funding
 - Analogous to "business as usual" in a business case analysis
- Baseline data for both build and impact metrics will be used to assess the incremental and cumulative differences
- Baseline values for Build Metrics should reflect the recipient's asset deployment plans and schedules prior to SGIG funding opportunity
 - For example the SGIG may have contributed to:
 - a) Recipient expanded scope to include Distribution Automation
 - b) Accelerated Smart Grid deployment by two years
- Baseline values for Impact Metrics should reflect the estimated value of the parameter that would have been achieved given the asset deployment plan had there been no SGIG grant
 - For example:
 - a) Peak demand reduction resulting from baseline Demand Response program
 - b) SAIDI reduction resulting from baseline Automated Switch deployment



Baseline Metrics Overview

- If baseline data is not available for certain aspects of the project, recipients should use alternative data sources and statistical tools to develop a representative baseline
 - **Alternative Data Sources**
 - Industry information: EEI, NERC, FERC, EIA
 - Utility Peer Groups
 - Markets and System Operators
 - **Statistical Tools**
 - Data Normalization
 - Multi-Year Averaging
- After interacting more extensively with the Project Teams and identifying “best practices”, we will share alternative approaches to handling certain problem areas
- In some instances the monitoring of control groups (or other unaffected feeders, etc...) may be necessary since the data does not exist

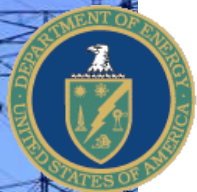


Baseline data will be submitted near the beginning of the project and revised as necessary

Build and Impact Metrics*

	WITH SGIG		WITHOUT SGIG (i.e., BASELINE)	
	PROJECT FOOTPRINT (e.g., Specific Feeders)	OVERALL SYSTEM	PROJECT FOOTPRINT (e.g., Specific Feeders)	OVERALL SYSTEM
Time Period 1	<ul style="list-style-type: none">• Build Metrics• Impact Metrics	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric
Time Period 2	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric
Time Period 3	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric
ETC.	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric	<ul style="list-style-type: none">• Build Metrics• Impact Metric

* Data for all relevant Build and Impact Metrics should be reported for each time period



The “Guidebook” Summarizes Data Reporting Requirements for Build Metrics and Impact Metrics that DOE will use to calculate Benefits

Build Metrics

- Monetary Investments
- Electricity Infrastructure Assets
- Policies and Programs
- Job Creation
- Marketplace Innovation

Impact Metrics

- Customer Electricity Usage
- Utility O&M Costs
- Equipment Failures
- Power Quality Incidents
- Reliability Indices
- Transmission Line, Distribution, and Substation Load and Overloads
- Deferred Generation, Transmission, and Distribution Capacity Investment
- T&D Losses
- Power Factor
- Generation Capacity Factor
- Energy Supplied from Distributed Resources
- Electricity Theft
- Vehicle Emissions

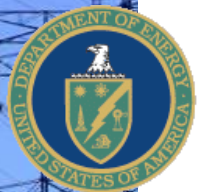
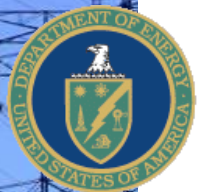


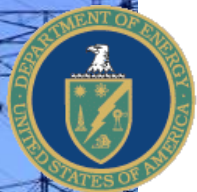
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Each project will be provided a Metrics and Benefits Discussion Document

- Developed based on review of the project technical proposal
- Identifies the Build Metrics, Impact Metrics and Benefits the DOE Metrics and Benefits Team determine the Project Team should be able to report
- Intended to a starting place for the development of the Metrics and Benefits Reporting Plan
- Provides a completed list of possible Build and Impact Metrics for all types of projects
- Build and Impact Metric data lists are different for the various project groups:
 - Equipment Manufacturing
 - Customer Systems
 - Advanced Metering Infrastructure
 - Electric Distribution Systems
 - Electric Transmission Systems
 - Integrated and/or Crosscutting Systems
- The following pages illustrate the types of information provided in the discussion documents



Overview of the Project's Objectives and Key Features

Project Goals and Objectives

- Achieve >15% peak power reduction on a circuit that is cost competitive with capacity upgrades
- Demonstrate the viability of advanced circuit control through multi-agent technologies by employing advanced wireless communications to address interoperability issues between control and protection systems and distributed energy resources (DER)
- Demonstrate the benefits of integration of rotary and inverter based distributed generation (DG), energy storage, advanced metering infrastructure (AMI), Price Driven Demand Response (DR), Automated Load Control (ALC), advanced wireless communications and advanced system controls
- Demonstrate operational strategies such as dynamic islanding and microgrids for serving priority loads with advanced control technologies.
- Demonstrate reliability benefits of dynamic feeder reconfiguration across several adjacent feeders .

Key Smart Grid Features

- Distributed Generation and Energy Storage
- Advanced Metering Infrastructure
- Advanced Wireless Communications
- Price Driven Demand Response & Automated Load Control
- Low-Cost Distribution Sensors w/ Fault Location and Prediction
- Multi-Agent Grid Management System (MGM)
 - Multi-Agent Controls
 - Advanced Micro-grid Operation
 - Dynamic Feeder Reconfiguration

Illustrative



DOE Smart Grid Functions Supported by Project

Function	Provided by Project
Fault Current Limiting	NO
Wide Area Monitoring, Visualization, & Control	NO
Dynamic Capability Rating	NO
Power Flow Control	NO
Adaptive Protection	MAYBE
Automated Feeder Switching	YES
Automated Islanding and Reconnection	YES
Automated Voltage & VAR Control	MAYBE
Diagnosis & Notification of Abnormal Condition	MAYBE
Enhanced Fault Protection	YES
Real-time Load Measurement & Management	MAYBE
Real-time Load Transfer	MAYBE
Customer Electricity Use Optimization	MAYBE

Illustrative

Yes = This function was described in the proposal.

Maybe = It is not clear whether this function will be demonstrated by the proposed project but DOE believes that it is possible.

No = It does not appear that this function will be demonstrated by the proposed project.

Please refer to Table C-1 in the Guidebook for ARRA Smart Grid Program Metrics and Benefits for definitions of these functions, http://www.oenergy.gov/DocumentsandMedia/09_SG_Kickoff_Guidebook.pdf



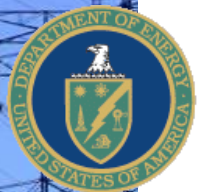
DOE Smart Grid Benefits Supported by Project

Benefit Category	Benefit Sub-category	Benefit	Provided by Project
Economic	Improved Asset Utilization	Optimized Generator Operation (utility/ratepayer) Deferred Generation Capacity Investments (utility/ratepayer) Reduced Ancillary Service Cost (utility/ratepayer) Reduced Congestion Cost (utility/ratepayer)	YES
	T&D Capital Savings	Deferred Transmission Capacity Investments (utility/ratepayer) Deferred Distribution Capacity Investments (utility/ratepayer) Reduced Equipment Failures (utility/ratepayer)	YES
	T&D O&M Savings	Reduced Distribution Equipment Maintenance Cost (utility/ratepayer) Reduced Distribution Operation and Maintenance Cost (utility/ratepayer) Reduced Meter Reading Cost (utility/ratepayer)	YES
	Theft Reduction	Reduced Electricity Theft (utility/ratepayer)	MAYBE
	Energy Efficiency	Reduced Electricity Consumption (utility/ratepayer)	YES
	Electricity Cost Savings	Reduced Electricity Cost (consumer)	YES
Reliability	Power Interruption	Reduced Momentary Outages (consumer) Reduced Major Outages (consumer) Reduced Restoration Cost (utility/ratepayer)	YES
	Power Quality	Reduced Momentary Outages (consumer) Reduced Sags and Swells (consumer)	YES
Environmental	Air Emissions	Reduced carbon dioxide Emissions (society) Reduced SO _x , NO _x , and PM-10 Emissions (society)	YES
Security	Energy Security	Reduced Oil Usage (society) Reduced Wide-scale Blackouts (society)	YES

Yes = This benefit was described in the proposal.

Maybe = It is not clear whether this benefit will be demonstrated by the proposed project but DOE believes that it is possible.

No = It does not appear that this benefit will be demonstrated by the proposed project.



Summary of Metrics to be Reported

- The tables on the following pages indicate the metrics that DOE believes pertain to this project based on its review of the project proposal. These metrics are shaded in green.
- Build Metrics are to be reported Quarterly
- Impact Metrics are to be reported Semi-Annually
- Baseline values for these metrics (as if no project had been undertaken) are to be reported along with the first set of project values.
- Data reported are for the 3- or 6-month period, i.e., incremental rather than cumulative

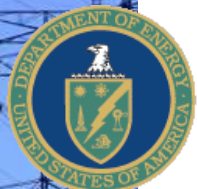
BUILD METRICS

- AMI Assets
- Electric Distribution Assets
- Pricing Programs
- Distributed Energy Resources

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IMPACT METRICS

- AMI and Customer Systems
- Electric Distribution



Example: Cross Cutting Project

The SGIG recipient will deploy:

- 700,000 AMI smart meters within its service territory of
- Integrate enterprise systems: DMS, OMS, and CIS
- Monitoring and Automation at 50 Substations
- DA technologies will be deployed on 40 circuits

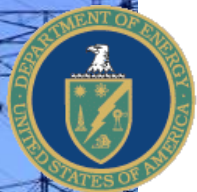
Project Goals and Objectives

- Monitor and control smart meters
- Enable automatic service restoration
- Improve fault isolation and reduce outage restoration time
- Enable real-time pricing (RTP) and critical peak pricing (CPP) to manage peak demand
- Provide customers with information to make energy usage decisions
- Reduce peak power requirements

Key Smart Grid Features

- Expansion of SCADA and Substation Automation
- Automated switches and Reclosers
- Distribution Management System
- Outage Management System
- Smart Meters / AMI System
- Dynamic Pricing Program
- Direct Load Control
- In Home Displays

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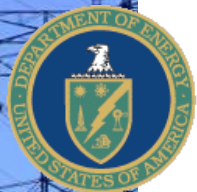


Example: Excerpt of Data Discussion Document BUILD Metrics - AMI Assets

BUILD METRICS: AMI Assets			
Metric	Value		Remarks
	Project	System	
End-Points (meters)	#	#	Meters in planned implementation
Portion of Customers with AMI			
Residential	%	%	Customers with AMI by class
Commercial	%	%	
Industrial	%	%	
Metering Features			
Interval reads of 1 hour or less	Interval	Interval	Indicate the read interval of meters
Remote Connection/Disconnection	Yes/No	Yes/No	Indicate if meters will be used for this purpose
Outage Detection/Reporting	Yes/No	Yes/No	
Power quality monitoring	Yes/No	Yes/No	
Tamper detection	Yes/No	Yes/No	
Backhaul Communications Network	Description	Description	Network characteristics from collectors to head-end
Meter Communications Network	Description	Description	Network characteristics from collectors to meters
Headend system	Description	Description	Characteristics of system
Meter Data Management System	Description	Description	Characteristics of system
Meter data analysis systems	Description	Description	Software for analyzing and manipulating meter data
Enterprise systems integration			
Billing	Yes/No	Yes/No	Indicate if AMI will be integrated with system
Customer information system	Yes/No	Yes/No	
Outage management system	Yes/No	Yes/No	
Distribution management system	Yes/No	Yes/No	
Others	Yes/No	Yes/No	

Illustrative

Metric values shaded in green are those that DOE believes pertain to this project.



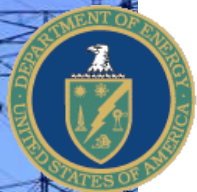
BUILD METRICS

Customer Systems Assets

BUILD METRICS: Customer Systems Assets			
Metric	Value		Remarks
	Project	System	
Home Area Network	Description	Description	Network characteristics within customer premise
In-home displays	#	#	Number of customers with a dedicated energy display
Web portal	#	#	Number of customers with access to a web portal
Energy management devices/systems	#	#	Number of customers with an energy management device or system
Direct Load Control devices	#	#	Number of devices that can be cycled or controlled by a third party
Programmable Controllable Thermostat	#	#	Number of customers with a device
Smart appliances	#	#	Number of appliances that can be programmed or can respond to pricing signals or schedules
Other customer devices	#/Description	#/Description	Numbers of other customer devices or systems

Illustrative

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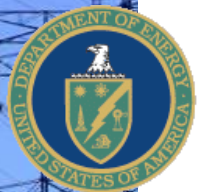
BUILD METRICS

Electric Distribution System Assets

BUILD METRICS: Electric Distribution System Assets			
Metric	Value		Remarks
	Project	System	
Portion of system with SCADA	%	%	Including distribution substation and feeder monitoring/control
Portion of system with Distribution Automation (DA)	%	%	Including feeders, substations, and key equipment
DA Devices			
Automated Feeder Switches	#	#	Locally centrally coordinated/operated
Automated Capacitors	#	#	
Automated Regulators	#	#	
Feeder monitors	#	#	Voltage and current sensors
Remote Fault Indicators	#	#	Detection and reporting of fault location
Transformer monitors (line)	#	#	Loading and/or equipment health
Smart relays	#	#	Settings can be coordinated with other devices
DA communications network	Description	Description	Characteristics of system, including integration or dependencies with other networks (e.g., AMI)
Other DA devices		#	Characteristics of DA devices
DA System Features/Applications			
Fault Location, Isolation and Service Restoration (FLISR)	Yes/No	Yes/No	Indicate if DA will be used for these purposes
Voltage Optimization	Yes/No	Yes/No	
Feeder Peak Load Management	Yes/No	Yes/No	
Microgrids	Yes/No	Yes/No	
Other Applications	Yes/No	Yes/No	

Illustrative

Metric values shaded in green are those that DOE believes pertain to this project.



BUILD METRICS Electric Distribution System Assets (Continued)

BUILD METRICS: Electric Distribution System Assets (continued)			
Metric	Value		Remarks
	Project	System	
Distribution Management System			
Integration with AMI	Yes/No	Yes/No	Including loading, voltage and power quality sensing and reporting from meters
Integration with Outage Management System	Yes/No	Yes/No	Includes outage detection and reporting from OMS
Integration with transmission management system	Yes/No	Yes/No	Interfaced with high voltage energy management system
Integration with distributed energy resources	Yes/No	Yes/No	Interfaced with customer energy management systems and
Fault Current Limiter	#		
Other Distribution devices	#		Characteristics of Distribution devices

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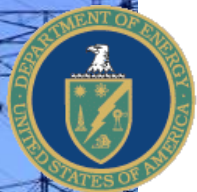
Metric values shaded in green are those that DOE believes pertain to this project.



BUILD METRICS Electric Transmission System Assets

BUILD METRICS: Electric Transmission System Assets			
Metric	Value		Remarks
	Project	System	
Portion of transmission system covered by Phasor Measurement systems	%	%	Including lines, transmission substations, and key equipment
Phasor Measurement Systems			
PMUs	# and Description	# and Description	Make and model, security measures, consistency with NASPI and synchrophasor standards, substation name, location, nominal voltage level, settings, CEII designation, PTA, CT transducer make and model
Phasor Data Concentrators	# and Description	# and Description	Make and model, security measures, consistency NASPI and synchrophasor standards, number of PMUs networked
Communications Network	Description	Description	Make and characteristics
Advanced Transmission Applications			Applications utilizing phasor data or other Smart Grid information for transmission operations and planning
Angle/Frequency Monitoring	Yes/No	Yes/No	Indicate if Phasor Measurement Systems will be used for these purposes
Post-mortem Analysis (including compliance monitoring)	Yes/No	Yes/No	
Voltage Stability Monitoring	Yes/No	Yes/No	
Thermal Overload Monitoring	Yes/No	Yes/No	
Improved State Estimation	Yes/No	Yes/No	
Steady-State Model Benchmarking	Yes/No	Yes/No	
DG/IPP Applications	Yes/No	Yes/No	
Power System Restoration	Yes/No	Yes/No	
Dynamic Capability Rating Systems			Systems designed to determine real-time ratings
Transmission lines	#	#	Based on line loading, temperature, sag or other operating parameters
Station Transformers	#	#	Based on equipment loading, temperature, oil condition, or other operating parameters
Other Transmission equipment	#	#	Other equipment that could benefit from a real-time rating
Other Transmission devices	#	#	Characteristics of transmission devices

Metric values shaded in green are those that DOE believes pertain to this project.



BUILD METRICS Pricing Programs

BUILD METRICS: Pricing Programs			
Policy/Program	Value		Remarks
	Project	System	
Retail Rate Design and Rate Level			Include program characteristics, customers with access, and participation rates
Flat	Yes/No	Yes/No	
Flat with Critical Peak Pricing	Yes/No	Yes/No	
Flat with Peak-Time Rebate	Yes/No	Yes/No	
Tier	Yes/No	Yes/No	
Tier with Critical Peak Pricing	Yes/No	Yes/No	
Tier with Peak-Time Rebate	Yes/No	Yes/No	
Time-of-use	Yes/No	Yes/No	
Variable Peak Pricing	Yes/No	Yes/No	
Time-of-use with Critical Peak Pricing	Yes/No	Yes/No	
Time-of-use with Peak-Time Rebate	Yes/No	Yes/No	
Real-Time Pricing	Yes/No	Yes/No	
Real-Time Pricing with Critical Peak Pricing	Yes/No	Yes/No	
Real-Time Pricing with Peak Time Rebate	Yes/No	Yes/No	
Pre-Pay Pricing	Yes/No	Yes/No	
Net Metering	Yes/No	Yes/No	
Rate Decoupling	Yes/No	Yes/No	
Other programs	Yes/No	Yes/No	

Illustrative

Metric values shaded in green are those that DOE believes pertain to this project.



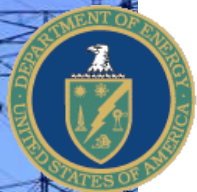
BUILD METRICS

Distributed Energy Resources

BUILD METRICS: Distributed Energy Resources			
Metric	Value		Remarks
	Project	System	
Distributed Generation	# MW MWh	# MW MWh	Number of units, total installed capacity and total energy delivered
Energy Storage	# MW MWh	# MW MWh	Number of units, total installed capacity and total energy delivered
DG Interface	Description	Description	Characteristics of DG interface or interconnection, information and control capability for utility
Plug-in Electric Vehicle Charging Points	#		Number of charging points, capacity, and total energy delivered

Illustrative

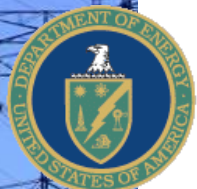
Metric values shaded in green are those that DOE believes pertain to this project.



IMPACT METRICS AMI and Customer Systems

IMPACT METRICS: AMI and Customer Systems			
Metric	Value		Remarks
	Project	System	
Metrics Related Primarily to Economic Benefits			
Hourly Customer Electricity Usage	kWh \$/kWh	Not Applicable	Hourly electricity consumption information (kWh) and applicable retail tariff rate. The nature of this data will be negotiated with DOE.
Monthly Customer Electricity Usage	kWh \$/kWh	Not Applicable	Monthly electricity consumption information (kWh) and applicable retail tariff rate. The nature of this data will be negotiated with DOE.
Peak Generation and Mix	MW Mix	MW Mix	Identify different generation by type and amount
Peak Load and Mix	MW Mix	MW Mix	Identify different controllable load by type
Annual Generation Cost	\$		Total cost of generation to serve load
Hourly Generation Cost	\$/MWh		Aggregate or market price of energy in each hour
Annual Electricity Production	MWh		Total electricity produced by central generation
Ancillary Services Cost	\$		Total cost of ancillary services
Meter Operations Cost		Not Applicable	Includes operations, maintenance, reading and data management
Truck Rolls Avoided	#	Not Applicable	Could include trips for meter reading, connection/disconnection, inspection and maintenance
Metrics Related Primarily to Environmental Benefits			
Meter Operations Vehicle Miles	Miles	Not Applicable	Total miles accumulated related to meter operations
CO2 Emissions	tons	tons	Could be modeled or estimated
Pollutant Emissions (SOx, NOx, PM-10)	tons	tons	Could be modeled or estimated
Metrics Related Primarily to AMI System Performance			
Meter Data Completeness	%	Not Applicable	Portion of meters that are online and successfully reporting in
Meters Reporting Daily by 2AM	%	Not Applicable	Portion of daily meter reads received by 2AM the following day

Metric values shaded in green are those that DOE believes pertain to this project.

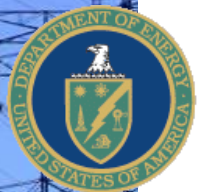


IMPACT METRICS

Electric Distribution Systems

IMPACT METRICS: Electric Distribution Systems			
Metric	Value		Remarks
	Project	System	
Metrics Related Primarily to Economic Benefits			
Distribution feeder or equipment overload incidents	#	Not Applicable	The total time during the reporting period that feeder or equipment loads exceeded design ratings
Distribution feeder load	MW MVAR	Not Applicable	Real and reactive power readings for those feeders involved in the project. Information should be based on hourly loads.
Deferred Distribution Capacity Investments	\$	Not Applicable	The amount of the capital project(s) deferred, and the time of deferral
Equipment failure incidents	#	Not Applicable	Number of equipment failure within the project scope, and the primary reason for failure
Distribution Equipment Maintenance Cost	\$	Not Applicable	Activity based cost for distribution equipment maintenance during the reporting period
Distribution Operations Cost	\$	Not Applicable	Activity based cost for distribution operations during the reporting period
Distribution Feeder Switching Operations	\$	Not Applicable	Activity based cost for feeder switching operations during the reporting period
Distribution Capacitor Switching Operations	#	Not Applicable	Activity based cost for capacitor switching operation during the reporting period
Distribution Restoration Cost	\$	Not Applicable	Total cost for distribution restoration during the reporting period
Distribution losses (%)	%	Not Applicable	Losses for the portion of the distribution system involved in the project. Modeled or calculated.
Distribution power factor	pf	Not Applicable	Power factor for the portion of the distribution system involved in the project. Modeled or calculated.
Truck Rolls Avoided	#	Not Applicable	Estimate of the number of times a crew would have been dispatched to perform a distribution operations or maintenance function

Metric values shaded in green are those that DOE believes pertain to this project.



IMPACT METRICS

Electric Distribution Systems (Continued)

IMPACT METRICS: Electric Distribution Systems (continued)			
Metric	Value		Remarks
	Project	System	
Metrics Related Primarily to Reliability Benefits			
SAIFI	Index	Not Applicable	As defined in IEEE Std 1366-2003, and do not include major event days. Only events involving infrastructure that is part of the project should be included.
SAIDI/CAIDI	Index	Not Applicable	
MAIFI	Index	Not Applicable	
Outage response time	Minutes	Not Applicable	Outage occurrence and action initiated
Major Event Information	Event Statistics	Not Applicable	Information should including, but not limited to project infrastructure involved (transmission lines, substations and feeders), cause of the event, number of customers affected, total time for restoration, and restoration costs.
Number of high impedance faults cleared	Not Applicable	Not Applicable	Faults cleared that could be designated as high impedance or slow clearing
Metrics Related Primarily to Environmental			
Distribution Operations Vehicle Miles	Miles	Not Applicable	Total mileage for distribution operations and maintenance during the reporting period
CO2 Emissions	tons	tons	Could be modeled or estimated
Pollutant Emissions (SOx, NOx, PM-10)	tons	tons	Could be modeled or estimated

Metric values shaded in green are those that DOE believes pertain to this project.



IMPACT METRICS Electric Transmission Systems

IMPACT METRICS: Electric Transmission Systems			
Metric	Value		Remarks
	Project	System	
Metrics Related Primarily to Economic Benefits			
Peak Generation and Mix	Not Applicable	MW Mix	Specify intermittent generation by type and amount
Peak Load and Mix	Not Applicable	MW Mix	Specify controllable load by type
Annual Generation Cost	Not Applicable	\$	Total cost of generation to serve load
Hourly Generation Cost	Not Applicable	\$/MWh	Aggregate or market price of energy in each hour
Annual Generation Dispatch	Not Applicable	MWh	Total electricity produced by central generation
Ancillary Services Cost	Not Applicable	\$	Cost of ancillary services
Congestion (MW)	MW	Not Applicable	Transmission congestion during the reporting period
Congestion Cost	\$	Not Applicable	Transmission congestion cost during the reporting period
Transmission line or equipment overload incidents	#	Not Applicable	The total time during the reporting period that line loads exceeded design ratings
Transmission line load		Not Applicable	Real and reactive power readings for those lines involved in the project. Information should be based on hourly loads.
Deferred Transmission Capacity Investments		Not Applicable	The value of the capital project(s) deferred, and the time of the deferral.
Equipment failure incidents	#	Not Applicable	Incidents of equipment failure within the project scope, including reason for failure
Transmission Equipment Maintenance Cost	\$	Not Applicable	Activity based cost for transmission equipment maintenance during the reporting period
Transmission Operations Cost	\$	Not Applicable	Activity based cost for transmission operations during the reporting period
Transmission Restoration Cost	\$	Not Applicable	Total cost for transmission restoration during the reporting period
Transmission losses	%	Not Applicable	Losses for the portion of the transmission system involved in the project. Could be modeled or calculated.
Transmission power factor	pf	Not Applicable	Power factor for the portion of the transmission system involved in the project. Could be modeled or calculated.

Metric values shaded in green are those that DOE believes pertain to this project.

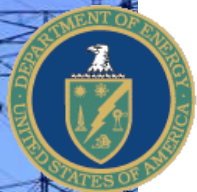


IMPACT METRICS

Electric Transmission Systems (Continued)

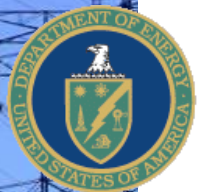
IMPACT METRICS: Electric Transmission Systems (continued)			
Metric	Value		Remarks
	Project	System	
Metrics Related Primarily to Transmission Reliability			
BPS Transmission Related Events Resulting in Loss of Load (NERC ALR 1-4)	#	Not Applicable	
Energy Emergency Alert 3 (NERC ALR 6-2)	#	Not Applicable	
Metrics Related Primarily to Environmental Benefits			
Transmission Operations Vehicle Miles	Miles	Not Applicable	Total mileage for transmission operations and maintenance during reporting period
CO2 Emissions	tons	tons	Modeled or estimated
Pollutant Emissions (SOx, NOx, PM-10)	tons	tons	Modeled or estimated
Metrics Related Primarily to Energy Security Benefits			
Event Capture and Tracking			Major Events or Blackouts
Number, Type ,and Size	Events	Not Applicable	Causes could include line trips, generator trips, or other large disturbances
Duration	Hours	Not Applicable	
PMU dynamic data	PMU Data	Not Applicable	From related PMUs
Detection	Application	Not Applicable	Application that detected the event
Events Prevented	#	Not Applicable	Include reason for prevention
Metrics Related Primarily to PMU/PDC System Performance			
PMU Data Completeness	%	Not Applicable	Portion of PMUs that are operational and successfully providing data
Network Completeness	%	Not Applicable	Portion of PMUs networked into regional PDCs
PMU/PDC Performance	Reliability Quality	Not Applicable	
Communications Performance	Availability	Not Applicable	
Application Performance	Description	Not Applicable	Usefulness of applications, including reliability improvements, markets and congestion management, operational efficiency

Metric values shaded in green are those that DOE believes pertain to this project.



Metrics and Benefits Reporting Plan Contents Summary

- Descriptions of pertinent build and impact metrics that will reported to DOE, at both the project- and system-level
- Provide sufficient information so build metrics can be correlated with numbers and types of customers (residential, commercial, industrial), the extent of the service territory covered and how funding is allocated against the equipment
- Build metrics will include the numbers and types of jobs created
- Impact metrics will include a description of the calculations that will be used
- Describe how the impact metrics will lead to benefits and provide recommendations on how benefits will be quantified
- Describe how baseline values for each build and impact metric will be determined, including the basis and methods that will be applied to calculate the values



Metrics and Benefits Reporting Plan Schedule and Collaboration

- Show how the reporting of build and impact metrics will coincide with the deployment of key smart grid technology
- Indicate key decision milestones
- Present approaches and recommendations for collaboration between DOE and the recipient, including the types of valuable insight and information that will be derived for your project



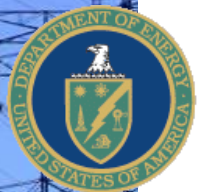


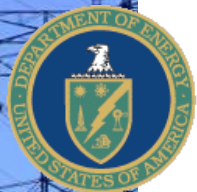
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1	Introduction
2	Objectives
3	Process and Schedule
4	Metrics & Benefits Reporting Plan Development
5	Metrics & Benefits Discussion Document
6	Smart Grid Data Hub
7	Highlights and Take-Aways
8	Q&A

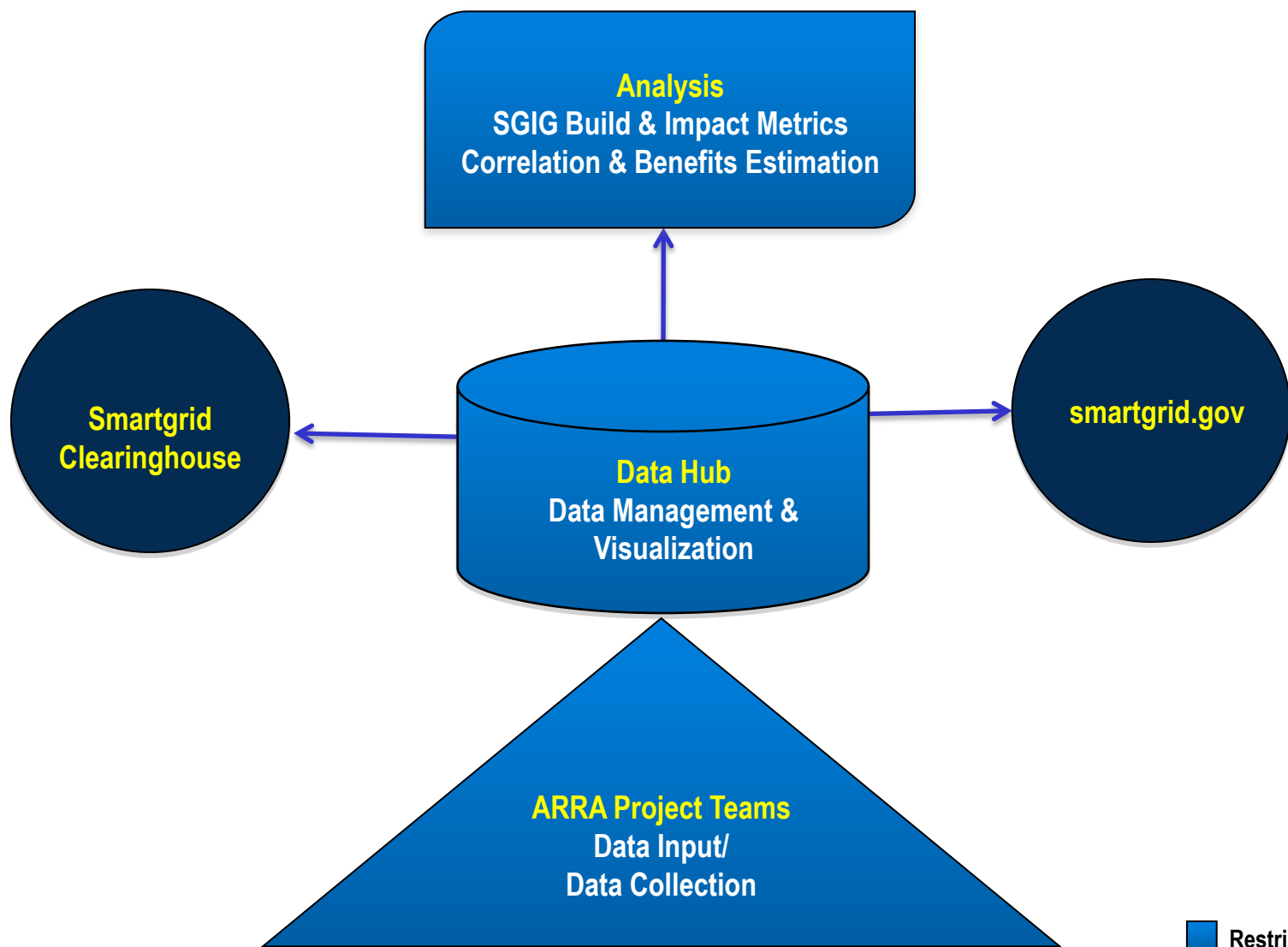


Data Hub – Data Collection and Management

- Collect, manage, store, and provide access to Build and Impact Metrics
- Open and commercially valuable information will be stored in the data hub
- Commercially valuable data will be treated as Business Sensitive data and will have access management through a username and password and secure transactions
- As Metrics and Benefits Reporting Plans are finalized for each project, the Data Hub will be ready to accept data
- “Go live” planned for mid-May



Smart Grid Data Management & Analysis





Smartgrid.gov ARRA Project Teams Subsite

One touch entry into the Project Reporting Applications

Under Development

[About Smart Grid](#) [Task Force](#) [Stakeholders](#) [Books](#) [News/Events](#) [Contacts](#)

[Home](#) > [Information for Smart Grid Project Teams](#)

Information for Smart Grid Project Teams

Through this Web site, Smart Grid Program project teams can learn more about reporting requirements, locate project development resources, and access tools to manage project data. The United States Department of Energy (DOE) is investing approximately \$4 billion to encourage smart grid deployment and demonstration through the Smart Grid Investment Grant and Smart Grid Demonstration programs. To ensure fiscal responsibility and maximize results, DOE is working closely with project teams throughout their performance periods and gathering periodic data to monitor progress and results.

Project Reporting

Data Hub
Project Build & Impact Metrics

FederalReporting.gov
Jobs & Financial Data

VIPERS
Invoicing System

Technical Project Management System

Projects

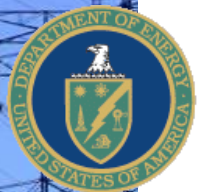
Smart Grid Project Maps

Investment Grant Program

- ▶ Advanced Metering Infrastructure
- ▶ Customer Systems
- ▶ Electric Distributions Systems
- ▶ Electric Transmission Systems

Project Resources

- ▶ [Guidebook for Recovery Act Smart Grid Program Metrics and Benefits \(PDF 1.2 MiB\)](#)
- ▶ [Sample Data Submittal Forms \(PDF 230 KiB\)](#)
- ▶ [Smart Grid System Report \(PDF 4.8 MiB\)](#)
 - ▶ [Annex A-B \(PDF 4 MiB\)](#)

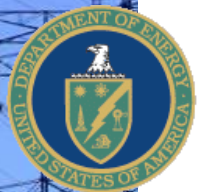


Data Security

- Build Metrics will be treated as open and publicly available
- Impact Metrics will be treated as commercially valuable data and will be protected according to business sensitive processes.

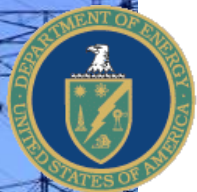
FAQ Language:

- The Department of Energy (DOE) intends to gather and make available to the public information developed under these grants, as defined within the Guidebook for Reporting ARRA Smart Grid Program Metrics and Benefits, dated December 7, 2009. This information includes build metrics, impact metrics, and raw data sets, and it will be posted on the Smartgrid.gov website.
- Build metrics, e.g., those associated with the deployment and costs of smart grid technologies, will be made available in aggregated and unaggregated form. The names of grant recipients will be associated with the build metrics.
- Impact metrics relate to the performance of grid operations, e.g., improvements in operations and maintenance costs due to the deployment of smart grid technology. They may also relate to deferment of asset purchases due to efficiency improvements. DOE recognizes that impact metric information may be considered confidential by the grant recipient. Where this is true, DOE is requesting that grant recipients mark such data as being "commercially valuable" before submitting it to DOE. DOE will make impact metric information available only in aggregated form; DOE does not plan to provide company-specific impact metric information and intends to keep company-specific information relating to impact metrics confidential.

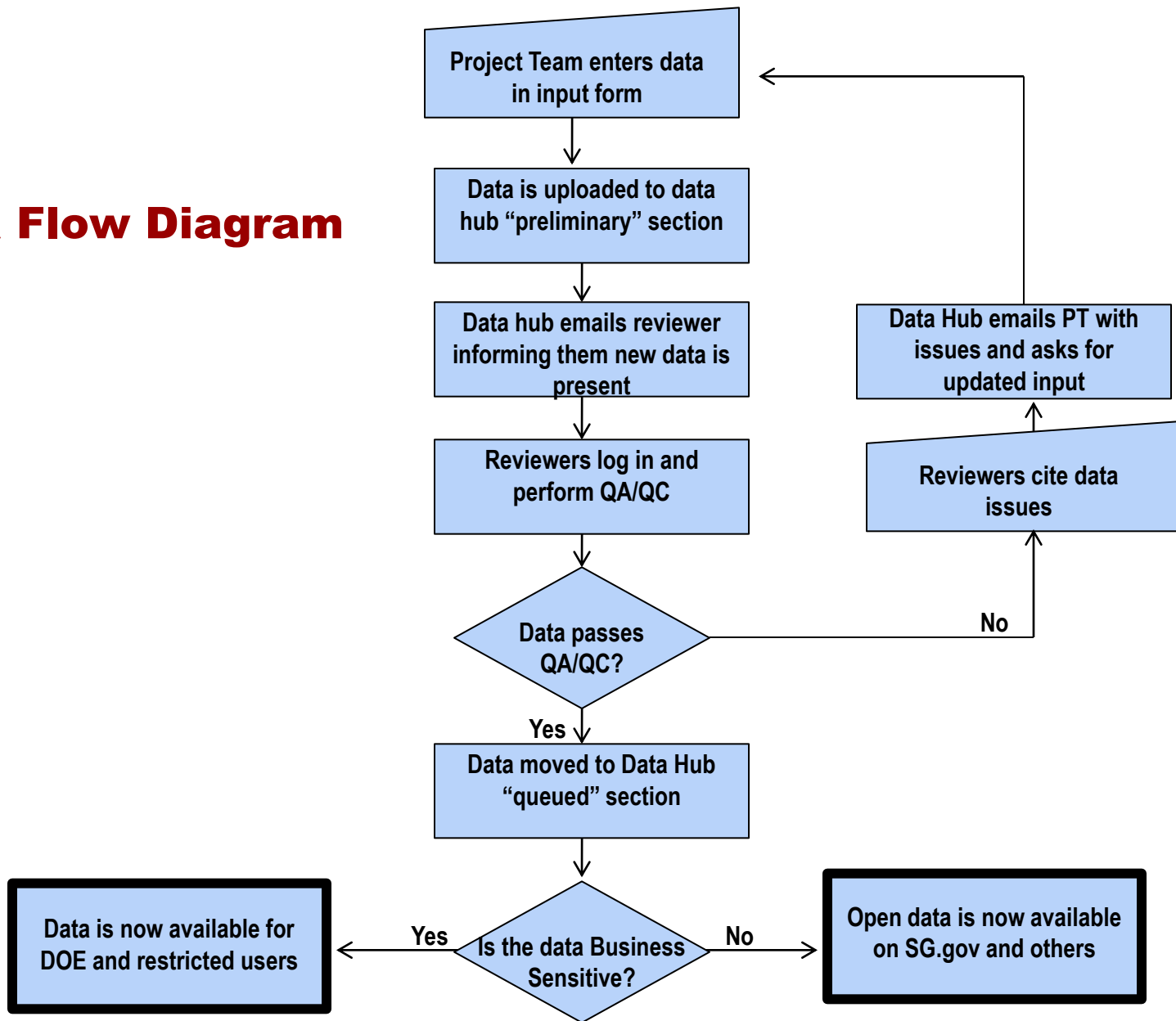


Data Input Process

- Web interface using editable PDF forms
- Metric IDs are provided for the end user for something to reference when asking questions.
- Data Quality Controls:
 - PDF forms ensure data consistency
 - You cannot type letters into a numeric field
 - If you try to enter a negative number in fields where it would not make sense, you'll get an error
 - If you hover over an input field, you'll be shown a tooltip with more information describing what should be entered
 - If you hit "Submit" without populating all required fields, you'll be told you must go back and complete those fields



Data Flow Diagram





Sample Project Input Form

Free-form text fields
will be provided so
projects can describe
unique situations
related to data inputs

	ID	Title
Project	p-0001	AMI Project #1
Filing	f-0001	Baseline Build Metrics
Period	January 01, 2010 - December 31, 2010	
Filing Date	January 15, 2011	

Metric	Description	Project Value	System Value
b1-ami-0001	Number of Planned Residential Endpoints		
b1-ami-0002	Number of Planned Commercial Endpoints		
b1-ami-0003	Number of Planned Industrial Endpoints		

Metric	Description	Value
b1-ami-0004	Residential Meters: Read Interval	
b1-ami-0005	Commercial Meters: Read Interval	
b1-ami-0006	Industrial Meters: Read Interval	
b1-ami-0007	Residential Meters: Remote Connection?	<input type="checkbox"/>
b1-ami-0008	Commercial Meters: Remote Connection?	<input type="checkbox"/>
b1-ami-0009	Industrial Meters: Remote Connection?	<input type="checkbox"/>
b1-ami-0010	Residential Meters: Outage Reporting?	<input type="checkbox"/>
b1-ami-0011	Commercial Meters: Outage Reporting?	<input type="checkbox"/>
b1-ami-0012	Industrial Meters: Outage Reporting?	<input type="checkbox"/>
b1-ami-0013	Residential Meters: Power Quality Monitoring?	<input type="checkbox"/>
b1-ami-0014	Commercial Meters: Power Quality Monitoring?	<input type="checkbox"/>
b1-ami-0015	Industrial Meters: Power Quality Monitoring?	<input type="checkbox"/>
b1-ami-0016	Residential Meters: Tamper Detection?	<input type="checkbox"/>
b1-ami-0017	Commercial Meters: Tamper Detection?	<input type="checkbox"/>
b1-ami-0018	Industrial Meters: Tamper Detection?	<input type="checkbox"/>

Metric	b1-ami-0019
Description	General Description of Communications System
Value	



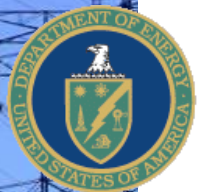
Sample Project Input Form

	ID	Title
Project	P-0001	AMI Project #1
Filing	F-0002	Quarterly Build Metrics
Period		January 01, 2011 - March 31, 2011
Filing Date		April 11, 2011



Metric	Description	Project Value	System Value
bm-ami-0001	Number of Installed Residential Endpoints		
bm-ami-0002	Number of Installed Commercial Endpoints		
bm-ami-0003	Number of Installed Industrial Endpoints		

Submit



Your Data will be very Useful!

- Data will be used for DOE Analysis and Reports
 - SGIG Metrics and Benefits Analysis and Reports
- Data will showcased on Smartgrid.gov
 - Build Metrics will be shown at the project level and will also be aggregated
 - Impact Metrics will not be tied to projects specifically on the website – only aggregated and correlated views will be shown to the public
 - Smartgrid.gov will also share data with the Smart Grid Clearing House

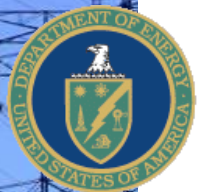
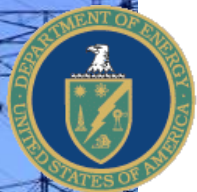


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Key Data-Reporting Concepts

- Collect, manage, store, and provide access to Build and Impact Metrics that reflect the functionality of the Smart Grid systems to be deployed
- “Baseline” refers to what would have occurred had there been no SGIG grant – analogous to “Business-as-Usual”
 - Could be no change from current conditions, or
 - Could be investments and improvements that were previously planned, if there had been no SGIG
 - Baseline values for each time period are required (e.g., July-Dec 2010, Jan-Jun 2011, July-Dec 2011, etc.)
 - Baseline may be updated
- To aggregate to the program level, need to be consistent in data definitions and include the broader, system-level impacts





Key Points on smartgrid.gov

- Projects to report data in standardized formats to Smart Grid Data Hub in smartgrid.gov
- Smartgrid.gov will have links to all other sites where data needs to be reported
- Data will be managed in a secure IT environment

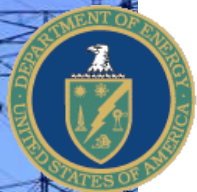


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