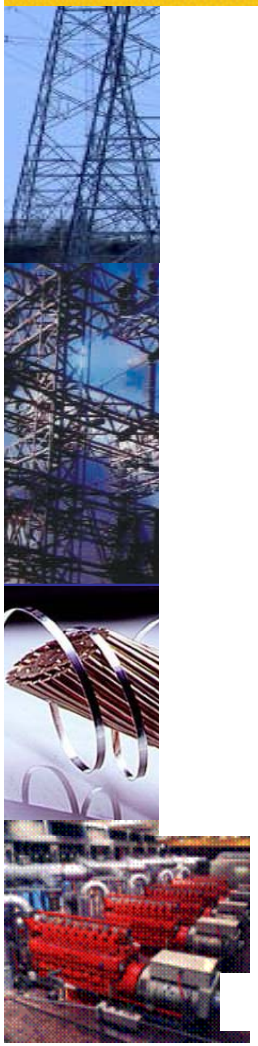
U.S. Department of Energy

Office of Electricity Delivery and Energy Reliability



Smart Grid Demonstration Program
Energy Storage Metrics and Benefits Reporting Objectives & Overview

Data Analysis Team

April 30, 2010

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Data Analysis Team Presenters

NETL Office of Systems, Analyses and Planning (OSAP)

- Steve Bossart
- Jacquelyn Bean

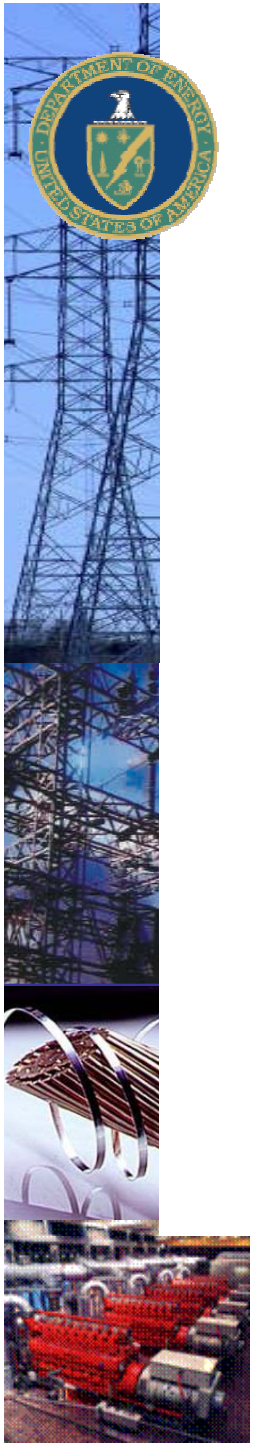
Sandia National Laboratory

- Dan Borneo

Navigant Consulting

- David Walls

*The Data Analysis Team includes NETL Federal staff, staff from Sandia National Laboratory, and staff from NETL support contractors – Booz Allen Hamilton and Navigant Consulting.



Procedures for Today's Call

- Please mute phone lines.
- Feedback will be processed in the following manner:
  - Direct project-specific questions to your Technical Project Officer (TPO).
  - Send all other questions to Jacquelyn Bean (jacquelyn.bean@netl.doe.gov) no later than Friday, May 7.
  - FAQ will be emailed to all invitees to today's meeting and will be posted on SmartGrid.gov.

The methodology we will describe forms the basis for consistently evaluating costs and benefits of all DOE OE Smart Grid projects.

- **DOE OE RDSI Model (2008-2009) –** The U.S. Department of Energy (DOE) Office of Electricity Delivery and Energy Reliability (OE) tasked Navigant Consulting Inc. (NCI) to develop a model to estimate the benefits of the Renewable and Distributed Systems Integration (RDSI) Program.

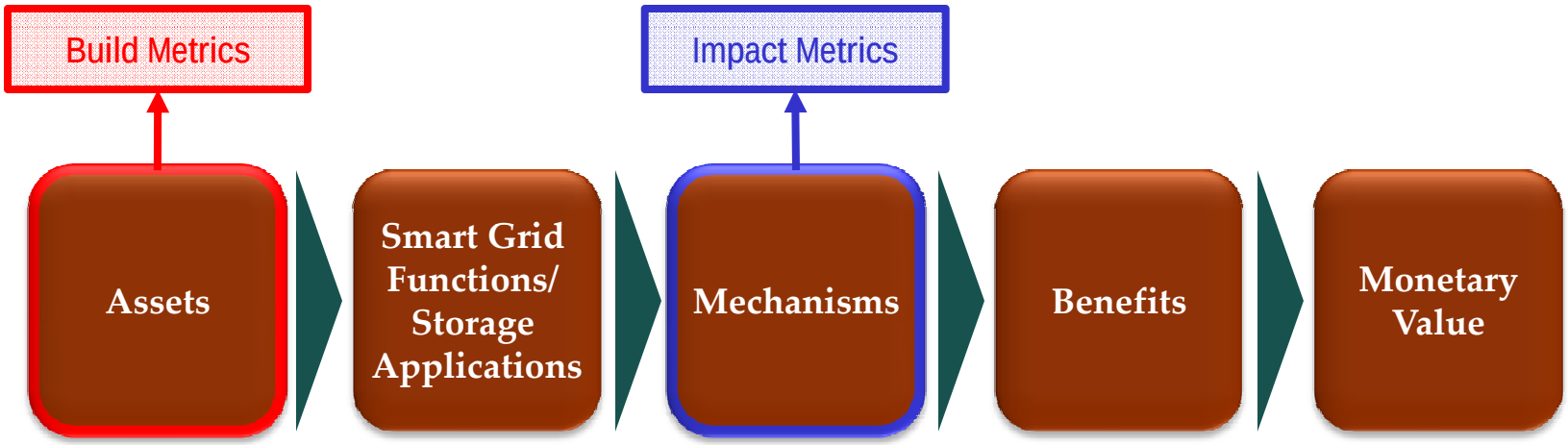
- **CBA Team (2009) –** DOE OE established a Cost Benefit Analysis (CBA) team composed of industry experts to develop a common methodology to evaluate the benefits and costs of Smart Grid projects. This team was led by Oak Ridge National Laboratory (ORNL) and National Energy Technology Laboratory (NETL) and co-sponsored by the Electric Power Research Institute (EPRI).

- **Computational Tool (2009-present) –** As a follow-on the CBA Team activities, DOE OE/ORNL tasked NCI to implement the methodology by developing a computational tool.

The CBA methodology was designed to be flexible enough to accommodate variations across programs.

- Smart Grid Demonstration Program (SGDP)
  - Energy Storage Demonstrations
  - Smart Grid Regional Demonstrations
- Renewable and Distributed Systems Integration (RDSI) Demonstrations
- Smart Grid Investment Grant Program (SGIG)
  - Equipment Manufacturing
  - Customer Systems
  - Advanced Metering Infrastructure
  - Electric Distribution Systems
  - Electric Transmission Systems
  - Integrated and/or Crosscutting Systems

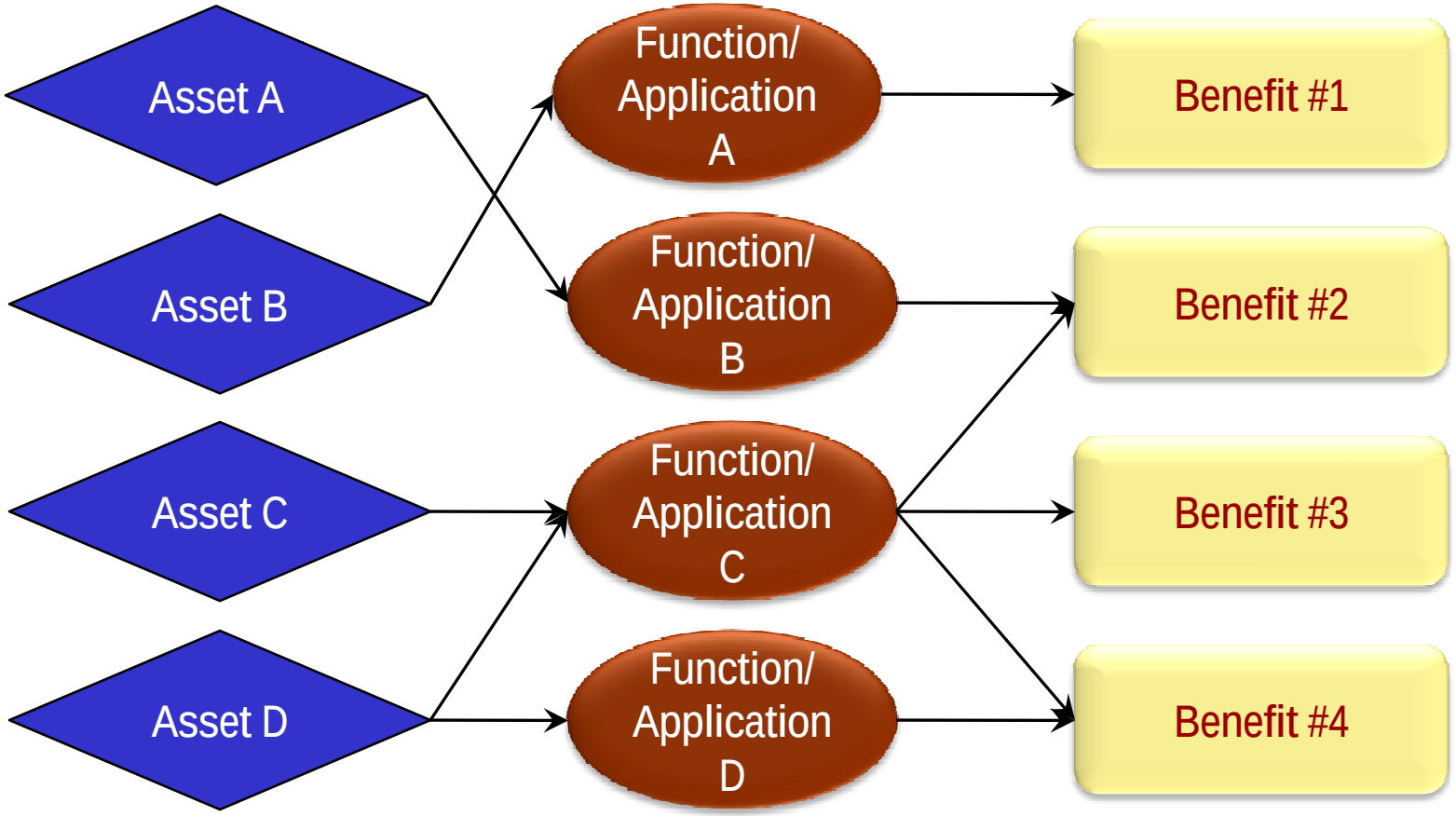
The CBA methodology seeks to quantify the value provided by Smart Grid/Energy Storage technologies.



Example

Energy Storage (Flow Batteries)	Electric Energy Time Shift	Annual and Hourly Generation Costs reduced	Reduced electricity costs	⟶ $X per year

Energy Storage assets can be used for applications that lead to multiple benefits.



Purpose of Collecting Data for the Smart Grid Programs

Investment Tracking	Account for **Build Metrics** that represent the monetary investments, electricity infrastructure assets, policies and programs, marketplace innovation, and jobs data that are part of Smart Grid projects.
Impact Determination	Quantify the **Impact Metrics** of Smart Grid technologies against baseline conditions to modernize the electrical grid and enable active customer participation.
Aggregation/ Analysis of Program Results	Analyze metrics, calculate benefits, and communicate system-wide results and progress through SmartGrid.gov or other appropriate channels.
Business Case Analysis	Improve understanding of business cases for Smart Grid/ Energy Storage technologies to aid future investment decision-making by industry.

Key Metrics and Benefits To pics To Cover Today

- **Process & Schedule –** Describe the process and timeframe for developing, reviewing, and a pproving Metrics and Benefits Reporting Plans.
- **Metrics and Benefits Reporting Plan –** Discuss the metrics data, baseline data, and analysis needed to develop a robust plan.
- **Metric and Benefits Data Discussion Document –** Review approaches to determine Build Metrics, Impact Metrics, and overall project benefits.
- **Action Items for Principal Investigators –** Illustrate how Recipients are to complete forms indicating the applicability of Build and Impact Metrics to their respective projects. Metrics identified may be immediately applied to baseline planning.

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Metrics and Benefits Reporting Plan Development and Data Input Process

Metrics and Benefits Discussion Document	Metrics and Benefits Reporting Plan	Project Input Forms for Metrics and Benefits
▪ Basis for initial discussion of Metrics and Benefits Reporting Plan ▪ Developed by DOE Data Analysis Team based on reviews of project narratives and Project Management Plans (PMPs) along with Principal Investigator (PI) input on applicable metrics	▪ Based on proposed project Metrics and Benefits ▪ Includes technology performance objectives ▪ Developed by each Recipient with support provided by the Data Analysis Team and TPO ▪ Draft Metrics and Benefits Reporting Plan to be submitted to DOE within 90 days of project award definitization	▪ Forms for Metrics and Benefits data collection and analysis to be submitted with interim and final reports ▪ Designed to provide consistent yet flexible reporting processes for data management and additional analysis, including upload to Smartgrid.gov

A draft Metrics and Benefits Reporting Plan is due 3 months (90 days) following Award Definitization.

Metrics and Benefits Reporting Plan Schedule				
Reporting Plan Activities	**1 month**	**2 months**	**3 months**	**4 months**
Award Definitized	◇			
Hold Kick-Off Meeting	▬			
Discussions with Data Analysis Team	▬	▬	▬	
Draft and Submittal	▬	▬	▬ ◇	
Review / Edit				▬
DOE Approval of Reporting Plan				▬ ◇

The Data Analysis Team, in coordination with TPOs, expects to interact with the PIs using the process outlined below.

Recipient Input on Metrics and Energy Storage Applications

- Following the Metrics and Benefits webinar, PIs are asked to enter "Yes", "No", or "Maybe" for each Build and Impact Metric and Energy Storage Application using forms provided by the Data Analysis Team.
- Send responses to Warren Wang of Navigant Consulting by May 14, and cc Jacquelyn Bean of NETL and project TPO.
- Contact TPO if guidance from the Data Analysis Team is needed to complete the forms.

Baseline Data Development

- NETL requests and recommends Recipients begin planning baseline development activities and collecting baseline dataset during the period between the Metrics and Benefits webinar and the kick-off meeting following award definitization.
- PIs are strongly advised to coordinate with the Data Analysis Team through their respective TPOs to ensure baseline activities are consistent with the DOE Metrics and Benefits methodology.

Data Discussion Meetings (at TPO's discretion)

- These meetings involving project PIs and the Data Analysis Team are held only if the TPO indicates a project has begun significant work prior to award definitization.
- Review and discuss applicable metrics based on Recipients' input on Build and Impact Metrics, storage applications, and description of the Recipients' baseline development approach. During the meeting, the Data Analysis Team will also review and confirm the projects' objectives, functions, and benefits.

SGDP Energy Storage Kick-Off Meetings

- Face-to-face meetings that cover plan, purpose, agreement clauses.
- TPO schedules post-definitization kick-off meeting with PI, Data Analysis Team, and notifies the NETL Technical Project Manager.
- PIs prepare presentation that includes progress in defining and collecting baseline data.
- Data Analysis Team will review and confirm project's objectives, functions, and benefits if Data Discussion Meeting is not previously held.
- Data Analysis Team will provide feedback during and/or shortly after meeting.

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Metrics and Benefits Reporting Plan Development

- Each Recipient will develop a Metrics and Benefits Reporting Plan that describes the methods and resources used to gather build metrics, collect field data, and calculate impact metrics and overall project benefits.
- The Data Analysis Team will provide Data Discussion Documents to the SGDP PIs prior to the individual Data Discussion Meetings.
- The Discussion Document will identify the DOE's data reporting expectations based on initial review of submitted project narratives and PMPs.
  - Project Objectives
  - Features and Equipment
  - Smart Grid Functionality
  - Energy Storage Applications
  - Build Metrics (including monetary investments and jobs data)
  - Impact Metrics (included in Technical Performance Reports)
  - Project Benefits
  - Technology Performance Objectives (especially for projects pursing Subarea 2.5 – Demonstration of Promising Technologies)
- Recipients should meet the intent of the Data Discussion Document and resolve any open issues with DOE regarding the Reporting Plan.

Recipients need to determine and report “Project” and “System” level metrics.

Project Level Data	▪ “Project" data are defined as the Build and Impact Metrics that pertain to the specific scope of the project funded by DOE and Recipient cost share. ▪ Some Impact Metrics 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, PIs are asked to track these system level metrics and calculate their project level values.
System Level Data	▪ The Data Analysis Team seeks to obtain information regarding the Build and Impact Metrics as they pertain the "system". These are metrics applicable to the larger environment with which the project interacts. ▪ Assets critical to the project, but not funded directly by DOE or Recipient cost share, should be accounted for under System level Build Metrics. ▪ System level metrics are also used to establish the baseline and used for tracking Smart Grid progress made across the U.S.

Build Metrics Overview

- Build Metrics refer to the monetary investments, electricity infrastructure assets, policies and programs, marketplace innovation and jobs data that are part of Smart Grid projects.

- These metrics extend beyond specific units of equipment and include:
  - DA devices
  - DA systems and features
  - Distribution Management System integration
  - Energy Storage system and associated controls
  - Facilities to support the above

- The attributes or capabilities of specific asset-related Build Metrics will be required to determine the applicable Smart Grid functionality.
  - For instance, the capabilities and features of the storage equipment that will be installed by the Recipient (e.g., MW rating, MWh storage, technology description, power electronics, integration with grid, and other features).

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, Energy Storage used to defer distribution capacity investment will avoid specific investments in substations or feeder upgrades. The avoided cost is an Impact Metric (total investment and annual value). Additional Impact Metrics for storage include details of storage capacity used (annual and hourly) and efficiency of the storage device.

- Impact Metrics are diverse and wide-ranging due to the amount and types of functionality that are enabled by Energy Storage technologies. Examples include:
  - Reliability
  - Deferred T&D Capacity Investment
  - Energy Supplied from Renewables and Distributed Resources
  - CO_2 Emissions

Baseline Metrics Overview

- The Baseline should reflect the parameter values of the Recipient's Smart Grid and Energy Storage initiatives without the SGDP project.
  - Analogous to "business as usual" in a business case analysis.

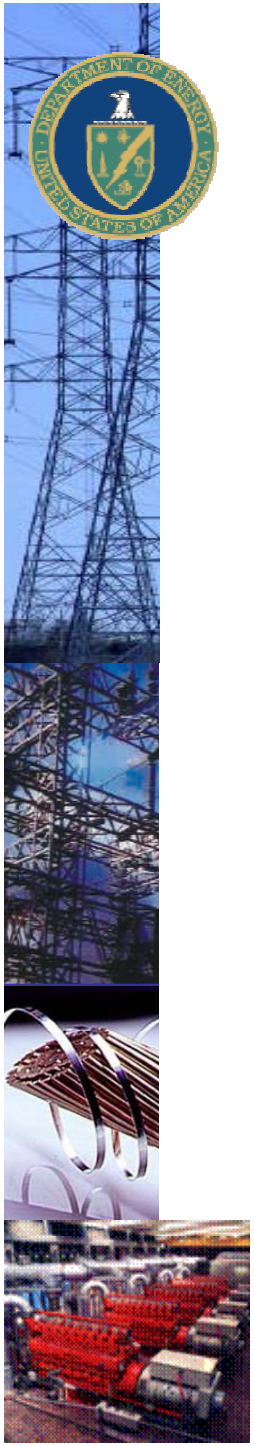
- Baseline data for both Build and Impact Metrics will be used to assess the incremental and cumulative differences.

- Baseline values for Build Metrics should reflect the Recipient's asset deployment plans and schedules without DOE funding.

- Baseline values for Impact Metrics are not static and should reflect expected performance without DOE funding.
  - For example:
    a) Peak demand reduction resulting from baseline without use of storage
    b) SAIDI reduction resulting from use of Energy Storage.

Baseline Metrics Overview (Continued)

- If baseline data are 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
    - Data from comparable system assets or similar circuits
    - Industry information from sources including EEI, NERC, FERC, and EIA
    - Utility peer groups
    - Markets and system operators
  - Statistical Tools
    - Multi-year averaging
    - Data normalization
- After interacting more extensively with the Recipients and identifying “best practices”, we will share alternative approaches to handling certain problem
- In some instances, the monitoring of control groups (or other unaffected feeders) may be necessary.



Baseline data reporting requirements will be finalized during the review and finalization of the Metrics and Benefits Reporting Plan.

Build and Impact Metrics*

	WITH PROJECT		WITHOUT PROJECT (i.e., BASELINE)	
	PROJECT FOOTPRINT (e.g., Specific Feeders)	OVERALL SYSTEM	PROJECT FOOTPRINT (e.g., Specific Feeders)	OVERALL SYSTEM
Period or Test 1	•Build Metrics (Q1) •Impact Metrics	•Build Metrics (Q1) •Impact Metrics	•Build Metrics (Q1) •Impact Metrics	•Build Metrics (Q1) •Impact Metrics
Period or Test 2	•Build Metrics (Q2) •Impact Metrics	•Build Metrics (Q2) •Impact Metrics	•Build Metrics (Q2) •Impact Metric	•Build Metrics (Q2) •Impact Metric
Period or Test 3	•Build Metrics (Q3) •Impact Metrics	•Build Metrics (Q3) •Impact Metrics	•Build Metrics (Q3) •Impact Metric	•Build Metrics (Q3) •Impact Metric
…ETC.	•Build Metrics •Impact Metrics	•Build Metrics •Impact Metric	•Build Metrics •Impact Metric	•Build Metrics •Impact Metric

* *Applicable Build Metrics are reported quarterly. Impact metrics reporting intervals may vary depending on the nature of the project, but reporting schedules must be described in the Metrics and Benefits Reporting Plan.*

The SGDP Statement of Project Objectives (SOPO) provides additional guidance on metrics reporting.

Build Metrics Reporting
"The Recipient shall report Build Metrics data on a quarterly basis. Submissions are due within 30 days of the end of calendar quarter. Build metrics refer to the monetary investments, electricity infrastructure assets, policies and programs, marketplace innovation and jobs data that are part of Smart Grid projects."

Impact Metrics and Benefits Reporting Through Technology Performance Reports
"The Recipient shall submit interim and final Technology Performance Reports (TPR) to DOE for review and approval. The frequency of the interim reports will be as specified in the DOE-approved Metrics and Benefits Reporting Plan. The TPRs shall include the status of Impact Metrics and cost-benefit data and analyses with respect to the pre-demonstration (baseline) system configuration and the demonstrated system configuration, as applicable. Impact metrics refer to Smart Grid capabilities enabled by projects and the measurable impacts of Smart Grid projects that deliver technical and economic value." *From SOPO Appendix 1 – Instructions for Preparation of Deliverables* *"If the project contains more than one distinct technology or groups of technologies, the Recipient should prepare a TPR for each."*

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The "Guidebook" describes data reporting requirements for Build and Impact Metrics that the Data Analysis Team will use to calculate benefits.

Build Metrics
➢ Electricity Infrastructure Assets
➢ Monetary Investments
➢ Jobs Created and Retained
➢ Policies and Programs
➢ 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

Guidebook for ARRA Smart Grid Program Metrics and Benefits (December 2009)
http://www.smartgrid.gov/files/teams/metrics_guidebook.pdf

A Metrics and Benefits Data Discussion Document will be developed after PIs identify applicable metrics.

The Metrics and Benefits Data Discussion Document:

- Serves as the basis for the development of the Metrics and Benefits Reporting Plan
- Is developed based on review of the project narrative and PMP
- Identifies the Build Metrics, Impact Metrics and Benefits the Data Analysis Team determine the PIs should be able to report
- Provides a completed list of possible Build and Impact Metrics, although applicable Build and Impact Metrics vary by project.

The following pages illustrate the types of information provided in the discussion documents.

Metrics and Benefits Reporting Plan Content Summary

- Describe pertinent Build and Impact Metrics that will reported to DOE, at both the project and system levels.

  Build Metrics

  - Show expected monetary investments to be made during lifetime of project across cost categories.
  - List the numbers and types of jobs created and retained.
  - Provide sufficient information on asset-related Build Metrics so they 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.

  Impact Metrics

  - Include descriptions of the calculations used for each Impact Metric.
  - Describe the benefits associated with applicable Impact Metrics and 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.
- Describe the technology performance objectives that will be reported in the interim and final Technology Performance Reports (TPRs).

Metrics and Benefits Reporting Plan Schedule and Collaboration

- Show how the reporting of Build and Impact Metrics as well as reporting of technology performance in TPRs will coincide with the deployment of Smart Grid and Energy Storage technologies.
- Indicate key decision milestones (e.g., PUC/PSC approval of rates).
- Present approaches and recommendations for collaboration between DOE and the Recipient, including the types of valuable insight and information that will be derived for project.

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 (DERs)
- Demonstrate the benefits of integrated operation 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 .

Illustrative

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

Summary of Metrics to be Reported

- Metrics data collection and analysis are important aspects of project management and reporting.
- The tables on the following pages indicate the metrics that DOE believes may pertain to this project based on its review of the project proposal.
- Applicable Build Metrics will be reported Quarterly.
- The reporting frequency of Impact Metrics will be agreed upon on a project-by-project basis and outlined in the Metrics and Benefits Reporting Plan.

BUILD METRICS

- Monetary Investments
- Jobs Created and Retained
- Electric Distribution Assets
- Distributed Energy Resources
- Pricing Programs

IMPACT METRICS

- Electric Distribution
- Electric Transmission

BUILD METRICS
Monetary Investments

Additional reporting requirements will be provided in the near future for equipment costs so that they may better correspond to the asset Build Metrics which are reported quarterly.

Project Cost Reporting by Category ($1000's)			
Cost Category	***DOE Funding***	***Recipient Cost Share***	**Total**
Personnel	-	-	-
Contractual	-	-	-
Construction	-	-	-
Equipment	-	-	-

BUILD METRICS
Jobs Created and Retained

Jobs Reporting by Category (FTEs)				
Job Category	**Jobs Created Through DOE Funding**	**Jobs Retained Through DOE Funding**	**Jobs Created Through Recipient Cost Share**	**Jobs Retained Through Recipient Cost Share**
Managers	-	-	-	-
Engineers	-	-	-	-
Computer-Related Occupations	-	-	-	-
Environmental and Social Scientists	-	-	-	-
Construction, Electrical, and Other Trades	-	-	-	-
Analysts	-	-	-	-
Business Occupations	-	-	-	-
Recording, Scheduling, Computer Operator Occupations	-	-	-	-

Refer to the December 2009 Guidebook for ARRA Smart Grid Program Metrics and Benefits for further information on the jobs categories listed: http://www.smartgrid.gov/files/teams/metrics_guidebook.pdf

BUILD METRICS
AMI Assets

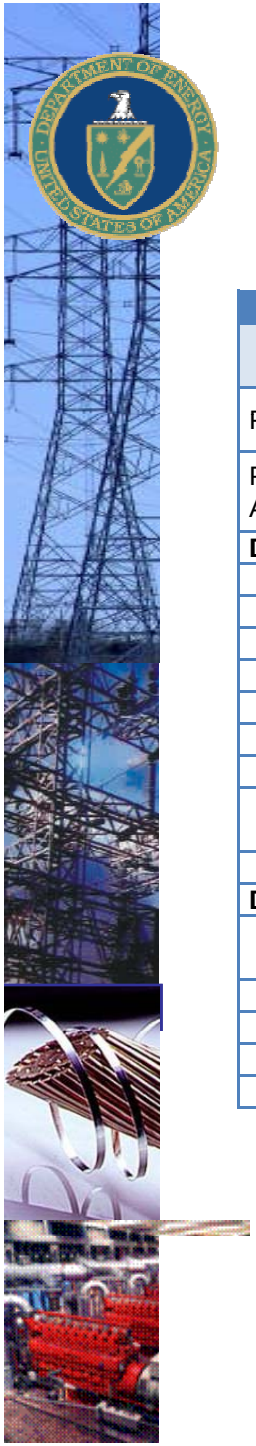
Generally Not Applicable to SGDP Energy Storage Projects

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	

BUILD METRICS
Customer Systems Assets

Generally Not Applicable to SGDP Energy Storage Projects

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 utility or 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



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 or centrally coordinated/operated
Automated Capacitors	#	#	
Automated Regulators	#	#	
Feeder Monitors	#	#	Including 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	

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	Interface with high voltage energy management system
Integration with Distributed Energy Resources	Yes/No	Yes/No	Interface with customer energy management systems and DERs
Fault Current Limiter	#	#	
Other Distribution Devices	#	#	Characteristics of Distribution devices

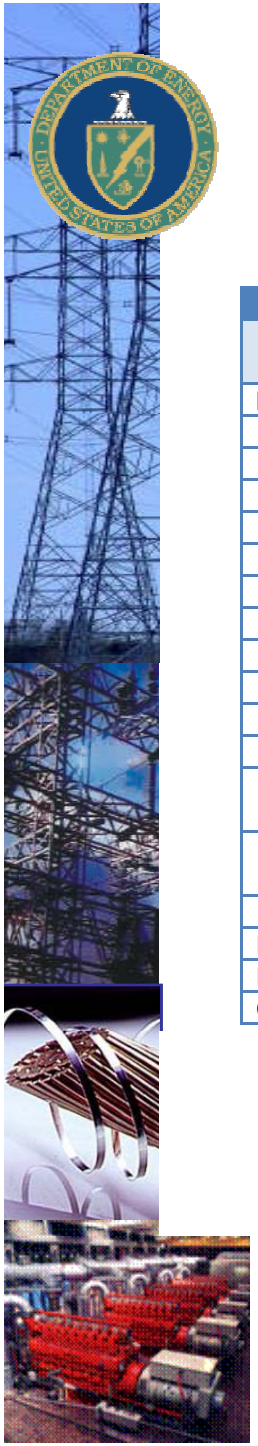
Generally Not Applicable to SGDP Energy Storage Projects

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, PT/VT and 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	Type 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

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, including information and control capability for utility
Plug-in Electric Vehicle Charging Points	#	#	Number of charging points, capacity, and total energy transacted



BUILD METRICS
Pricing Programs

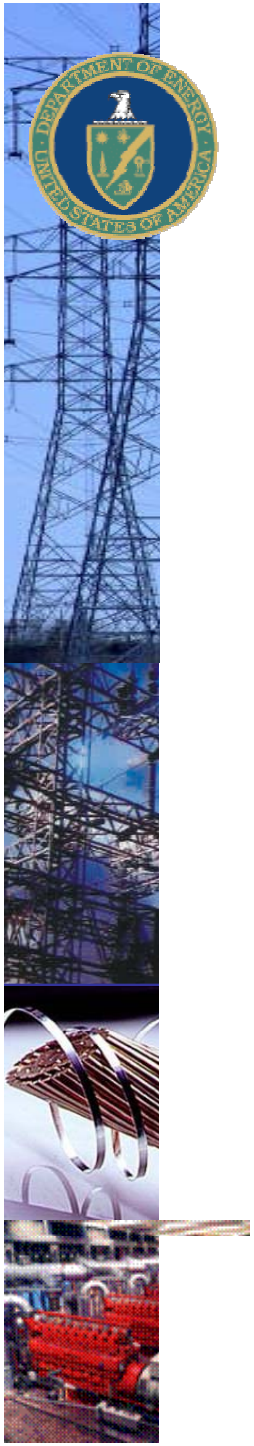
BUILD METRICS: Pricing Programs			
Policy/Program	**Value**		**Remarks**
	Project	**System**	
Retail Rate Design and Rate Level			Include program characteristics, customers with access, and participation rates
Flat	Yes/No	Yes/No	
Flat with Critical Peak Pricing	Yes/No	Yes/No	
Flat with Peak-Time Rebate	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	

DOE Smart Grid Functions Supported by Project

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

Yes = This function was described in the proposal.
No = It does not appear that this function will be demonstrated by the proposed project.
Maybe = It is not clear whether this function will be demonstrated by the proposed project but DOE believes that it is possible.

Please refer to Table C-1 in the December 2009 Guidebook for ARRA Smart Grid Program Metrics and Benefits for definitions of these functions: http://www.oe.energy.gov/DocumentsandMedia/09_SG_Kickoff_Guidebook.pdf



Energy Storage Applications Supported by Project

ENERGY STORAGE APPLICATIONS	
Application	**Applicability to Project**
Electric Energy Time Shift	Yes/ No/ Maybe
Electric Supply Capacity	Yes/ No/ Maybe
Load Following	Yes/ No/ Maybe
Area Regulation	Yes/ No/ Maybe
Electric Supply Reserve Capacity	Yes/ No/ Maybe
Voltage Support	Yes/ No/ Maybe
Transmission Support	Yes/ No/ Maybe
Transmission Congestion Relief	Yes/ No/ Maybe
T&D Upgrade Deferral	Yes/ No/ Maybe
Substation Onsite Power	Yes/ No/ Maybe
Time-of-Use Energy Cost Management	Yes/ No/ Maybe
Demand Charge Management	Yes/ No/ Maybe
Electric Service Reliability	Yes/ No/ Maybe
Electric Service Power Quality	Yes/ No/ Maybe
Renewables Energy Time Shift	Yes/ No/ Maybe
Renewables Capacity Firming	Yes/ No/ Maybe
Wind Generation Grid Integration, Short Duration	Yes/ No/ Maybe
Wind Generation Grid Integration, Long Duration	Yes/ No/ Maybe

Reference Document – *Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide* (SAND2010-0815, February 2010)
http://www.smartgrid.gov/sites/default/files/resources/energy_storage.pdf

DOE Smart Grid and Energy Storage Benefits Supported by Project

Benefit Category	Benefit Sub-category	Benefit	Provided by Project
Economic	Market Revenue	Arbitrage Revenue (consumer) Capacity Revenue (consumer) Ancillary Service Revenue (consumer)	Yes/ No/ Maybe
	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/ No/ Maybe
	T&D Capital Savings	Deferred Transmission Capacity Investments (utility/ratepayer) Deferred Distribution Capacity Investments (utility/ratepayer) Reduced Equipment Failures (utility/ratepayer)	Yes/ No/ Maybe
	T&D O&M Savings	Reduced Distribution Equipment Maintenance Cost (utility/ratepayer) Reduced Distribution Operations Cost (utility/ratepayer) Reduced Meter Reading Cost (utility/ratepayer)	Yes/ No/ Maybe
	Theft Reduction	Reduced Electricity Theft (utility/ratepayer)	Yes/ No/ Maybe
	Energy Efficiency	Reduced Electricity Losses (utility/ratepayer)	Yes/ No/ Maybe
	Electricity Cost Savings	Reduced Electricity Cost (consumer) Reduced Electricity Cost (utility/ratepayer)	Yes/ No/ Maybe
Reliability	Power Interruptions	Reduced Sustained Outages (consumer) Reduced Major Outages (consumer) Reduced Restoration Cost (utility/ratepayer)	Yes/ No/ Maybe
	Power Quality	Reduced Momentary Outages (consumer) Reduced Sags and Swells (consumer)	Yes/ No/ Maybe
Environmental	Air Emissions	Reduced carbon dioxide Emissions (society) Reduced SO_X, NO_X, and PM-10 Emissions (society)	Yes/ No/ Maybe
Security	Energy Security	Reduced Oil Usage (society) Reduced Wide-scale Blackouts (society)	Yes/ No/ Maybe

IMPACT METRICS
AMI and Customer Systems

Generally Not Applicable to SGDP Energy Storage Projects

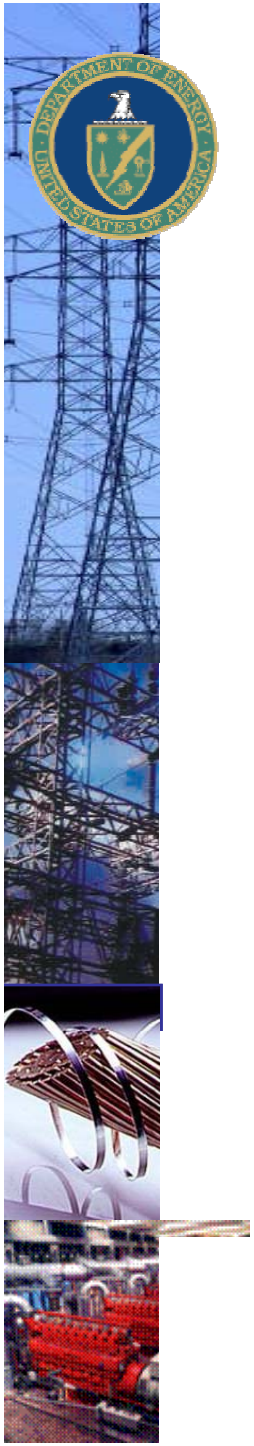
IMPACT METRICS: AMI and Customer Systems			
Metric	**Value**		**Remarks**
	Project	**System**	
Metrics Related Primarily to Economic Benefits			
Hourly Customer Electricity Usage	kWh $/kWh	Not Applicable	Hourly electricity consumption information (kWh) and applicable retail tariff rate. The nature of 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	Specify intermittent generation by type and amount
Peak Load and Mix	MW Mix	MW Mix	Specify controllable load by type
Annual Generation Cost	$	$	Total cost of generation to serve load
Hourly Generation Cost	$/MWh	$/MWh	Aggregate or market price of energy in each hour
Annual Electricity Production	MWh	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
CO_2 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$_{me}$ ters 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

IMPACT METRICS
Electric Distribution Systems

IMPACT METRICS: Electric Distribution 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
Annual Storage Dispatch	kWh	Not Applicable	Total number of hours that storage is dispatched for retail load shifting
Average Energy Storage Efficiency	%	Not Applicable	Efficiency of energy storage devices installed
Monthly Demand Charges	$/kW-month	Not Applicable	Average commercial or industrial demand charges
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 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
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

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	Time between 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	Faults cleared that could be designated as high impedance or slow clearing
Metrics Related Primarily to Environmental Benefits			
Distribution Operations Vehicle Miles	Miles	Not Applicable	Total mileage for distribution operations and maintenance during the reporting period
CO_2 Emissions	tons	tons	Could be modeled or estimated
Pollutant Emissions (SOx, NOx, PM-10)	tons	tons	Could be modeled or estimated



IMPACT METRICS
Electric Transmission Systems

IMPACT METRICS: Electric Transmission Systems			
Metric	**Value**		**Remarks**
	Project	**System**	
Metrics Related Primarily to Economic Benefits			
Annual Storage Dispatch	MWh	MWh	Total number of hours that storage is dispatched for wholesale energy markets or ancillary services
Capacity Market Value	$/MW	$/MW	Capacity value
Ancillary Services Price	$/MWh	$/MWh	Ancillary service price during hours when Storage was dispatched
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
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 Dispatch	Not Applicable	MWh	Total electricity produced by central generation
Ancillary Services Cost	Not Applicable	$	Total cost of ancillary services
Congestion (MW)	MW	Not Applicable	Total transmission congestion during the reporting period
Congestion Cost	$	Not Applicable	Total 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	MW MVAR	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

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 the reporting period
CO_2 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 Energy Security Benefits			
Event Capture and Tracking			Major Events or Blackouts
Number, Type ,and Size	Events Cause Load Lost	Not Applicable	Causes could include line trips, generator trips, or other large disturbances
Duration	Minutes/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

Table of Contents

Action Items for Principal Investigators

- After this call, please coordinate with your project team to enter "Yes", "No" or "Maybe" for each of the Build Metrics, Energy Storage Applications, and Impact Metrics highlighted on the following slides using the forms provided in the Excel file sent on April 29.
- The forms should be completed regardless of your project's award status.
- Send completed forms to Warren Wang of Navigant Consulting at wwang@navigantconsulting.com by Friday, May 14, and cc Jacquelyn Bean of NETL at jacquelyn.bean@netl.doe.gov and your respective TPOs.
- NETL requests and recommends Recipients begin planning baseline development activities and collecting baseline datasets.
- Contact your TPO for additional guidance from the Data Analysis Team, as needed.

BUILD METRICS
AMI Assets

Generally Not Applicable to SGDP Energy Storage Projects

BUILD METRICS: AMI Assets			
Metric	**Value**		**Remarks**
	Project	**System**	
End-Points (meters)	Yes/No/Maybe	Yes/No/Maybe	
Portion of Customers with AMI			
Residential	Yes/No/Maybe	Yes/No/Maybe	
Commercial	Yes/No/Maybe	Yes/No/Maybe	
Industrial	Yes/No/Maybe	Yes/No/Maybe	
Metering Features			
Interval Reads of 1 Hour or Less	Yes/No/Maybe	Yes/No/Maybe	
Remote Connection/Disconnection	Yes/No/Maybe	Yes/No/Maybe	
Outage Detection/Reporting	Yes/No/Maybe	Yes/No/Maybe	
Power Quality Monitoring	Yes/No/Maybe	Yes/No/Maybe	
Tamper Detection	Yes/No/Maybe	Yes/No/Maybe	
Backhaul Communications Network	Yes/No/Maybe	Yes/No/Maybe	
Meter Communications Network	Yes/No/Maybe	Yes/No/Maybe	
Headend System	Yes/No/Maybe	Yes/No/Maybe	
Meter Data Management System	Yes/No/Maybe	Yes/No/Maybe	
Meter Data Analysis System	Yes/No/Maybe	Yes/No/Maybe	
Enterprise Systems Integration			
Billing	Yes/No/Maybe	Yes/No/Maybe	
Customer Information System	Yes/No/Maybe	Yes/No/Maybe	
Outage Management System	Yes/No/Maybe	Yes/No/Maybe	
Distribution Management System	Yes/No/Maybe	Yes/No/Maybe	
Others	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

BUILD METRICS
Customer Systems Assets

Generally Not Applicable to SGDP Energy Storage Projects

BUILD METRICS: Customer Systems Assets			
Metric	**Value**		**Remarks**
	Project	**System**	
Home Area Network	Yes/No/Maybe	Yes/No/Maybe	
In-Home Displays	Yes/No/Maybe	Yes/No/Maybe	
Web Portal	Yes/No/Maybe	Yes/No/Maybe	
Energy Management Devices/Systems	Yes/No/Maybe	Yes/No/Maybe	
Direct Load Control Devices	Yes/No/Maybe	Yes/No/Maybe	
Programmable Controllable Thermostat	Yes/No/Maybe	Yes/No/Maybe	
Smart Appliances	Yes/No/Maybe	Yes/No/Maybe	
Other Customer Devices	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

BUILD METRICS
Electric Distribution System Assets

BUILD METRICS: Electric Distribution System Assets			
Metric	**Value**		**Remarks**
	Project	**System**	
Portion of system with SCADA	Yes/No/Maybe	Yes/No/Maybe	
Portion of system with Distribution Automation (DA)	Yes/No/Maybe	Yes/No/Maybe	
DA Devices			
Automated Feeder Switches	Yes/No/Maybe	Yes/No/Maybe	
Automated Capacitors	Yes/No/Maybe	Yes/No/Maybe	
Automated Regulators	Yes/No/Maybe	Yes/No/Maybe	
Feeder monitors	Yes/No/Maybe	Yes/No/Maybe	
Remote Fault Indicators	Yes/No/Maybe	Yes/No/Maybe	
Transformer monitors (line)	Yes/No/Maybe	Yes/No/Maybe	
Smart relays	Yes/No/Maybe	Yes/No/Maybe	
DA communications network	Yes/No/Maybe	Yes/No/Maybe	
Other DA devices	Yes/No/Maybe	Yes/No/Maybe	
DA System Features/Applications			
Fault Location, Isolation and Service Restoration (FLISR)	Yes/No/Maybe	Yes/No/Maybe	
Voltage Optimization	Yes/No/Maybe	Yes/No/Maybe	
Feeder Peak Load Management	Yes/No/Maybe	Yes/No/Maybe	
Microgrids	Yes/No/Maybe	Yes/No/Maybe	
Other Applications	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

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/Maybe	Yes/No/Maybe	
Integration with Outage Management System	Yes/No/Maybe	Yes/No/Maybe	
Integration with transmission management system	Yes/No/Maybe	Yes/No/Maybe	
Integration with distributed energy resources	Yes/No/Maybe	Yes/No/Maybe	
Fault Current Limiter	Yes/No/Maybe	Yes/No/Maybe	
Other Distribution devices	Yes/No/Maybe	Yes/No/Maybe	

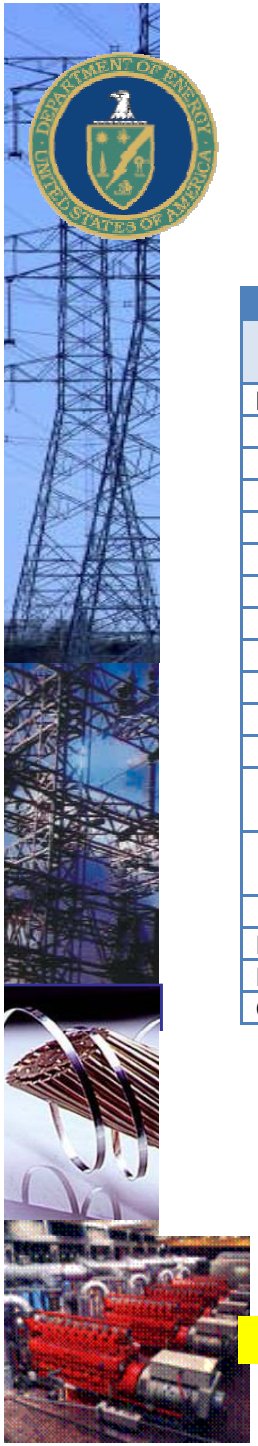
The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

Generally Not Applicable to SGDP Energy Storage Projects

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	Yes/No/Maybe	Yes/No/Maybe	
Phasor Measurement Systems			
PMUs	Yes/No/Maybe	Yes/No/Maybe	
Phasor Data Concentrators	Yes/No/Maybe	Yes/No/Maybe	
Communications Network	Yes/No/Maybe	Yes/No/Maybe	
Advanced Transmission Applications			Applications utilizing phasor data or other Smart Grid information for transmission operations and planning
Angle/Frequency Monitoring	Yes/No/Maybe	Yes/No/Maybe	
Post-mortem Analysis (Including Compliance Monitoring)	Yes/No/Maybe	Yes/No/Maybe	
Voltage Stability Monitoring	Yes/No/Maybe	Yes/No/Maybe	
Thermal Overload Monitoring	Yes/No/Maybe	Yes/No/Maybe	
Improved State Estimation	Yes/No/Maybe	Yes/No/Maybe	
Steady-State Model Benchmarking	Yes/No/Maybe	Yes/No/Maybe	
DG/IPP Applications	Yes/No/Maybe	Yes/No/Maybe	
Power System Restoration	Yes/No/Maybe	Yes/No/Maybe	
Dynamic Capability Rating Systems			Systems designed to determine real-time ratings
Transmission Lines	Yes/No/Maybe	Yes/No/Maybe	
Station Transformers	Yes/No/Maybe	Yes/No/Maybe	
Other Transmission Equipment	Yes/No/Maybe	Yes/No/Maybe	
Other Transmission Devices	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.



BUILD METRICS
Pricing Programs

BUILD METRICS: Pricing Programs			
Policy/Program	**Value**		**Remarks**
	Project	**System**	
Retail Rate Design and Rate Level			
Flat	Yes/No/Maybe	Yes/No/Maybe	
Flat with Critical Peak Pricing	Yes/No/Maybe	Yes/No/Maybe	
Flat with Peak-Time Rebate	Yes/No/Maybe	Yes/No/Maybe	
Tier	Yes/No/Maybe	Yes/No/Maybe	
Tier with Critical Peak Pricing	Yes/No/Maybe	Yes/No/Maybe	
Tier with Peak-Time Rebate	Yes/No/Maybe	Yes/No/Maybe	
Time-of-use	Yes/No/Maybe	Yes/No/Maybe	
Variable Peak Pricing	Yes/No/Maybe	Yes/No/Maybe	
Time-of-use with Critical Peak Pricing	Yes/No/Maybe	Yes/No/Maybe	
Time-of-use with Peak-Time Rebate	Yes/No/Maybe	Yes/No/Maybe	
Real-Time Pricing	Yes/No/Maybe	Yes/No/Maybe	
Real-Time Pricing with Critical Peak Pricing	Yes/No/Maybe	Yes/No/Maybe	
Real-Time Pricing with Peak Time Rebate	Yes/No/Maybe	Yes/No/Maybe	
Pre-Pay Pricing	Yes/No/Maybe	Yes/No/Maybe	
Net Metering	Yes/No/Maybe	Yes/No/Maybe	
Rate Decoupling	Yes/No/Maybe	Yes/No/Maybe	
Other programs	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

BUILD METRICS
Distributed Energy Resources

BUILD METRICS: Distributed Energy Resources			
Metric	**Value**		**Remarks**
	Project	**System**	
Distributed Generation	Yes/No/Maybe	Yes/No/Maybe	
Energy Storage	Yes/No/Maybe	Yes/No/Maybe	
DG Interface	Yes/No/Maybe	Yes/No/Maybe	
Plug-in Electric Vehicle Charging Points	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

ENERGY STORAGE APPLICATIONS

ENERGY STORAGE APPLICATIONS		
Applications	**Applicability to Project**	**Remarks**
Electric Energy Time Shift	Yes/No/Maybe	
Electric Supply Capacity	Yes/No/Maybe	
Load Following	Yes/No/Maybe	
Area Regulation	Yes/No/Maybe	
Electric Supply Reserve Capacity	Yes/No/Maybe	
Voltage Support	Yes/No/Maybe	
Transmission Support	Yes/No/Maybe	
Transmission Congestion Relief	Yes/No/Maybe	
T&D Upgrade Deferral	Yes/No/Maybe	
Substation Onsite Power	Yes/No/Maybe	
Time-of-Use Energy Cost Management	Yes/No/Maybe	
Demand Charge Management	Yes/No/Maybe	
Electric Service Reliability	Yes/No/Maybe	
Electric Service Power Quality	Yes/No/Maybe	
Renewables Energy Time Shift	Yes/No/Maybe	
Renewables Capacity Firming	Yes/No/Maybe	
Wind Generation Grid Integration, Short Duration	Yes/No/Maybe	
Wind Generation Grid Integration, Long Duration	Yes/No/Maybe	

The highlighted cells require Recipient feedback with a Yes, No, or Maybe indicating the applicability of each energy storage application to the project Use the Remarks column for any clarifying statements.

IMPACT METRICS
AMI and Customer Systems

Generally Not Applicable to SGDP Energy Storage Projects

IMPACT METRICS: AMI and Customer Systems			
Metric	**Value**		**Remarks**
	Project	**System**	
Metrics Related Primarily to Economic Benefits			
Hourly Customer Electricity Usage	Yes/No/Maybe	Not Applicable	
Monthly Customer Electricity Usage	Yes/No/Maybe	Not Applicable	
Peak Generation and Mix	Yes/No/Maybe	Yes/No/Maybe	
Peak Load and Mix	Yes/No/Maybe	Yes/No/Maybe	
Annual Generation Cost	Yes/No/Maybe	Yes/No/Maybe	
Hourly Generation Cost	Yes/No/Maybe	Yes/No/Maybe	
Annual Electricity Production	Yes/No/Maybe	Yes/No/Maybe	
Ancillary Services Cost	Yes/No/Maybe	Yes/No/Maybe	
Meter Operations Cost	Yes/No/Maybe	Not Applicable	
Truck Rolls Avoided	Yes/No/Maybe	Not Applicable	
Metrics Related Primarily to Environmental Benefits			
Meter Operations Vehicle Miles	Yes/No/Maybe	Not Applicable	
CO_2 Emissions	Yes/No/Maybe	Yes/No/Maybe	
Pollutant Emissions (SOx, NOx, PM-10)	Yes/No/Maybe	Yes/No/Maybe	
Metrics Related Primarily to AMI System Performance			
Meter Data Completeness	Yes/No/Maybe	Not Applicable	
Meters Reporting Daily by 2AM	Yes/No/Maybe	Not Applicable	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

IMPACT METRICS
Electric Distribution Systems

IMPACT METRICS: Electric Distribution Systems			
Metric	**Value**		**Remarks**
	Project	**System**	
Metrics Related Primarily to Economic Benefits			
Hourly Customer Electricity Usage	Yes/No/Maybe	Not Applicable	
Annual Storage Dispatch	Yes/No/Maybe	Not Applicable	
Average Energy Storage Efficiency	Yes/No/Maybe	Not Applicable	
Monthly Demand Charges	Yes/No/Maybe	Not Applicable	
Distribution Feeder or Equipment Overload Incidents	Yes/No/Maybe	Not Applicable	
Distribution Feeder Load	Yes/No/Maybe	Not Applicable	
Deferred Distribution Capacity Investments	Yes/No/Maybe	Not Applicable	
Equipment Failure Incidents	Yes/No/Maybe	Not Applicable	
Distribution Equipment Maintenance Cost	Yes/No/Maybe	Not Applicable	
Distribution Operations Cost	Yes/No/Maybe	Not Applicable	
Distribution Feeder Switching Operations	Yes/No/Maybe	Not Applicable	
Distribution Capacitor Switching Operations	Yes/No/Maybe	Not Applicable	
Distribution Restoration Cost	Yes/No/Maybe	Not Applicable	
Distribution Losses (%)	Yes/No/Maybe	Not Applicable	
Distribution Power Factor	Yes/No/Maybe	Not Applicable	
Truck Rolls Avoided	Yes/No/Maybe	Not Applicable	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

IMPACT METRICS
Electric Distribution Systems (Continued)

IMPACT METRICS: Electric Distribution Systems (continued)			
Metric	**Value**		**Remarks**
	Project	**System**	
Metrics Related Primarily to Reliability Benefits			
SAIFI	Yes/No/Maybe	Not Applicable	
SAIDI/CAIDI	Yes/No/Maybe	Not Applicable	
MAIFI	Yes/No/Maybe	Not Applicable	
Outage Response Time	Yes/No/Maybe	Not Applicable	
Major Event Information	Yes/No/Maybe	Not Applicable	
Number of High Impedance Faults Cleared	Yes/No/Maybe	Not Applicable	
Metrics Related Primarily to Environmental Benefits			
Distribution Operations Vehicle Miles	Yes/No/Maybe	Not Applicable	
CO_2 Emissions	Yes/No/Maybe	Yes/No/Maybe	
Pollutant Emissions (SOx, NOx, PM-10)	Yes/No/Maybe	Yes/No/Maybe	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

IMPACT METRICS
Electric Transmission Systems

IMPACT METRICS: Electric Transmission Systems			
Metric	**Value**		**Remarks**
	Project	**System**	
Metrics Related Primarily to Economic Benefits			
Annual Storage Dispatch	Yes/ No/ Maybe	Yes/ No/ Maybe	
Capacity Market Value	Yes/ No/ Maybe	Yes/No/Maybe	
Ancillary Services Price	Yes/No/Maybe	Yes/No/Maybe	
Annual Generation Cost	Not Applicable	Yes/No/Maybe	
Hourly Generation Cost	Not Applicable	Yes/No/Maybe	
Peak Generation and Mix	Not Applicable	Yes/No/Maybe	
Peak Load and Mix	Not Applicable	Yes/No/Maybe	
Annual Generation Dispatch	Not Applicable	Yes/No/Maybe	
Ancillary Services Cost	Not Applicable	Yes/No/Maybe	
Congestion (MW)	Yes/No/Maybe	Not Applicable	
Congestion Cost	Yes/No/Maybe	Not Applicable	
Transmission Line or Equipment Overload Incidents	Yes/No/Maybe	Not Applicable	
Transmission Line Load	Yes/No/Maybe	Not Applicable	
Deferred Transmission Capacity Investments	Yes/No/Maybe	Not Applicable	
Equipment Failure Incidents	Yes/No/Maybe	Not Applicable	
Transmission Equipment Maintenance Cost	Yes/No/Maybe	Not Applicable	
Transmission Operations Cost	Yes/No/Maybe	Not Applicable	
Transmission Restoration Cost	Yes/No/Maybe	Not Applicable	
Transmission Losses	Yes/No/Maybe	Not Applicable	
Transmission Power Factor	Yes/No/Maybe	Not Applicable	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

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)	Yes/No/Maybe	Not Applicable	
Energy Emergency Alert 3 (NERC ALR 6-2)	Yes/No/Maybe	Not Applicable	
Metrics Related Primarily to Environmental Benefits			
Transmission Operations Vehicle Miles	Yes/No/Maybe	Not Applicable	
CO_2 Emissions	Yes/No/Maybe	Yes/No/Maybe	
Pollutant Emissions (SOx, NOx, PM-10)	Yes/No/Maybe	Yes/No/Maybe	
Metrics Related Primarily to Energy Security Benefits			
Event Capture and Tracking			***Major Events or Blackouts***
Number, Type ,and Size	Yes/No/Maybe	Not Applicable	
Duration	Yes/No/Maybe	Not Applicable	
PMU Dynamic Data	Yes/No/Maybe	Not Applicable	
Detection	Yes/No/Maybe	Not Applicable	
Events Prevented	Yes/No/Maybe	Not Applicable	
Metrics Related Primarily to PMU/PDC System Performance			
PMU Data Completeness	Yes/No/Maybe	Not Applicable	
Network Completeness	Yes/No/Maybe	Not Applicable	
PMU/PDC Performance	Yes/No/Maybe	Not Applicable	
Communications Performance	Yes/No/Maybe	Not Applicable	
Application Performance	Yes/No/Maybe	Not Applicable	

The highlighted cells under Project and System Value require Recipient feedback with a Yes, No or Maybe for applicability of input. Use the Remarks column for any clarifying statements.

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