Task 1.6 Update

Scoping & Mapping of Smart Grid Projects

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1.6 Scoping & Mapping of Smart Grid Projects

- Product ID: 1018945
- Overview of Demo
- Definitions of Smart Grid
- Potential Benefits of Smart Grid
  – Utility
  – Customer
  – Reliability & PQ
  – Societal
  – Regulator
- Industry Standardization Efforts
- Assessment of Smart Grid DER Technologies
- Self Assessment Tool

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Smart Grid Distributed Energy Resources (DER) Project Assessment

Written Report
&
Smart Grid Project Self Assessment Spreadsheet

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Smart Grid Project Self-Assessment Tool

Technologies related to Smart Grid Functions involving Distributed Energy Resources and related Distribution Automation	Part of Project? Enter a "Y"	Benefits Smart Grid (SG) Criteria for Assessing the Benefits Provided by the Technologies (0-5) 0 = not relevant or no benefit 1 = low benefit; 3 = medium benefit or not fully realized; 5 = high benefit					
Electronic Equipment							
Substation equipment							
SCADA RTU		4	4	2	0	2	2.40
SCADA IED		5	5	5	0	5	4.00
Other							
Feeder equipment							
Locally controlled cap bank		2	4	3	0	2	2.20
Remotely controlled cap bank		3	5	5	0	3	3.20
Locally controlled automated feeder switch		4	0	5	0	0	1.80
Remotely controlled automated feeder switch		5	0	5	0	0	2.00
Reclosers		5	0	5	0	0	2.00

- **Electronic Equipment** (Substation, Feeder, DER Units & Controllers, Customer Site Equipment)
- **Communication Media and Field Protocols**
- **Data Management** (Communication Systems, Databases)
- **System Integration** (Enterprise Messaging, Security Policy & Framework, Security Protocols)
- **Software Applications** (Distribution Automation, DER Management)

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Smart Grid DER Projects Assessment Matrix

Benefits →	Reliability	Efficiency	Financial	Security	Environment	Total Benefits	Percent
Smart Grid Criteria for Assessing the Benefits Provided by the Categories **Categories** Smart Grid Categories	Improved power system reliability provided by technology	Increased energy efficiency provided by technology	Decreased costs through automation, standardization and flexibility	Increased security from cyber and physical hazards	Minimized environmental impact	Total Smart "Gridedness" Score	Percent of a perfect score by category
Electronic Equipment	6.60	15.57	9.40	0.00	21.69	53.25	69%
Communication Media and Protocols	3.47	0.00	4.03	0.00	0.00	7.50	24%
Data Management	0.00	0.00	0.67	0.00	0.00	0.67	13%
System Integration	0.69	0.00	1.12	4.42	0.00	6.24	18%
Software Applications	5.56	8.49	4.47	0.00	7.23	25.75	33%
Benefit Totals	16.32	24.06	19.69	4.42	28.92	93.40	41%
Benefit Percentage (of perfect)	6%	11%	4%	4%	35%	41%	

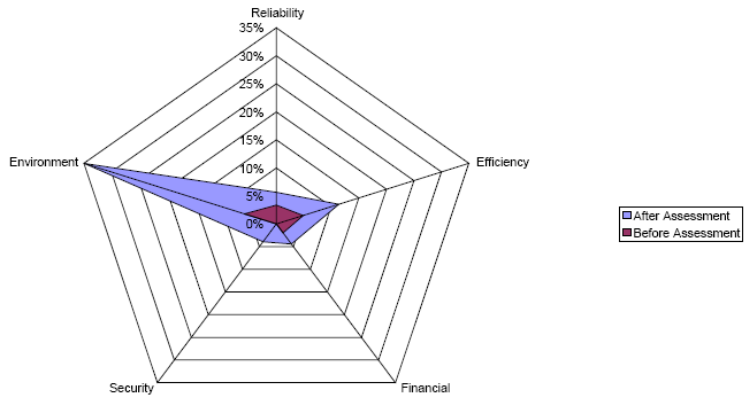No attempt to perform cost justification.

High or Low Score doesn't indicate if the project has a good business case

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Benefit Assessment Radar Chart

Reliability
35%
30%
25%
20%
15%
10%
5%
0%

Environment

Efficiency

Security

Financial

☐ After Assessment
■ Before Assessment

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Technology Assessment Radar Chart

Electronic Equipment
70%
60%
50%
40%
30%
20%
10%
0%

Software Applications

Communication Media and Protocols

System Integration

Data Management

☐ After Assessment
■ Before Assessment
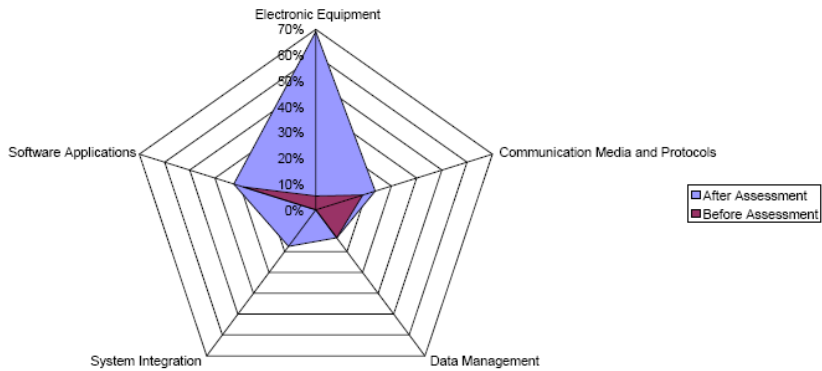
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Smart Grid Project Tracking
(Realizing DOE Smart Grid Clearinghouse Under Development, don't want to compete, but support)

Distributed Energy Resources

Distributed Generation
- Solar Photovoltaic (Customer Owned)
- Solar Photovoltaic (Utility Owned)
- Wind Turbine
- Combined Heat & Power (CHP)
- Fuel Cell
- Diesel Generator
- Concentrated Solar (Thermal)
- Microturbine
- Other

Distributed Storage
- Local Battery Storage (Customer Owned)
- System Battery Storage (Utility Owned)
- Ice (Thermal) Storage
- Compressed Air Storage
- Other

Load Management
- Demand Response
- Direct Load Control
- Electric Vehicle (Including PHEV)
- Microgrid
- Other

Energy Market Structure

Pricing structure
- Net Metering
- Feed-In Tariffs
- Time of Use
- Real Time Prices
- Day Ahead Prices
- Critical Peak Prices
- Ancillary Services
- Regulation Services
- Other

Mgmt structure
- Utility Managed (Monitoring and/or Control)
- Third Party Managed (Monitor and/or Control)
- Customer Managed (Monitor and/or Control)
- Other

Project-Related Efforts Furthering The Industry

Project Design
- Use of Standards related to DER
- Working directly with Standards Bodies
- Visibility of DER within real-time Sys Ops.
- Enables widespread integration of DER
- Addresses Cyber Security
- Links generation costs/grid conditions to Customer
- Interoperability: Multiple vendors can supply H/W & S/W
- Supports Development of Open Source Software

Information Transfer
- Public Sharing of Cost Benefit Analysis
- Public Sharing of Lessons Learned
- Public Sharing of Use Case Development
- Other

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Smart Grid Project Tracking   Cont'd

Primary Business Cases
- Reliability & Power Quality
- Energy Efficiency
- Safety & Security
- Environmental & Conservation
- Capital and O&M
- Societal Benefits
- Customer Lower Costs
- Other

DER-Related Standards

Interconnection
- IEEE 1547 series
- NERC reliability requirements

Field Protocol & HAN standards
- IEC 61850-7-420 for DER
- IEC 61400-24 for Wind
- IEC 61850 for Substation Devices
- DNP3 (IEC 60870-5)
- Modbus (RTU or ASCII) or Modbus/TCP
- Internet-based protocols - IP, TCP, HTTP
- ANSI C12.22 for metering
- BACnet for Building Automation
- oBIX
- WiFi (801.11 a/b/g/s)
- HomePlug
- Zigbee Smart Energy Profile (SEP)
- 6LoWPAN
- Other

Database management
- Structured Query Language (SQL)
- Open Database Connectivity (ODBC)
- ebXML
- Historian Interfaces
- Other

Enterprise messaging standards
- IEC 60870-6-ICCP
- IEC 61968 CIM for distribution
- IEC 61970 CIM for transmission
- MultiSpeak
- Web services
- DRBizNet
- OpenADR
- Other

Cyber security standards
- NERC CIP 002-009
- IEC 62351 protocol security series
- Transport Layer Security (TLS for TCP/IP)
- Intrusion detection
- Audit trails
- VPN
- Other

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Smart Grid Project Tracking   Cont'd

Communication Infrastructures					Equipment and/or Systems Impacted by Project	
Within customer site	Between customer and intermediate nodes	Between customer/intermediate nodes and headend	Headend system		Power System Equipment added or modified	Information Systems impacted

Communication Infrastructures column labels:
- Within customer site: Power line; Wireless LAN; Wired LAN; Internet; Other
- Between customer and intermediate nodes: RF Tower; RF Mesh; Power Line Based - Lo Baud; Power Line Based - Hi Baud (BPL); Other
- Between customer/intermediate nodes and headend: Private Wide Area Network; Broadband Internet (i.e. Cable, DSL); Cellular Based; Dialup; Other
- Headend system: Operations SCADA system; AMI system headend; Project-specific utility computer system; Third Party computer system; Other

Equipment and/or Systems Impacted by Project column labels:
- Power System Equipment added or modified: Transmission equipment; Distribution equipment; Substation equipment; Metering equipment; DER interconnection equipment
- Information Systems impacted: System Operations SCADA; Transmission Energy Management System; Distribution Management System; System Planning; Substation Automation; Automated Meter Reading (AMR); Automated Metering Infrastructure (AMI); Smart Meter with Customer Access to RT Data; Smart Meter (kWh & Volt, <=15 min interval); Customer Home Area Network (HAN); Customer Building/Process Control Systems; Customer Information System; Geographical Information System; Other

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Questions?

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