

NIST Framework and Roadmap for Smart Grid Interoperability Standards Update

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National Institute of Standards and Technology
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The NIST Role in Smart Grid

“In cooperation with the DoE, NEMA, IEEE, GWAC, and other stakeholders, **NIST** has “primary responsibility to **coordinate development of a framework** that includes protocols and model standards for information management **to achieve interoperability of smart grid devices and systems...**”

One Hundred Tenth Congress
of the
United States of America

AT THE FIRST SESSION

*Began and held at the City of Washington on Thursday,
the fourth day of January, two thousand and seven*

An Act

To move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes.

*Be it enacted by the Senate and House of Representatives of
the United States of America in Congress assembled,*

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the “Energy Independence and Security Act of 2007”.

NIST Smart Grid Framework and Roadmap

www.nist.gov/smartgrid

NIST Special Publication 1108

NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0

Office of the National Coordinator for Smart Grid Interoperability

NIST National Institute of Standards and Technology • U.S. Department of Commerce

Release 1
January 2010

NIST Special Publication 1108R2

NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0

Office of the National Coordinator for Smart Grid Interoperability,
Engineering Laboratory
in collaboration with
Physical Measurement Laboratory
and
Information Technology Laboratory

NIST National Institute of Standards and Technology • U.S. Department of Commerce

Release 2
February 2012

This publication is available free of charge from <http://dx.doi.org/10.6028/NIST.SP.1108r3>

NIST Special Publication 1108r3

NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 3.0

Smart Grid and Cyber-Physical Systems Program Office
and Energy and Environment Division,
Engineering Laboratory

in collaboration with
Quantum Measurement Division,
Semiconductor and Dimensional Metrology Division,
and Electromagnetics Division,
Physical Measurement Laboratory
and
Advanced Network Technologies Division
and Computer Security Division,
Information Technology Laboratory

<http://dx.doi.org/10.6028/NIST.SP.1108r3>

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Release 3
September 2014

Framework Contents

Executive Summary

- 1) Purpose and Scope
- 2) Smart Grid Visions
- 3) Smart Grid Interoperability Panel (SGIP)
- 4) Standards Identified for Implementation
- 5) Architectural Framework
- 6) Cybersecurity Strategy
- 7) Framework for Smart Grid Interoperability T&C
- 8) Cross-Cutting and Future Issues

Chapter 4 – Standards Identified for Implementation

- Table 4-1 is a list of standards and protocols identified as supporting interoperability of the smart grid
 - Guiding principles for identifying standards for implementation included
 - Includes requirements documents and guidelines
- Guidance to standards for all SG stakeholders

Table 4-1

No.	Standard	Application	Comments	Included in SGIP Catalog of Standards?	SG Conceptual Architecture Domains
29	<p>IEC61850-90-5 http://webstore.iec.ch/webstore/webstore.nsf/artnum/033549!opendocument</p> <p>CSWG Report : http://members.sqip.org/apps/group_public/document.php?document_id=2633&wg_abbrev=cold</p> <p>CoS : http://sgip.org/Member-Dashboard</p>	Synchrophasor data transmission	<p>This technical report is a part of the IEC 61850 series of standards that adds a method for exchanging synchrophasor data between PMUs, PDCs, WAMPAC (Wide Area Monitoring, Protection, and Control) systems, and between control center applications. The data, to the extent covered in IEEE C37.118.2 - 2011, is transported in a way that is compliant to the concepts of IEC 61850.</p> <p>This document also provides routable profiles for IEC 61850-8-1 GOOSE and IEC 61850-9-2 SV packets. These routable packets can be utilized to transport general IEC 61850 data as well as synchrophasor data.</p>	Y	Transmission, Distribution

Table 4-1

Link to SSO website

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29	IEC61850-90-5 http://webstore.iec.ch/webstore/webstore.nsf/artnum/033549!opendocument CSWG Report : http://members.sgip.org/apps/group_public/document.php?document_id=2633&wg_abbrev=cold CoS : http://sgip.org/Member-Dashboard	Synchrophasor data transmission	<p>This technical report is a part of the IEC 61850 series of standards that adds a method for exchanging synchrophasor data between PMUs, PDCs, WAMPAC (Wide Area Monitoring, Protection, and Control) systems, and between control center applications. The data, to the extent covered in IEEE C37.118.2 - 2011, is transported in a way that is compliant to the concepts of IEC 61850.</p> <p>This document also provides routable profiles for IEC 61850-8-1 GOOSE and IEC 61850-9-2 SV packets. These routable packets can be utilized to transport general IEC 61850 data as well as synchrophasor data.</p>	Y	Transmission, Distribution

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Link to cybersecurity review

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29	<p>IEC61850-90-5 http://webstore.iec.ch/webstore/webstore.nsf/artnum/033549!opendocument</p> <p>CSWG Report : http://members.sgip.org/apps/group_public/document.php?document_id=2633&wg_abbrev=cold</p> <p>CoS : http://sgip.org/Member-Dashboard</p>	Synchrophasor data transmission	<p>This technical report is a part of the IEC 61850 series of standards that adds a method for exchanging synchrophasor data between PMUs, PDCs, WAMPAC (Wide Area Monitoring, Protection, and Control) systems, and between control center applications. The data, to the extent covered in IEEE C37.118.2 - 2011, is transported in a way that is compliant to the concepts of IEC 61850.</p> <p>This document also provides routable profiles for IEC 61850-8-1 GOOSE and IEC 61850-9-2 SV packets. These routable packets can be utilized to transport general IEC 61850 data as well as synchrophasor data.</p>	Y	Transmission, Distribution

Table 4-1

Link to SGIP CoS search

No.	Standard	Application	Comments	Included in SGIP Catalog of Standards?	SG Conceptual Architecture Domains
29	<p>IEC61850-90-5 http://webstore.iec.ch/webstore/webstore.nsf/artnum/033549!opendocument</p> <p>CSWG Report : http://members.sgip.org/apps/group_public/document.php?document_id=2633&wg_abbrev=cosg</p> <p>CoS : http://sgip.org/Member-Dashboard</p>	Synchrophasor data transmission	<p>This technical report is a part of the IEC 61850 series of standards that adds a method for exchanging synchrophasor data between PMUs, PDCs, WAMPAC (Wide Area Monitoring, Protection, and Control) systems, and between control center applications. The data, to the extent covered in IEEE C37.118.2 - 2011, is transported in a way that is compliant to the concepts of IEC 61850.</p> <p>This document also provides routable profiles for IEC 61850-8-1 GOOSE and IEC 61850-9-2 SV packets. These routable packets can be utilized to transport general IEC 61850 data as well as synchrophasor data.</p>	Y	Transmission, Distribution



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Table 4-1



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What's new in R3.0?

- A column was added identifying the relevant Smart Grid Conceptual Architecture domain
 - Generation, Transmission, Distribution, Operations, Service Providers, Customer
- The number of implemented standards has increased from 37 to 74
 - Standards are still grouped as “families of standards”, but parts have a separate numbered entry
- Standards added include:
 - Synchrophasors: IEC61850-90-5, IEEE C37.118.1, IEEE C37.118.2
 - Event data: IEEE C37.239
 - Energy Services Provider Interface: NAESB REQ-21
 - Third party access to Smart Meter Data: NAESB REQ-22
 - OASIS Energy Interoperation
 - Coexistence for broadband power line carrier: NISTIR 7862
 - PAP18 transition from SEP 1 to SEP 2.0
- Standard updated:
 - DNP3: IEEE 1815-2012 replaced IEEE 1815-2010

Smart Grid Testbed Facility Summary

Problem: NIST/industry do not have an interactive platform to research SG technologies and measurement science, and demonstrate solutions to a full range of SG interoperability issues.

Solution: Develop a fully integrated SG measurements/validation testbed, with emphasis on microgrids.

Vital Role: Addresses national priority of SG interoperability, standards traceability, dissemination of data

Attributes: Open-architecture, physics-based, scalable, renders fully characterized and validated model for residential and commercial/industrial microgrids.

NIST Smart Grid Testbed

A031-A029	A027-A025	A023	A021	A019	A017	A015	A013
Cyber Security V. Pillieteri	Microgrid Power Conditioning A. Hefner	Synchro -phasor/ Sensors J. FitzPatrick	Metering Accuracy T. Nelson	Comm Modeling N. Golmie	Energy Storage A. Hefner	Sensor Interfaces K. Lee	Guest Researcher

- Deploy commercial PMUs with advanced sensors
- Develop interoperability tests for distribution PMUs/micro-PMUs (IEEE C37.118.2/IEC 61850-90-5)
- Develop/test smart sensors interoperability requirements based upon IEEE 1451.1
- Beyond PMUs – Merging Units (Mus)
 - Develop interoperability tests for MUs based upon IEC 61869-9