NASPI North American SynchroPhasor Initiative

NIST Interoperability Standards Update

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The NIST Role

Energy Independence and Security Act (EISA) of 2007
Title XIII, Section 1305.
Smart Grid Interoperability Framework

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**…"

NIST Definition - Interoperability

"The capability of two or more networks, systems, devices, applications or components to exchange and readily use information – securely, effectively and with little or no inconvenience to the user. The Smart Grid will be a system of interoperable systems. That is different systems will be able to exchange meaningful, actionable information. The systems will share a common meaning of the exchanged information, and this information will elicit agreed upon types of response. The reliability, fidelity and security of information exchanges between and among Smart Grid systems must achieve requisite performance levels".

Note: This is the simplified version. See the Grid Wise Architecture Council's (GWAC) Interoperability Framework for a more detailed version.

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First 16 NIST Framework Standards

	Domain Expert Working Groups							
1	AMI-SEC System Security Requirements	✓	✓	✓			✓	✓
2	ANSI C12.19 End Device (Meter) Tables		✓	✓				✓
3	BACnet Building Automation & Control Net			✓	✓			✓
4	DNP3 – Distributed Network Protocol		✓		✓	✓	✓	
5	IEC 60870-6 – Inter-Control Center		✓					
6	IEC 61850 – Comms Nets in Substations		✓		✓	✓	✓	
7	IEC 61968/61970 – Common Info Model		✓	✓				
8	IEC 62351 – Data Comms Security		✓		✓	✓	✓	
9	IEEE C37.118 - Synchrophasors		✓			✓		
10	IEEE 1547 – Distributed Resources		✓		✓	✓	✓	
11	IEEE 1686 – IED Cyber Security				✓	✓	✓	
12	NERC Critical Infrastructure Protection	✓	✓	✓	✓	✓	✓	✓
13	NIST SP 800-53/82 Fed Info Sys Security	✓	✓	✓	✓	✓	✓	✓
14	Open Automated Demand Response	✓	✓	✓				✓
15	Open Home Area Network Requirements							✓
16	ZigBee/HomePlug Smart Energy Profile							✓

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Priority Action Plan – 13 Harmonization of IEEE C37.118 with IEC 61850 and Precision Time Synchronization

PAP Leadership and Coordination

PAP Leadership:

- NIST Lead: Jerry FitzPatrick, gerald.fitzpatrick@nist.gov
- PAP-13: Lead: Ron Farquharson, EnerNex, ron@enernex.com

SDO and Stakeholder Co-Leads:

- IEEE PSRC H11 Committee Chair: Ken Martin kemartin8421@comcast.net.
- IEEE PSRC H7 Committee Chair: Galina Antinova galina.antonova@ieee.org or galina.s.antonova@ca.abb.com
- IEC TC57 WG10 (IEC 61850): Christoph Brunner, Convenor christoph.brunner@it4power.com
- UCA-IUG: Mark Adamiak, TC Chair, mark.adamiak@ge.com
- NASPI: Allison Silverstein, allisonsilverstein@mac.com
- NASPI - PSTT: Vahid Madani, VxM6@pge.com
- IEEE Power Systems Relay Committee, Communications Subcommittee: Veselin Skendzic, Veselin_Skendzic@selinc.com
- IEC TC57 WG19: Paul Skare Paul.Skare@siemens.com

PAP Leadership and Coordination

Other Coordination:

- Other related IEEE and IEC standards activities (eg IEEE 2030)
- Other PAPs
- DEWGs – Domain Expert Working Groups
- SGAC – Smart Grid Architecture Committee
- SGCSWG – Smart Grid Cyber Security Working Group
- SGTCC – Smart Grid Test and Certification Committee

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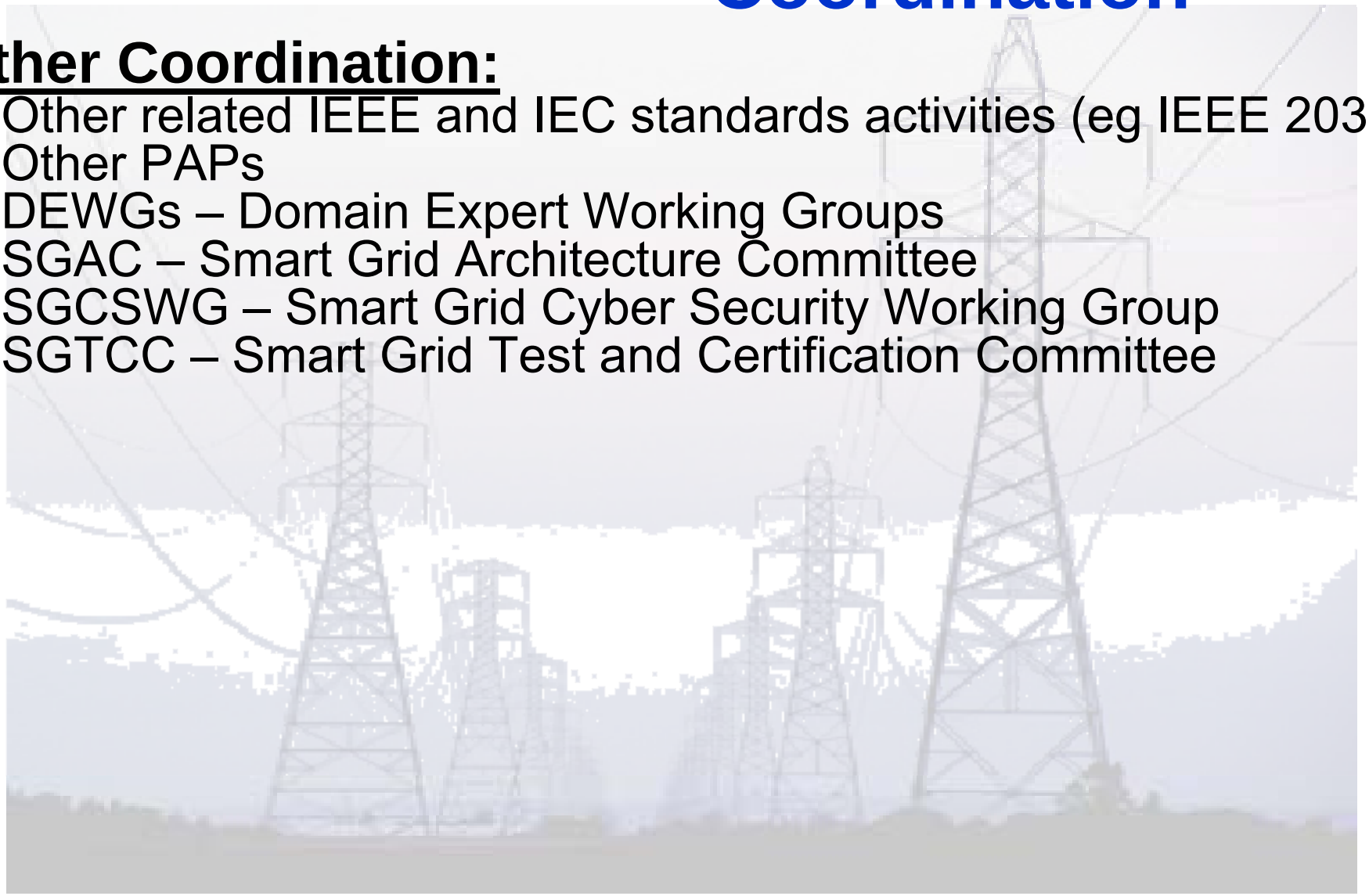
PAP Leadership and Coordination

Other Coordination:

- Other related IEEE and IEC standards activities (eg IEEE 2030)
- Other PAPs
- DEWGs – Domain Expert Working Groups
- SGAC – Smart Grid Architecture Committee
- SGCSWG – Smart Grid Cyber Security Working Group
- SGTCC – Smart Grid Test and Certification Committee



PAP-13 Abstract - 1

The current primary standard for the communications of phasor measurement unit (PMU) and phasor data concentrator (PDC) data and information is the IEEE Standard C37.118 which was published in 2005. This standard also includes requirements for the measurement and determination of phasor values. IEC 61850 is seen as a key standard for all substation and field equipment operating under both real-time and non-real time applications. The use of IEC 61850 for wide-area communication is already discussed in IEC 61850-90-1 (Draft technical report) in the context of communication between substations. It appears possible to use a similar approach for the transmission of PMU and PDC data but the capability needs to be formally defined in IEC 61850. This action plan seeks to assist and accelerate the integration of standards that can impact phasor measurement and applications depending on PMU and PDC based data and information.

PAP-13 Abstract - 2

Common time synchronization is the key to many Smart Grid applications for real-time operation necessary to make the Smart Grid highly robust and resilient to disturbances ("self-healing"), either from natural events such as earthquakes or large variations in wind or solar power availability, or from potential terrorist actions. Guidelines on how to achieve that synchronization and addressing different issues related to that synchronization are required. A standard (IEEE 1588) is available to achieve highly accurate synchronization over a communication network however an implementation profile for power system applications is required.

Key Role for the PAP - Requirements

- Written requirements
  - Functional requirements
    - Based on real world cases
    - Use case traceability
  - Non-Functional requirements
    - Performance requirements
    - Regulatory and other “soft” requirements
    - Testing and certification requirements
    - Cyber security requirements
    - Architectural requirements
- Utilize a standards analysis criteria when standards work is “handed off” back to team

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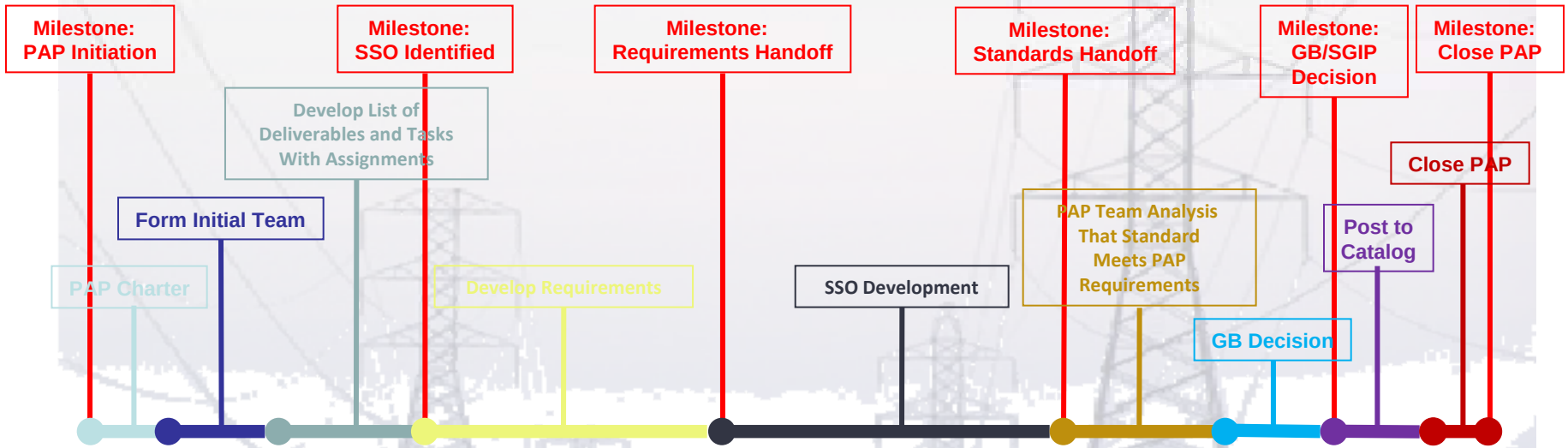
PAP Timeline Generic Example



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PAP-13 Activities

Status of PAP13: Harmonization of IEEE C37.118 with IEC 61850 and Precision Time Synchronization

Updated May 27, 2010.

A#	Current Activities and Accomplishments
A1	IEEE PSRC H11 (C37.118) are in the process of PAR revisions and IEEE Working Group changes in support of the decision to split standard (communications and measurement). New PSRC Working Group 19 has been formed to address the update of the communications portion of C37.118 and to work with the IEC to map with 61850.
A2	IEEE PSRC H7/C7 - IEEE PC37.238 (Power Profile for IEEE 1588) is now Draft 4.0 and is in a pre-ballot review. Lots of good work is happening with this effort.
A3	IEEE PSRC Working Groups H11, H7/C7 and HTF3 are met at the PSRC meeting in Madison, WI in mid May. More discussion on use cases and requirements occurred.
A4	Next steps for the C37.118 Gap List (Enhancement) list is to decide which enhancements to implement on an updated C37.118 communications standard vs which to implement with IEC 61850-90-5 (new Technical Report for Phasor Data Communications)
A5	IEC WG10 mapping task force have new actions to update the use cases and define a roadmap for migration

S	D#	Deliverable
☑	D1	Harmonization use cases and requirements
🟢	D2	C37.118 Enhancement (gaps) List
🟡	D3	IEC 61850-90-5 Mapping document
☑	D4	1588 Time Sync Demo
🟡	D5	1588 Power Profile
🟡	D6	Amendments to IEC 61850 documents

PAP-13 Activities - 2

I#	Issues, Concerns & Help Needed
I1	Need contracted help to move the work along

S	T#	Task	Plan	Actual	Resp	D#
☑	T1	Requirements document for Synchrophasors	Sep-2009	Oct-2009	Mark Adamiak	D1
	T2	Create outline for IEC mapping document (IEC 61850-90-5)	June-2010		HTF3 - Joint IEEE/IEC	D3
	T3	Create the draft IEC mapping document (90-5)	Dec-2010		IEC WG10	D3
	T4	IEEE PSRC H7 - Power Profile for IEEE 1588	May-2010		IEEE H7/C7	D5
☑	T5	Interop demo 1588	Jan-2010	Jan 2010	IEEE H7/C7	D4
	T6	Validate time synchronization requirements	May-2010		NIST	D5
	T7	Differences in time stamps C37.118 / IEC 61850	June-2010		TC57/WG10	D3
	T8	Amendments to IEC 61850	Jan-2011		TC57/WG10	D6
	T9	NIST Testbed for 1588 - Requirements	June-2010		NIST	D5

IEEE PSRC – Activities Related to SGIP PAP-13

Group	Title	Output	Chair	Start	Projected end date
H7	IEEE 1588 Profile for Protection Applications	Standard C37.238	G. Antonova	2008	Aiming to initiate balloting 05/2010
H11	Revision of C37.118 Synchrophasor Standard	Standard C37.118	K. Martin	2006	TBD
HTF3	IEEE/IEC Joint Standard for C37.118 and IEC 61850	TBD	K. Martin	2009	TBD
C5	Investigation of NASPI Guidelines for Incorporation in IEEE standards	Guide	Jim Hackett Paul Myrda	2010	Target for ballot in Q4, 2010
Related activities	**Title**	**Output**	**Chair**	**Start**	**Projected end date**
H2	Protective Relaying Applications Using Smart Grid Communications Infrastructure	Report	M. Simon	2006	
H3	Timetagging in Protection and Disturbance Recording IEDs	Recommended practice	B. Dickerson	2006	
H8	Application of COMTRADE for Exchange of Synchrophasor data	Report	E. Allen	2008	
H17	Establishing links between Comtrade, IEC61850 and CIM	Report	C. Brunner	2010	
C14	Use of Time Synchronized Measurements in Protective Relaying Applications	Report	J. O'Brien	2008	
C2	Role of Protective Relaying in the Smart Grid	Report	A. Apostolov	2010	

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PSTT Activities Related to PAP13

Goal #	Goal	Metric	Industry Needed Deliverable	Priority	Lead	Funding Required to Reach the Target
1	Oversee the process of moving PSTT documents to IEEE Standards and Guides and to expedite the process	Form WG addressing: - Test and calibration procedures - Synchronization techniques - PMU Installation requirements and typical station configurations	IEEE TF initiated. Documents to be completed on December '10.	High	Group effort: Paul Myrda (lead), Mladen Kezunovic, Vahid Madani, Damir Novosel	NO
2	Identify and formalize the gaps not in present standards	Develop white paper	October '10	High	Farnoosh Rahmatian	YES: to speed up and reach the target
3	Define cerification of PMUs	Develop white paper	October '10	High	Jerry Stenbakken	YES: to speed up and reach the target
4	Sharing Specification and Functional Requirements	Review and Approve documents submitted by NASPI members	on-going	High	Vahid Madani/ Damir Novosel	NO
5	Phasor Data Concentrator Requirements	Develop specification or use existing one (see item 4)	November '10	High	Tony Weekes	YES: to speed up and reach the target
6	PMU-PDC/PDC-PDC Communication Methods	Develop a guide to be used by and coordinated with **IEEE** to develop a guide	March '11	High	To identify (Coordinated between PSTT and DNMTT)	YES: to speed up and reach the target
7	Phasor Data Concentrator Testing and Calibration Standard	Develop a guide to be used by and coordinated with **IEEE** to develop a standard	March '11	High	To identify	YES: to speed up and reach the target
8	Guide on using PMU as part of the multi-function devices.	Develop a guide	March '11	Medium	Krish Narendra	May be needed to speed up and reach the target
9	Develop guide on Requirements for Combined Applications using Synchronized Measurement Data.	Develop a guide	July '11	Low	Yi Hu	Low priority
10	Support other TT as needed	Request for support and identifying the type of support needed (e.g. Coordination with DNMTT on NasPInet)		High	Vahid Madani / Damir Novosel & Respective TT Leads	TBD

PSTT Activities Related to PAP13 - 2

Items for Special Focus:

- All high priority
- All require resources to speed up and reach the target

5	Phasor Data Concentrator Requirements	Develop specification or use existing one (see item 4)	Nov '10	Tony Weekes
6	PMU-PDC/PDC-PDC Communication Methods	Develop a guide to be used by and coordinated with **IEEE** to develop a guide	March '11	Henry Huang
7	Phasor Data Concentrator Testing and Verification Standard	Develop a guide to be used by and coordinated with **IEEE** to develop a standard	March '11	Mladen Kezunovic

SGIP-GB Resolution for the Smart Grid Architecture Committee (SGAC)

RESOLUTION 1: "The SGAC shall prepare and submit to the SGIP GB a roadmap and work plan to develop architectural templates and other artifacts necessary to ensure that investments under way now will interoperate, are upgradable, are secure and minimize the impact of technology change that would otherwise result in stranded assets. Another task is that the SGAC shall map Priority Action Plans to the existing Conceptual Model in the "NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1."

SGIP-GB Resolution for the Smart Grid Testing and Certification Committee (SGTCC)

RESOLUTION 2: The SGTCC shall prepare and submit to the SGIP GB a roadmap and work plan to develop processes, testing methods, and other artifacts necessary to ensure that testing and certification programs are implemented that ensure secure interoperability between systems in smart grid applications. The roadmap includes requirements and concepts of methodology and operations for interoperability testing which will be provided to the SGIPGB by March 31, 2010."

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Please Join the PSTT Breakout Session to discuss coordination with IEEE, IEC, NIST on Synchronized Measurements Related Gaps, Testing and the Roadmap to Standards