2012 Smart Grid R&D Program
Peer Review Meeting

Architecture and Standards and GridWise® Architecture Council (GWAC)

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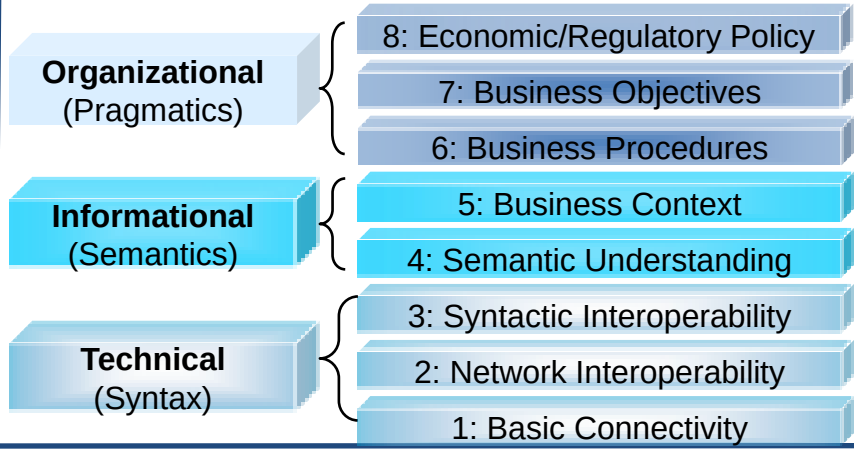
Architecture and Standards
GridWise Architecture Council

Objective

Advance interoperability to enable full-scale smart grid deployments by engaging stakeholders in defining interoperability principles, methods, and tools. Provide DOE related point of coordination for NIST in response to EISA 2007 legislation.

GWAC Stack



Life-cycle Funding Summary ($K)

Prior to FY 12	FY12, authorized	FY13, requested	Out-year(s)
$5,400K	$560K	$200K	$500K/yr

Technical Scope

- GridWise® Architecture Council (GWAC) administration
- GWAC membership – 13 independent, nationally recognized, experts across multiple domains
- Development and dissemination of smart grid interoperability related methods, tools and education
- Leadership and participation in national smart grid interoperability standards activities such as the NIST Smart Grid Interoperability Panel

Significance and Impact

- GWAC's efforts focus on shaping the guiding principles for a highly intelligent, interactive electric power system
- As such they are not linked to specific cost/performance targets
- Impact is broad and tends to lead the industry efforts

Support to Smart Grid R&D Program Milestones, Outcomes, and Goals

Long-term Goal of Integration of DER / DR / PEV* for Improved System Efficiency

The GWAC efforts contribute as follows:

- Advancing interoperability practices and standards
  - Integration of smart grid assets requires interoperable solutions that cross smart grid domains – GWAC efforts continue to support the broader industry understanding of **what** this entails and **how** to achieve it.
  - Regulators, policymakers and legislators continue to need independent input on how to address interoperability and standards in their work – GWAC is recognized as a source of such input. The regulators, policymakers and legislators must be on-board to achieve the smart grid R&D cost & performance targets.

* Distributed energy resources / demand response / plugin electric vehicles

Support to Smart Grid R&D Program Milestones, Outcomes, and Goals, cont.

Continuing …

- Transactive Energy
  - GWAC is taking a lead in creating a consolidated view of "transactive energy" techniques
  - These techniques, which include consideration of dynamic pricing, are a key to a smart grid application layer that is needed to support wide scale integration of smart grid assets. These initial efforts facilitated by GWAC are currently leading the industry discussion

Combined long-term goals of a self-healing distribution grid and integration of DER / DR / PEV

- GWAC's efforts to promote open, interoperability related standards across all levels of the GWAC Stack contribute to these combined goals as follows:
  - Solutions at full operational scale require a move away from vertical, single vendor solutions – GWAC promotes enabling interoperable, multi-vendor solutions
  - Sustainable solutions must accommodate the existing diversity of the grid owner / operators – GWAC's efforts explicitly take this into account

Technical Approach

Methods and Tools

- Continue to update and develop interoperability tools and guidance for the benefit of the community
- Build on seminal work in the GWAC "Interoperability Context Setting Framework" which contains the well known GWAC Stack
- GWAC's efforts have given the community a common language, a way to talk about the challenges – especially important in the policy and regulatory groups

Strategic Vision

- GWAC provides an independent strategic vision to the community

Architecture and Standards Leadership

- PNNL staff provide leadership to the community on behalf of DOE, i.e., Steve Widergren's position as Chair of the SGIP Plenary, Todd Halter and Ron Melton as members of SGIP Architecture Committee

Technical Approach (cont.)

GWAC Engagement with the Industry

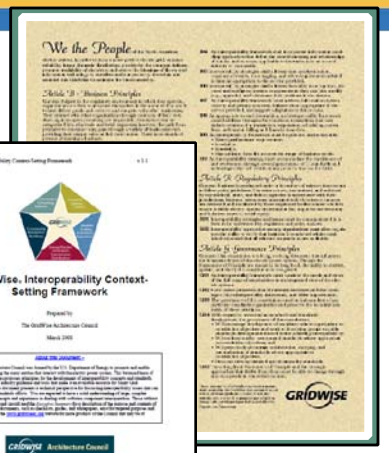
- GWAC Meetings
  - Held a minimum of quarterly
  - Open to all interested parties
  - Outside speakers covering national and international topics of interest
- GWAC Member Liaisons
  - Individual GWAC members are engaged in their respective industry activities
- Grid-Interop Forum
  - Annual GWAC-led technical meeting focused on smart grid interoperability
  - FY13 will be the 6th Grid-Interop with over 750 participants expected
- NIST SGIP Activities
  - GWAC members serve on Governing Board and lead the Architecture Committee and Testing & Certification Committee
  - GWAC members are actively involved in DEWG and PAP activities, often in leadership positions

Transformational Change Example

- GWAC's facilitation of the transactive energy discussion is an example of driving transformational change
- Transactive energy extends the interplay between economic activity (transactions) and the technical operation of an electric power system from end-to-end
- Provides integrated system wide and local benefits
- Requires careful attention to interoperability and architecture

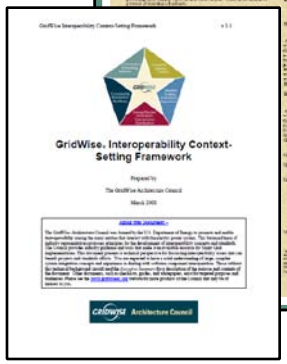
Prior-Years Progress & Accomplishments

2006 – Interoperability Constitution



2007 – Interoperability Decision Maker's Checklist

2008 – Interoperability Context Setting Framework



2009 – Interoperability Benefits Papers

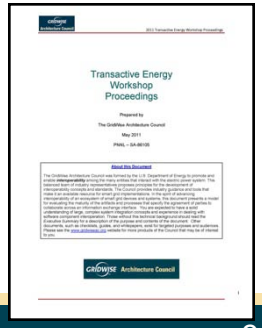
- *Environmental Benefits*
- *Financial Benefits*
- *Reliability Benefits*

2010 - Interoperability Decision Maker's Checklist update

2011 – Smart Grid Interoperability Maturity Model Beta Version
Electrical Power Engineering Academic Landscape

2007-2012 – Grid-Interop Forum

2011-2012 – Transactive Energy Workshop



FY12 Progress & Milestones

Grid-Interop Forum

5th Forum was held in Phoenix	Dec. 6 - 8, 2011
6th Forum planned for Dallas	Dec. 3 - 6, 2012

GWAC Community Engagement

Educational Outreach Needs Report	November 2011
Interoperability Maturity Model – Beta Release	December 2011
2nd Transactive Energy Workshop	March 28 – 29, 2012
ConnectivityWeek – GridWise Expo	May 23, 2012

NIST Support

BnP, H2G, T&D, I2G, AC, TCC chair or co-chair positions	Ongoing
Steve Widergren serves as the NIST SGIP Plenary Chair	Ongoing

Out-year Planned Progress & Milestones

Grid-Interop Forum 2012	
(Irving, TX)	December 3-6, 2012
Refine Interoperability Maturity Model	
Conduct SGIMM workshop	December 2012
Smart Grid Interoperability Webinars for Regulators	
Coordinated with NARUC	December 2012
Material developed and webinars started	July 2013
Transactive Energy Workshop	
White paper completed	December 2012
3rd workshop	July 2013
Smart Grid Interoperability Educational Materials	
Lecture material delivered to educators	August 2013
GWAC Administration and NIST Support	Ongoing

DOE Role and Funding Leverage

Organizational Interactions:

- GWAC Member's organizations (13 of them representing a cross-section of the industry) - GWAC members make a 20% time commitment
- Industry participation in GWAC meetings – FERC, EPRI, SGIP, NIST, and others
- GWAC members participation in other activities – SGIP, IEEE, ISO / IEC, UCAUIG, LON Mark, and others

DOE's Unique Role:

- GWAC serves as an independent, respected voice addressing longer term strategic aspects for the smart grid elements of grid modernization

DOE Role and Funding Leverage

DOE's Added Value:

- The independent / across the industry nature of GWAC is recognized and respected within the industry
- NIST is required by EISA 2007 to consult with GWAC
- GWAC adds value by providing a strategic context for day-to-day activities

How the GWAC activities catalyze the industry:

- The "GWAC Stack" has become the industry recognized framework for addressing interoperability
- GWAC continues to look for ways to educate, update and develop new material to inform the industry – currently focused on the business and regulatory dimensions

Contact Information

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Back-up Slides

GWAC Areas of Activity

- Interoperability
  - Exchange of actionable information
    - between two or more systems
    - across organizational boundaries
  - Shared meaning of the exchanged information
  - Agreed expectation of the response to information exchanges
  - Requisite quality of service of information exchange
- Heterogeneity
  - Multiple versions and mixtures of technology
    - Including today tech with *tomorrow's* innovations
  - Multiple vendors with multiple products
  - Multiple services needing integration
  - Multiple organization structures
- Transactive Energy
  - Extends the interplay between economic activity (transactions) and the technical operation of an electric power system from end-to-end

Phases of Progress

Goal: Develop a culture for implementation-ready electric automation products & services