

GridWise® Architecture Council

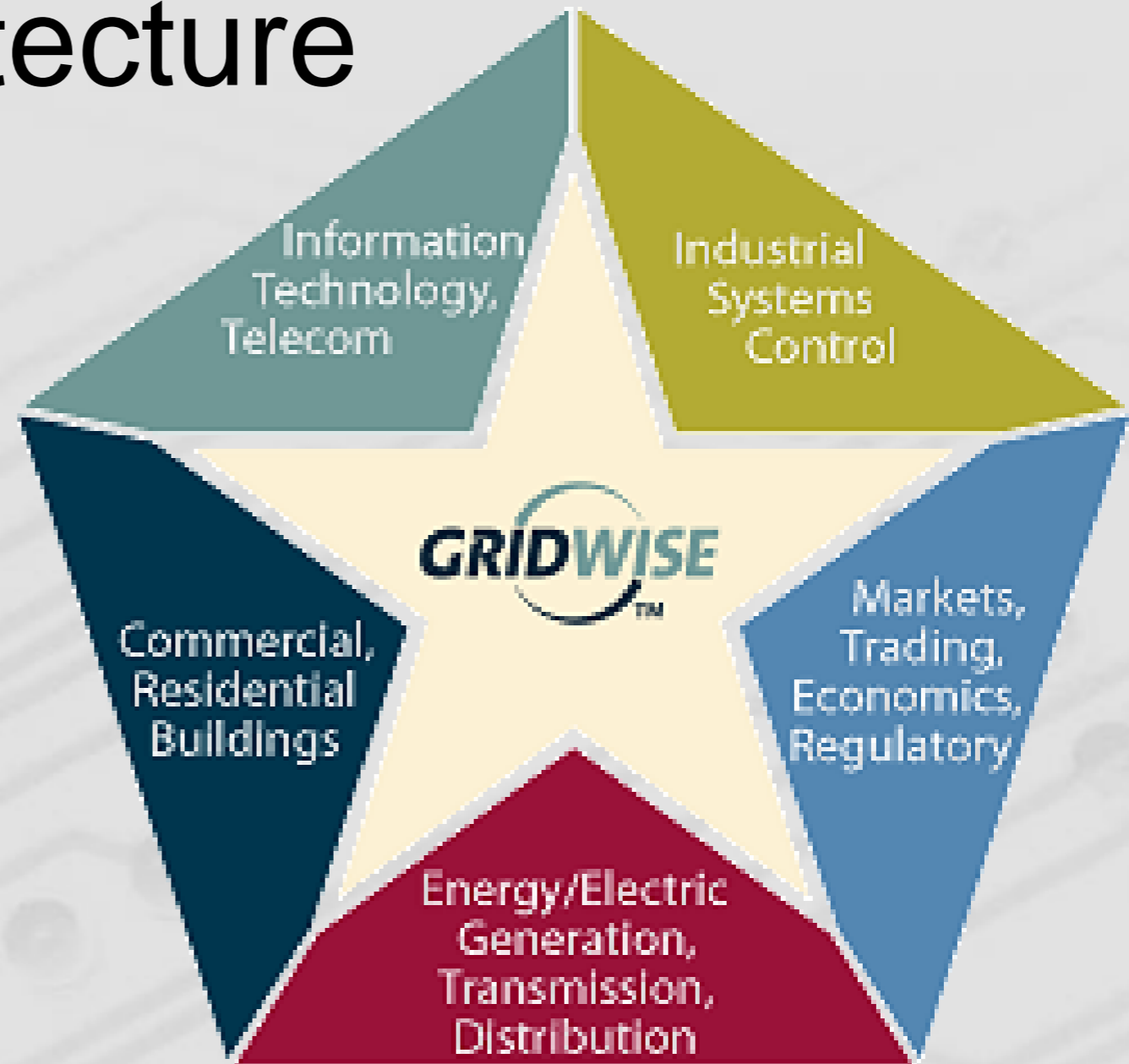
Erich W. Gunther, P.E., FIEEE

Chairman, GWAC

CTO, EnerNex

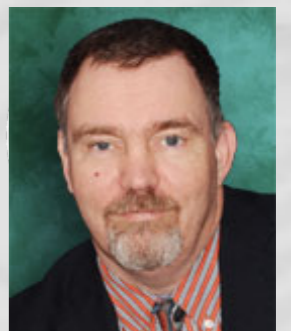
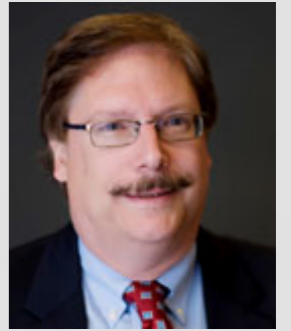
Chairman, UCAIug

Administrator, NIST SGiP



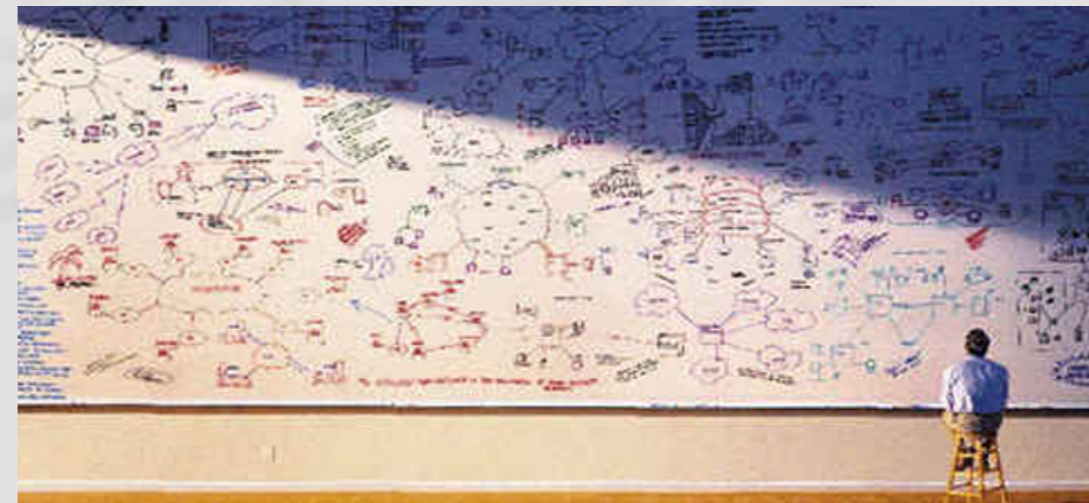
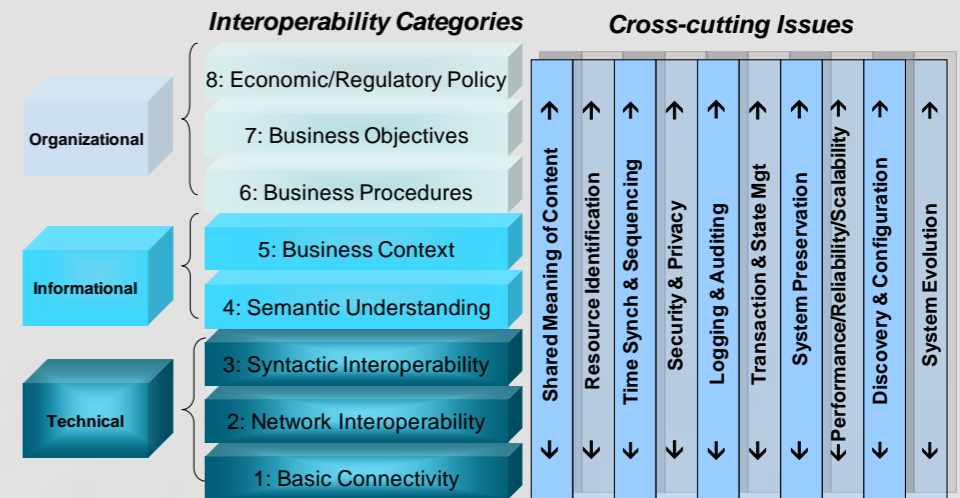
GridWise Architecture Council

- Strategic Impact
- Diverse team of leaders embedded in industry
- Shaping the guiding principles for a highly intelligent, interactive electric power system
- Guidance for public and private infrastructure investment



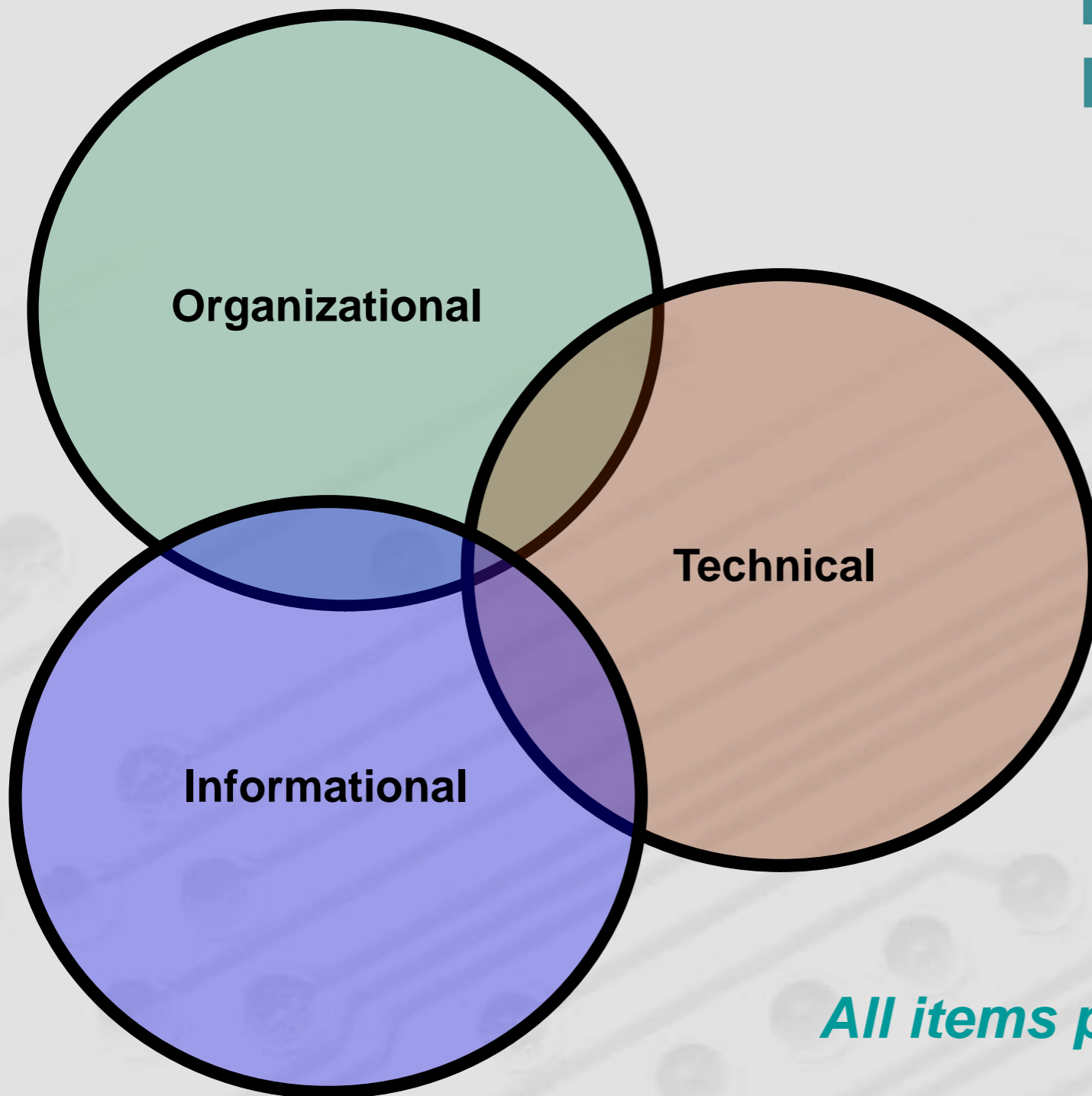
GWAC Activity Area's

- 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
- Managing Complexity
 - 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
- Strategic forum for GWAC members and third parties to address big problems
- Organizational support – NIST, SGIIP, DoE



GWAC Impact - Interoperability

Interoperable Systems- Expected Impact:

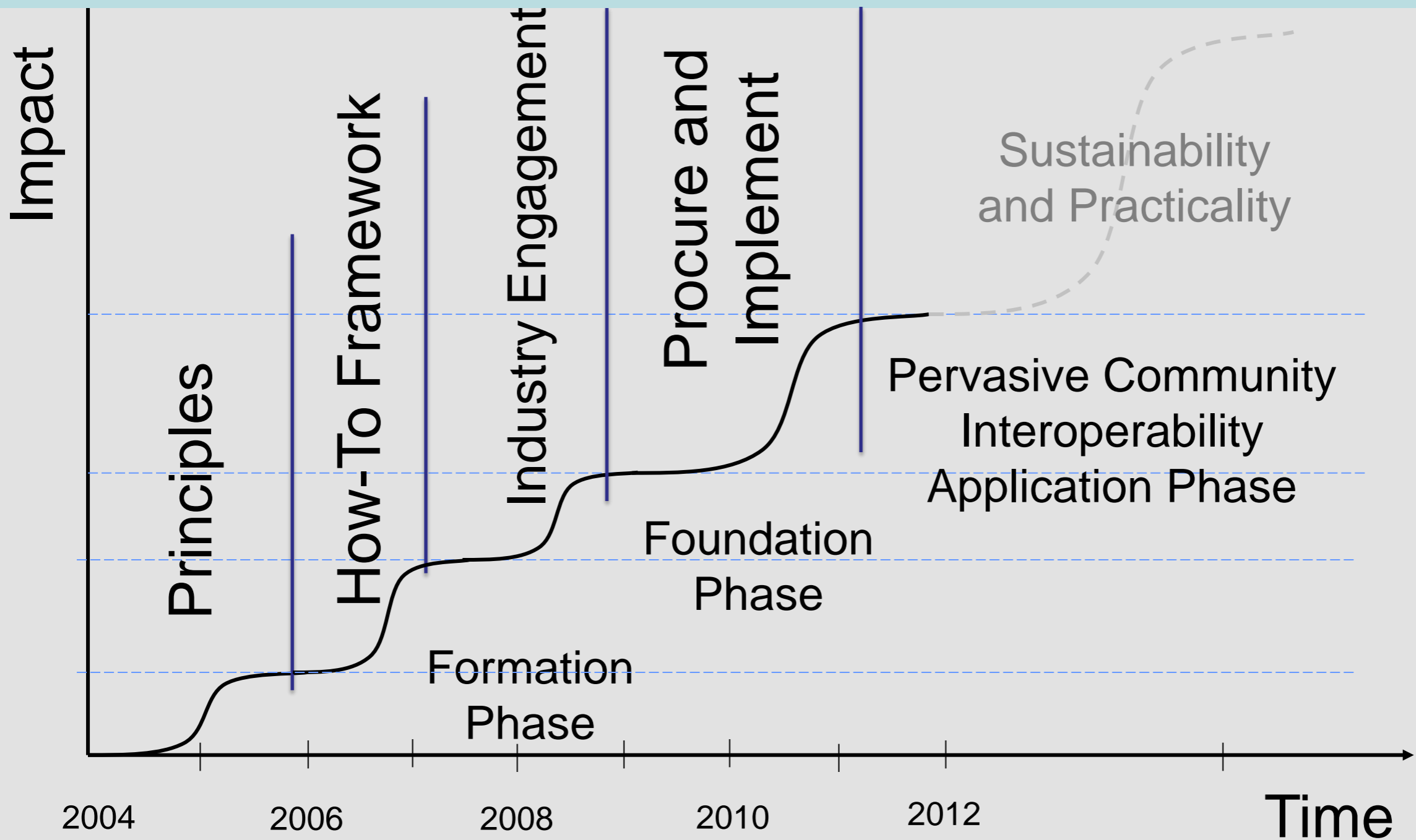


- Integration cost
- Cost to operate
- Capital IT cost
- Installation cost
- Upgrade cost
- Security management
- Choice in products
- Price points & features

All items provide compounding benefits

Phases of Progress

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



What's in it for you



We the People
of the North American electric system, in order to have a more perfect electric grid, ensure reliability, lower the waste distribution, provide for the constant delivery, promote availability of electricity, and secure the benefits of liberty and justice, including to ourselves and our posterity, do hereby establish this GridWise Constitution for Interoperability.

Article B - Business Principles
Governor: Subject to the regulatory environment, in which they operate, each utility shall have the right to operate in the most efficient way to best deliver goods and services and compete with other businesses. They interact with other organizations through contracts of their own choosing, in a spirit of mutual respect, as possible. Enterprises may be categorized into wholesale and retail, long-term, however, they shall from practice to consumer, may pass through a variety of business models, providing their unique value added contribution. There is no central point of funding or taxation.

Article R - Regulatory Principles
Governor: Electricity rates are a wide range of needs and energy management capabilities, as well as varying degrees of willingness to pay for any given energy product. The rate structure is a critical element of the system to be profitable, if any portion of a overall system, operations, including and not, include low, lower rates, and so on.

Article U - Utility Principles
Governor: Electricity rates are a wide range of needs and energy management capabilities, as well as varying degrees of willingness to pay for any given energy product. The rate structure is a critical element of the system to be profitable, if any portion of a overall system, operations, including and not, include low, lower rates, and so on.

GridWise Interoperability Context-Setting Framework v.1.1

GridWise. Interoperability Context-Setting Framework

Prepared by
The GridWise Architecture Council
March 2008

Interoperability Categories

- 8: Economic/Regulatory Policy
- 7: Business Objectives
- 6: Business Procedures
- 5: Business Context
- 4: Semantic Understanding
- 3: Syntactic Interoperability
- 2: Network Interoperability
- 1: Basic Connectivity

Cross-cutting Issues

- Shared Meaning of Content
- Resource Identification
- Time Synchronizing
- Security & Privacy
- Logging & Auditing
- Transaction & State Mgt
- System Preservation
- Performance/Reliability/Scalability
- Discovery & Configuration
- System Evolution



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Smart Grid Interoperability Maturity Model Beta Version
December 2011

www.gridwiseac.org

GridWise® Architecture Council

Interoperability Decision Maker's Checklist
August 2010

www.gridwiseac.org

GridWise® Architecture Co

Financial Benefits of Interoperability
How Interoperability in the Electric Power Industry Will Benefit Stakeholders Financially

www.gridwiseac.org

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Environmental Benefits of Interoperability
The Road to Maximizing Smart Grid's Environmental Benefit

www.gridwiseac.org

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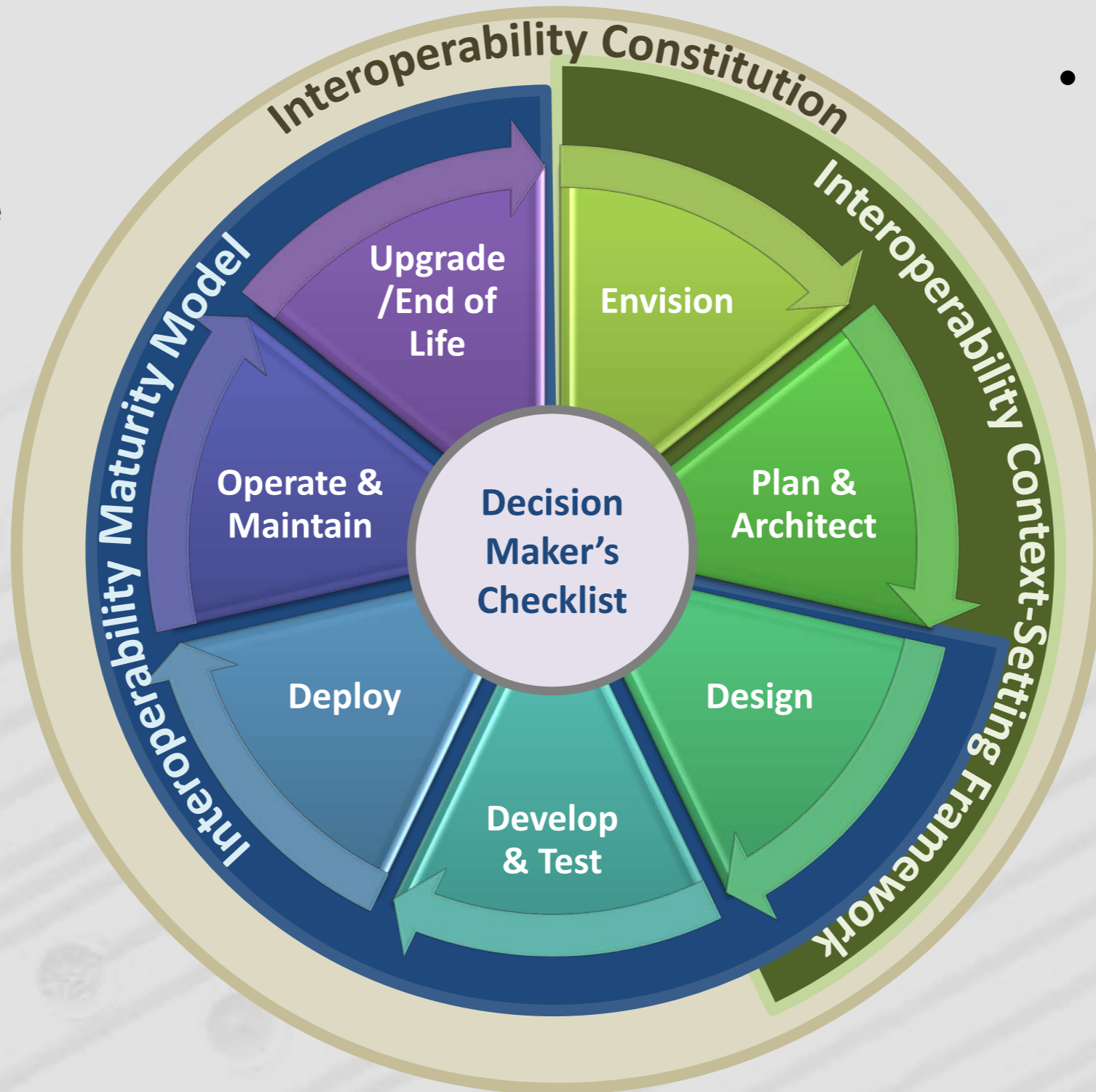
Reliability Benefits of Interoperability

www.gridwiseac.org

GWAC Work Products in Context of Technology Adoption Lifecycle

- Pragmatic
 - Support the Business Case
 - Security
 - Hybrid System Support

- Value
 - Financial
 - Environmental
 - Reliability
 - Safety



GWAC Impact - Metrics

- 2011 Document Downloads

GridWise® Interoperability Context-Setting Framework	1811
Decision-Maker's Interoperability Checklist	1701
Meeting Minutes	1138
Financial Benefits of Interoperability	394
GridWise® Interoperability Constitution	522
Reliability Benefits of Interoperability	371
Standards Mapping	611
Interoperability Path Forward Whitepaper	384
Environmental Benefits of Interoperability	367
GridWise Architecture Tenets and Illustrations	305
Constitutional Convention Proceedings	197
Bylaws	66
Mission & Structure	60
Other	984
Total	8911



- Paper references

40% of IEEE smart grid related conference papers reviewed by the IEEE PES IGCC in 2012 to date referenced the GWAC stack (double 2011 rate) versus 25% referencing NIST Framework

- H-Index = 21 (standard measure of productivity and impact for publications)

Industry Challenges

- Transactive Energy (more markets, more distributed, more players - smart devices and systems acting intelligently on our behalf in a business context)
- Enhanced reliability and quality – new metrics needed – old ones too coarse
- Concepts and strategy for pervasive DER
- Electrification of transportation
- Opportunities for the application of Microgrids
 - New interoperability concepts, standards and metrics required
- Regulatory reform required
 - Facilitate/allow utility infrastructure investment
 - More uniformity across states
- Education
 - Utility engineers – new skills necessary for grid modernization
 - Regulators – what is possible, what is necessary
 - Universities – what is needed by industry – creating smart grid engineers
- Leadership
 - Federal entity leadership necessary to help mitigate impacts of regulatory balkanization



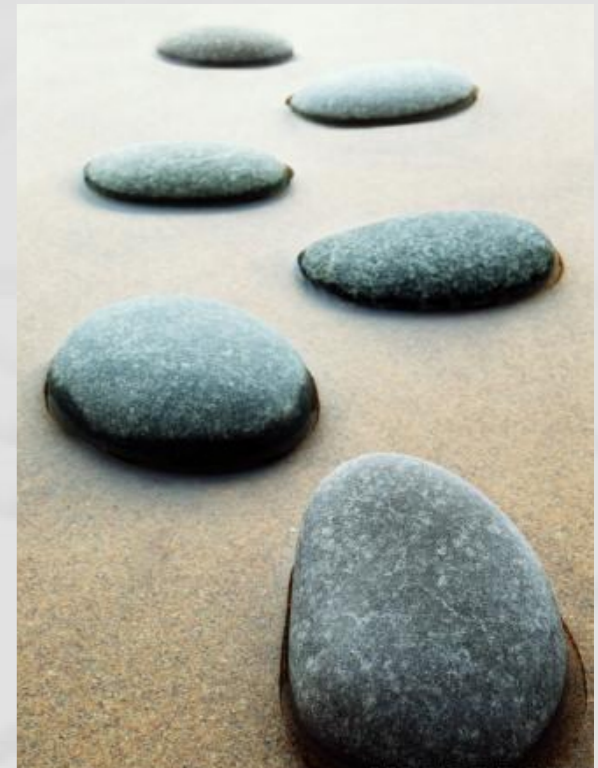
Success Story – Green Button

- Common sense idea – consumers own energy use data, have access to it in a standard format, apps and services available to use it – **a policy, a brand, a set of technologies**
- White House idea to first implementation in 90 days
- Utilizes new, fast tracked **interoperability standard (ESPI)**
- Implements many key principals of the **GWAC constitution** and utilizes almost all layers of the **GWAC stack**
- Lots of political haymaking, **satisfied customers**, market for apps, low cost energy provider implementation
- **10 million customer accounts** have access now, 20 million more associated with utility commitments
- **> 70 vendors** offering products and services
- **55 entrepreneurs** participate in US DoE Apps for Energy contest - <http://appsforenergy.challenge.gov/submissions>



Next Steps for the GWAC

- Sustainability
 - The GWAC is working to ensure that the success achieved to date is sustainable
 - Manufacturers and utilities applying GWAC principles and work products have done so successfully in green field situations
 - Pervasive interoperability necessitates applying the principles in hybrid systems as well – integrating existing infrastructure and processes with the new
- Assessing the Landscape
 - Articulating our observations on industry deployment progress, issues and challenges, and sage advice on how to achieve long term goals
 - Supporting public and private entities with independent informed ideas, views – support and enhance leadership



Summary

- We are an collection of diverse industry experts donating our time to provide independent viewpoints, strategy, and ideas in multiple contexts for a diverse stakeholder community with the guidance and administrative support of the DoE.
- GWAC has a successful historical and ongoing role and reputation in developing strategy for grid modernization including the concepts and benefits associated with standards based interoperable systems.
- We offer our support to you in fulfilling your mission and we request your support and advice on how to best leverage the council in your activities and the activities of others that you engage and influence.
- We invite you to participate in our numerous venues for strategic discussion and information exchange including our 2-3 day meetings (3 or 4 per year), teleconferences (monthly), conferences (GridInterop and Connectivity Week), and workshops (transactive energy, interoperability maturity model, and others)

Questions and Resources

- GWAC Web Site – All publications available here
<http://www.gridwiseac.org/>
- List Server
<http://www.smartgridlistserv.org/cgi/wa.exe?SUBED1=GWAC-INTEREST>
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