Agenda:

1. Review purpose and charter of the Implementation Methods Committee (IMC)

2. Review status of current work item: “Quantification of Effort by Integration Type” – Ron Cunningham

3. Group discussion: Future work items
Implementation Methods Committee

- **Objective of the IMC**: Focus on issues associated with the implementation and adoption of standards and interoperable systems

- **Target Audience**: Implementers of Interoperable systems: vendors, asset owners, consultants
IMC Charter

The IMC charter lists three areas of work:

• **Coexistence** with legacy systems and earlier versions of standards
  • Identify methods and practices to resolve technology conflicts affecting system reliability or operations
  • Identification of methods and practices of operating in a mixed technology environment

• **Migration Path Options**
  • Description of options for migrating from a legacy installed base or an earlier version of the standard to the new standard. (e.g. as PAP 18 did for SEP)

• **Lessons learned and best practices**
  • Documentation of reference implementations including lessons learned data, and analysis from smart grid deployments. May include architectural templates for implementing and/or guidance regarding implementation
Interoperability Implementation Experiences (IIE) Project

- Kelly Flowers, “Implementing the CIM at DTE”, IMC Utility Case Study Series, 1/14
- Doug Lambert, “Interoperability with MultiSpeak: One Utility’s Story”, NRECA, 3/14
- Jon Hawkins, “System Integration of Utility-Scale PV Plus Battery Storage – Interoperability”, Public Service Company of New Mexico, 5/14
- Glenn Pritchard, “Development of an AMI-Based Transformer Monitoring Analytics at PECO, PECO, 5/14
- Andrew Wright, “Implementing Cybersecurity in a G&T Coop”, Anonymized Utility, 9/14
- “Implementing the IEC 61850 Substation Automation Standard”, 5/15
<table>
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<th>ICT Project</th>
<th>Next Steps</th>
<th>Volunteers to Serve on the Project Working Group</th>
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| White paper on innovation within electric utilities  | • Create a working group / identify a project lead  
• Develop a project work plan  
• Develop a high level outline for the paper  
• Develop a proposal (work scope and cost estimate) for SGIP to hire a technical writer to develop the paper | Ron Cunningham  
Sharon Allen                                                                                                           |
| Guidelines for incorporating interoperability into procurement language | • Create a working group / identify a project lead  
• Develop a project work plan  
  o Define objectives, approach, deliverables and schedule.  
  o Determine the resources necessary to do the project | Ron Cunningham  
Bruce Muschlitz  
Rolf Bienert  
Sriram Narayanan                                                                                    |
| Methodology for developing a business case for interoperability | • Create a working group / identify a project lead  
• Develop a project work plan  
  o Define objectives, approach, deliverables and schedule.  
  o Determine the resources necessary to do the project | Ron Cunningham  
Nick Wagner  
Rolf Bienert  
Sriram Narayanan                                                                                    |
Quantification of Effort by Integration Type
Ron Cunningham, AEP
An EPRI P161E EA Collaboration Group Project
At what cost point is PtP or ESB or IOP Stds-Based Integrations Cost Effective? Should / Do we care?

PtP versus ESB versus SBI Work Effort - 10yr TCO measured wrt 1st PtP Integration with System A From System A's Organization Owner Perspective

Illustrative
Quantifying PtP versus ESB versus IOP Stds Based Integration Work Effort (costs) – Project

**Hypothesis** – System integrations using interoperable industry standards become more cost effective after x additional integrations than basic point-to-point integrations

EPRI EA Collaboration Group taken point on Grid 3.0 Interoperability Quantifying of Effort (Costs) by Integration Type project. Phase1:

- Research prior art / research / published papers on quantification of integration of costs, not qualification of integration costs
- Vet / Revise as needed (using results from research) in collaboration with GWAC, DOE GMLC IOP Project, SEPA-SGIP IMC/SGAC, NIST:
  - Integration and interoperability related terms & definitions
  - P2P, ESB, IOP Stds-Based integrations quantification of work effort (costs) Work Breakdown Structure
  - Gathering / assessment / categorization of integration work effort (costs) data
  - Create Quantification Assessment Framework and tool (Proof Of Concept)
- Prepare paper and slide-deck (with notes), share with industry

Note: Phase 1 target nominal elapsed time – 6 months, dependent upon resource availability; Phase 2 – late 2018 deliverable – tool with vetted industry metrics and address related topics raised by Phase 1
Phase 1 content created and being readied for EPRI Pubs and paper formatting and language norms. Includes (see following slides for details):

- Results of research of prior art / research / published papers on quantification of integration of costs
- Documenting integration and relater terms & definitions
- Created work breakdown structure by integration type PtP, ESB, SBI with discussion of architectural, design, deployment options
- Created and exercised spreadsheet tool to generated chart(s) of incremental and cumulative cost points (CapEx and OpEx, 10yr TCO), for PtP, ESB, SBI based integrations
Project Initial Observations

- prior art / research / published papers on quantification of integration of costs - very few found and readily sharable, mostly qualification based.

- integration and relater terms & definitions – many found with varying degrees of satisfying full scope of system interface layers as needed for this paper’s focus

- work breakdown structure by integration type – several architectural, design, deployment options discussed

- Substantiation of the hypothesis – not enough quantification examples gathered to load spreadsheet tool with real world data values. User must do that for themselves
Project Initial Observations (cont’d) - Integration Terms

Integration

- Interface
  - Adapter
  - Compatibility

Point-to-Point (PtP) Integration

Interoperability

- Vendor specific
  - Intraoperability
    - Enterprise Application Integration (EAI)
      - Hub and Spoke Integration
        - Horizontal Integration
          - Enterprise Service Bus (ESB)
            - Industry SSO/SDO IOP
              - Standards Based Integration

Legend

- Subject predicate Object
- Subject subsetOf Object
### Project Initial Observations (cont’d) – WBS Content for PtP, ESB, SBI Integrations +

<table>
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<tr>
<th>Work Effort Item per Interface layer</th>
<th>Comments - 1st Integration (no prior interfacing knowledge between System A &amp; B)</th>
<th>Comments on integrations post the 1st integration</th>
<th>Comments for ongoing O&amp;M and support for each system integrated to System A</th>
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<tbody>
<tr>
<td>1.0 Discovery &amp; Sharing of System Interfacing Capabilities</td>
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<td>2.0 Negotiating Interface Layer(s) specifics &amp; optioning</td>
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<td>3.0 Learning &amp; Training on the in-scope interface specification</td>
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<td>4.0 Design &amp; Build hardware/software to negotiated Interface Layer specs</td>
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<td>5.0 Conformance Testing to specific interface layer negotiated. specs</td>
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See appendix B of paper for all details
At what cost point is PtP or ESB or IOP Stds Based Integrations Cost Effective? Should we care Now?

PtP versus ESB with ESB deploy versus SBI with one IOP Std Dev participation
Work Effort 10yr TCO per integrate System x set - measured wrt 1st PtP Integration with System A assuming all systems owned by same Organization Illustrative
Potentials for Phase 2

- Gather/normalize more real world examples of detailed quantification of effort by integration type and load into spreadsheet tool.

- **Substantiation of the hypothesis** – not enough quantification examples gathered to load spreadsheet tool with real world data values. User must do that for themselves.

- Further investigate **linkage of this paper’s quantification of integration effort to integration / interoperability maturity models** e.g. DOE GMLC Interoperability Project IMM improvement; The Open Group’s Integration Maturity Model.

- **Integrations at a subcomponent with other subcomponents** and in the IoT lightweight domain space.
Group Discussion

• Potential Activities
  • Continuation of the Quantification of Effort by Integration Type” project
  • White papers on interoperability experiences
  • Procurement best practices
  • Other