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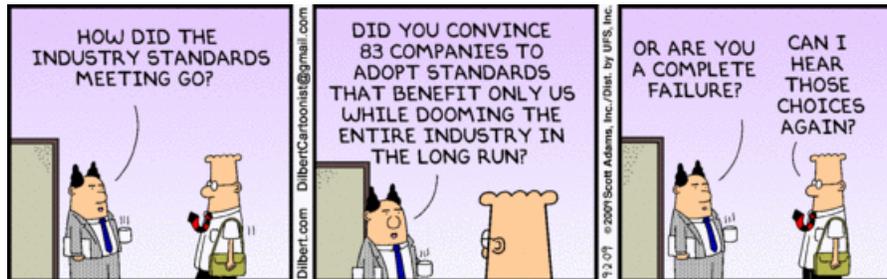
Smart Grid Demonstrations- Contributing to Industry Standards and Interoperability

Mark McGranaghan

Topics

- NIST Interoperability Standards Development Overview
- Examples of Priority Action Plans
 - Storage and Distributed Generation
 - Distribution Grid Management
- EPRI Coordination with Standards Development - Intelligrid
- Coordination with OpenSG and Standards Organizations
- Microgrids Coordination

One View of Standards Development



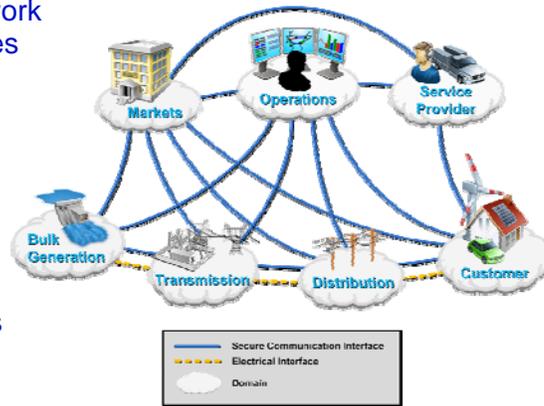
NIST Interoperability Standards Development Process – Phase 1

- 3 workshops held between April & August
- Over 1300 participants
- Identify “Low-Hanging Fruit” standards
- Develop Smart Grid applications and requirements
- Develop Action Plans for Priority Standards Development Activities



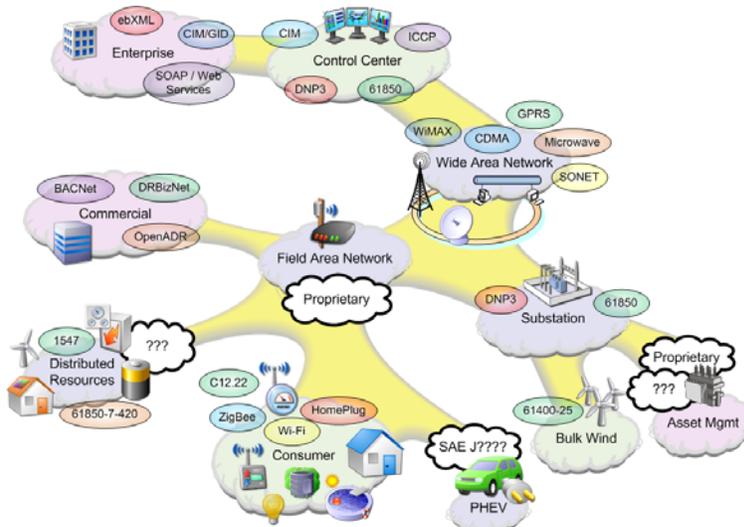
EPRI Report to NIST

- Interoperability Framework Principles and Strategies
- Smart Grid Conceptual Model
- Cyber Security Considerations for the Smart Grid
- Smart Grid Applications and Requirements
- Smart Grid Standards Assessment and Profile
- Prioritized Actions

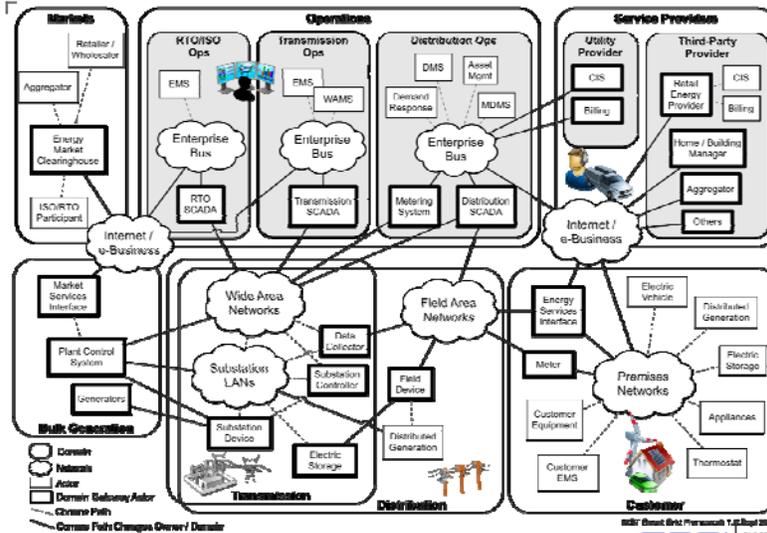


<http://www.nist.gov/smartgrid/>

Existing Standards – NIST expanded initial list to 31 standards



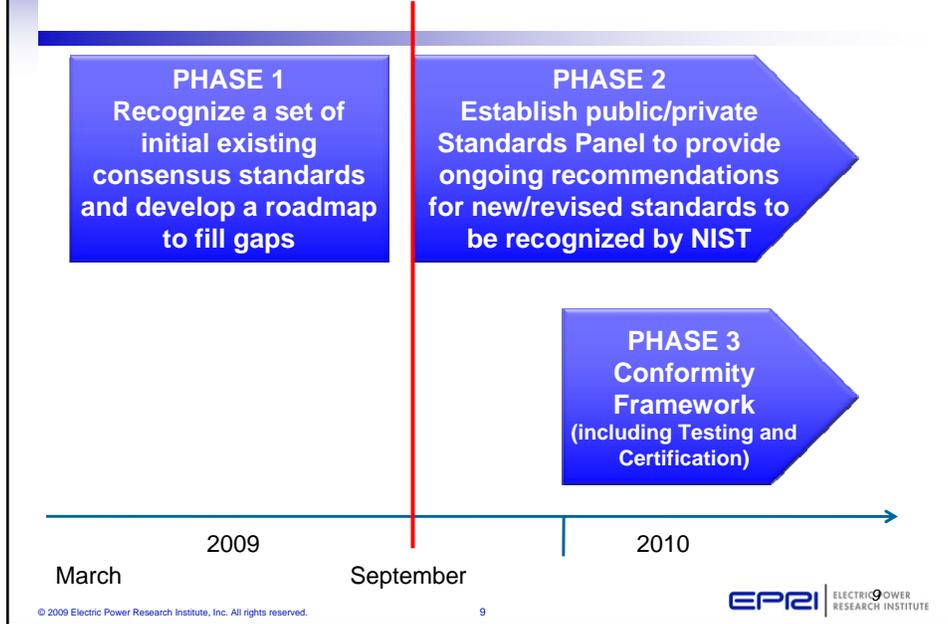
Conceptual Reference Diagram



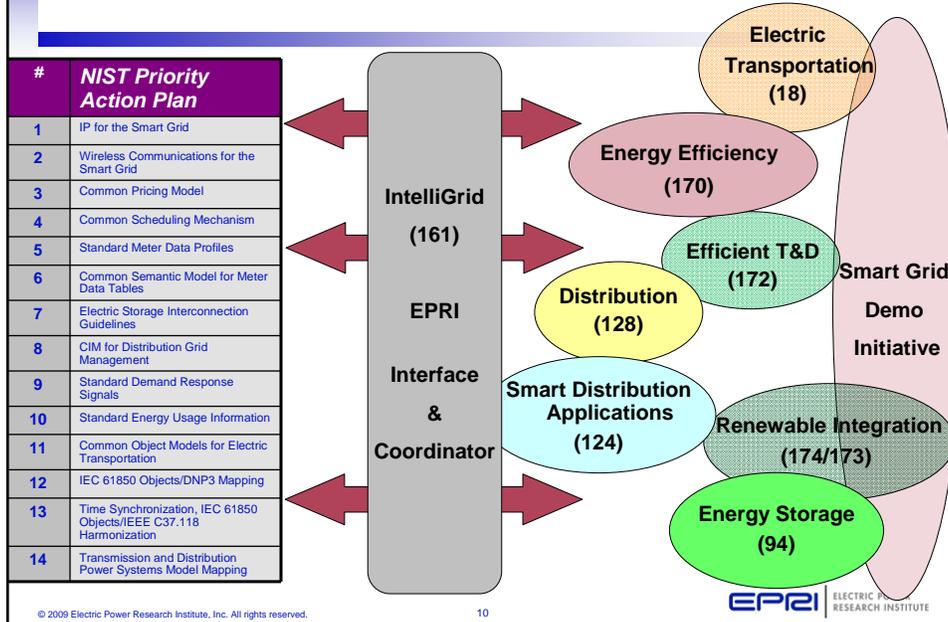
Priority Action Plans (plus Security Task Group)

- | # | Priority Action Plan |
|----|--|
| 1 | IP for the Smart Grid |
| 2 | Wireless Communications for the Smart Grid |
| 3 | Common Pricing Model |
| 4 | Common Scheduling Mechanism |
| 5 | Standard Meter Data Profiles |
| 6 | Common Semantic Model for Meter Data Tables |
| 7 | Electric Storage Interconnection Guidelines |
| 8 | CIM for Distribution Grid Management |
| 9 | Standard Demand Response Signals |
| 10 | Standard Energy Usage Information |
| 11 | Common Object Models for Electric Transportation |
| 12 | IEC 61850 Objects/DNP3 Mapping |
| 13 | Time Synchronization, IEC 61850 Objects/IEEE C37.118 Harmonization |
| 14 | Transmission and Distribution Power Systems Model Mapping |

NIST Phase 2 and Phase 3 Plan



EPRI Follow-Up on NIST Priority Actions



Program 161 – IntelliGrid

PS161A – IntelliGrid Technology
Transfer and Industry
Coordination

PS161B – Infrastructure for
Intelligent Transmission Systems

PS161C – Infrastructure for
Intelligent Distribution Systems

PS161D - Infrastructure and
Technology for Advanced
Metering, Integrating Demand
Response & Energy Efficiency

PS161E – Security Issues for the
Power System Communication,
Information, and Control
Infrastructure

Example – Energy Storage Integration

- Develop **Scoping Document**
 - ES-DER interconnection and operational interface requirements for the full spectrum of application issues
- Develop **Use Cases** to identify interconnection and object modeling requirements
- Update or augment the **IEEE 1547** distribution level standards series as appropriate to accommodate the wide range of ES-DER system requirements.
- Augment the **IEC 61850-7-420** object models for ES-DER through IEC TC57 WG17.
- Initiate development of **transmission level standards** for ES-DER.
- **Harmonize the distribution and transmission level standards**, where possible.

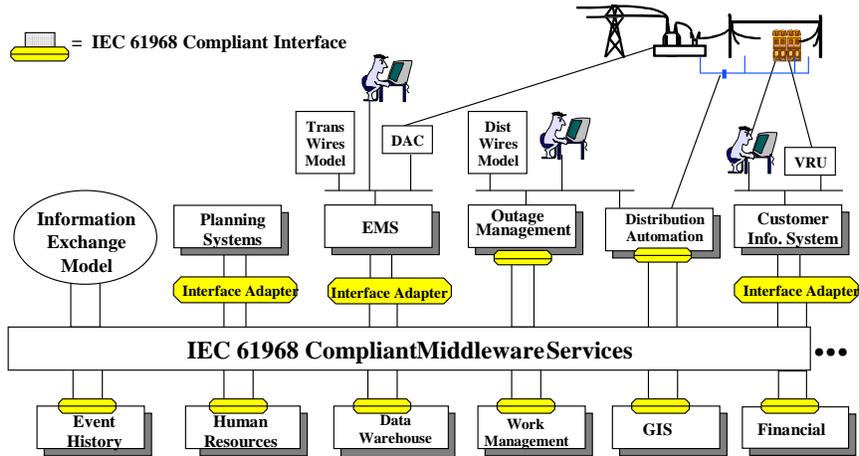
Energy Storage Scoping Document Outline

- Executive Summary/Introduction
- Applications for Dispatchable ES-DER
- Electrical Interconnection of ES-DER
- Regulatory Issues for ES-DER
- Business Issues for ES-DER
- General Standards and Implementation Guidelines for ES-DER
- Specific Standards needs for ES-DER Technologies/Applications
- Detailed Timeline and Specifications for High Priority Standards

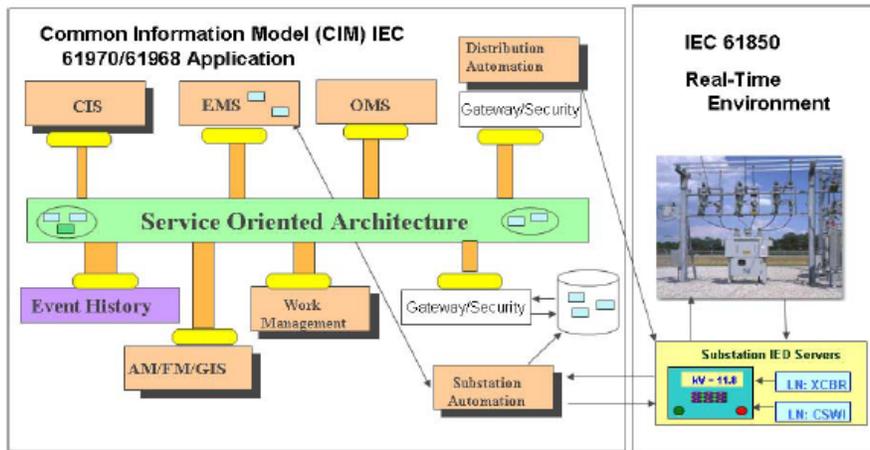
Example – CIM for Distribution

- Task 1: UML model for [MultiSpeak](#)
- Task 2: Team for UML tools (CIMug)
- Task 3: Team for interoperability testing (CIMug)
- Task 4: WG14 Modelling Team Status Webconference
- Task 5: Create SG use case team
- Task 6: Use case master list
- Task 7: Use cases refined
- Task 8: Review and assign use cases (WG19)
- Task 9: Develop models (CIM and 61850)

Common Information Model (CIM) and the IEC 61968 Interface

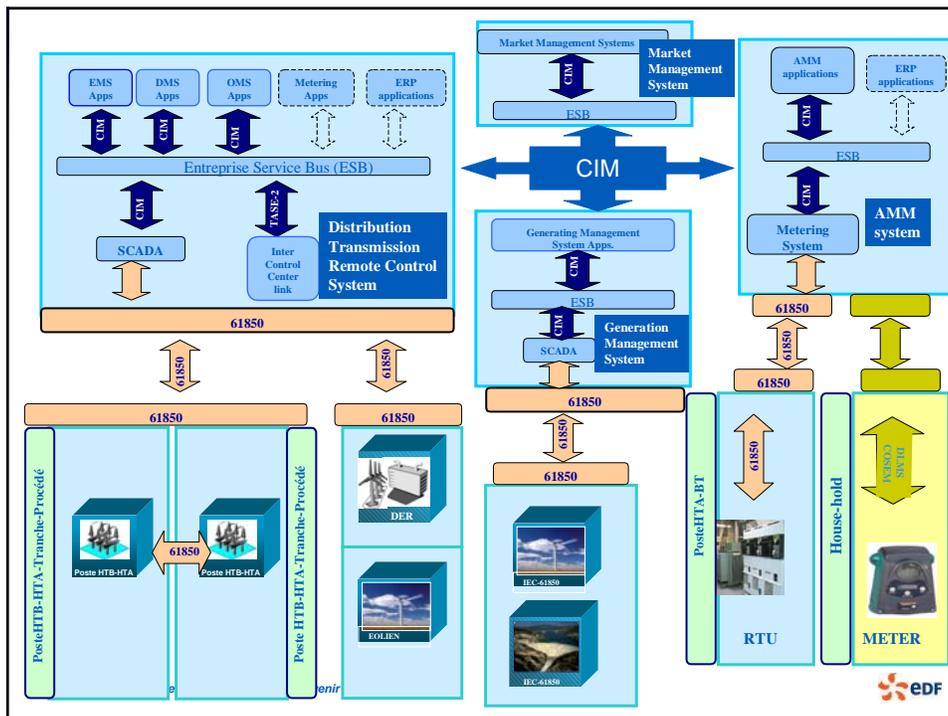
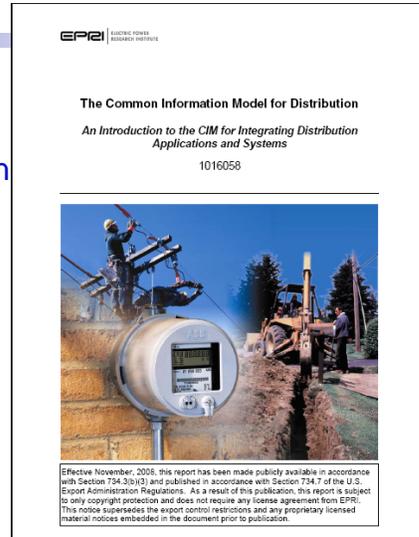


IEC 61850 and CIM



Accomplishments

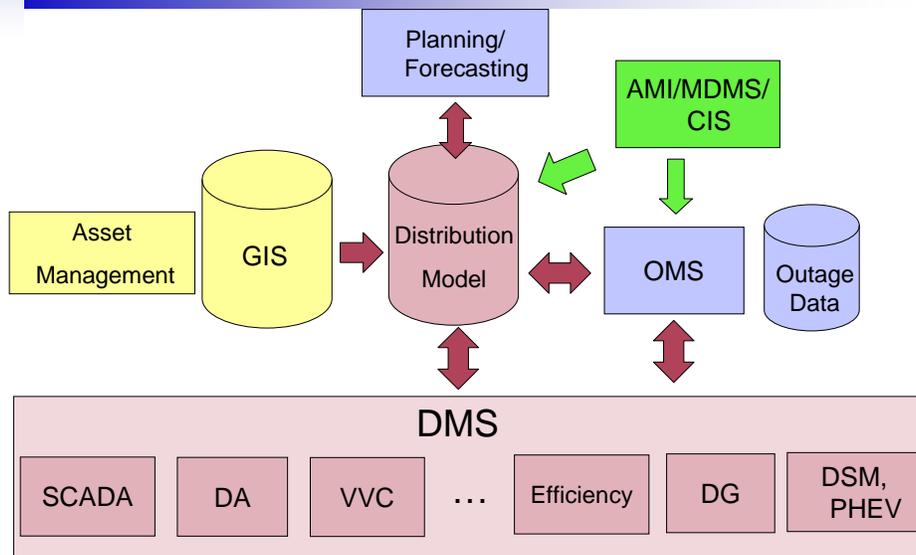
- CIM for Distribution Overview
- CIM for Distribution development plan in conjunction with IEC TC57 WG 14
- Contribution of CIM for Distribution plan for NIST PAP 08
- CIM interface development for OpenDSS
- Plan for Interop Testing
- Vendor Training



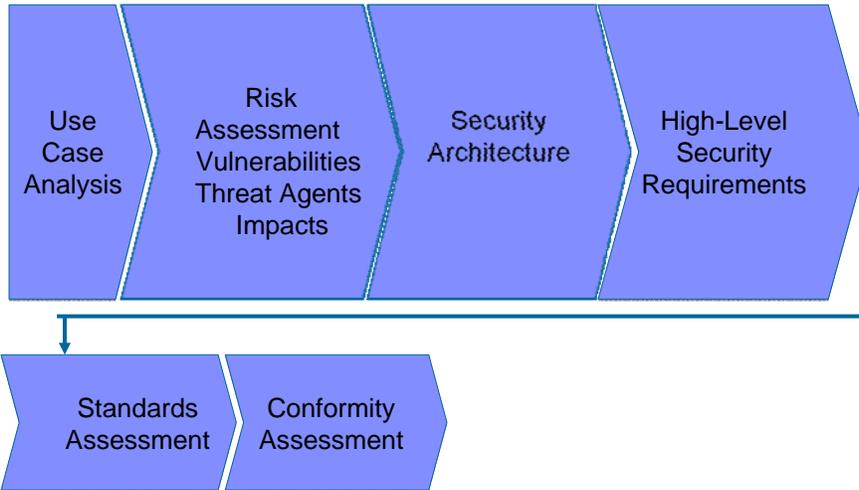
Example CIM Development Needs

- Support for unbalanced and single phase systems (basic distribution need)
- Distribution automation technologies and controls
- Advanced metering (Part 9)
- Advanced load/customer models
 - Load profiles by customer class
 - Demand response and direct load control
 - Voltage dependency
 - Price dependency
- Distributed renewables and DG
- Distributed storage systems
- Microgrids and Controls

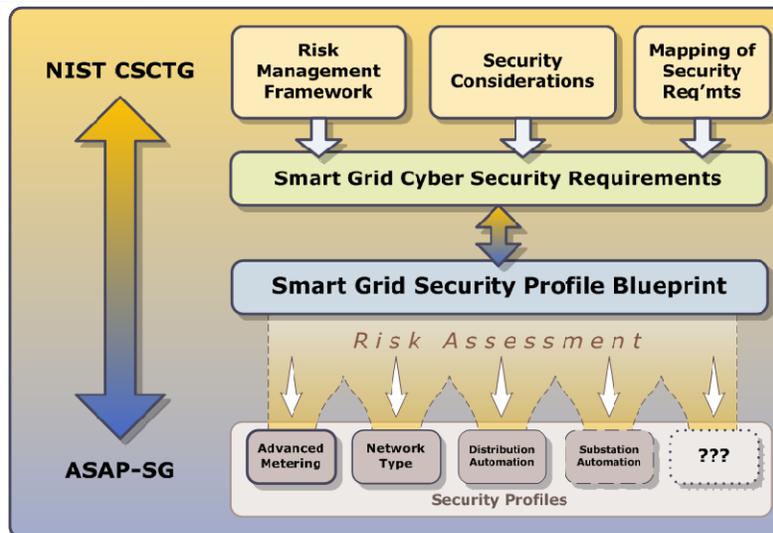
Distribution Model as Center of Future DMS



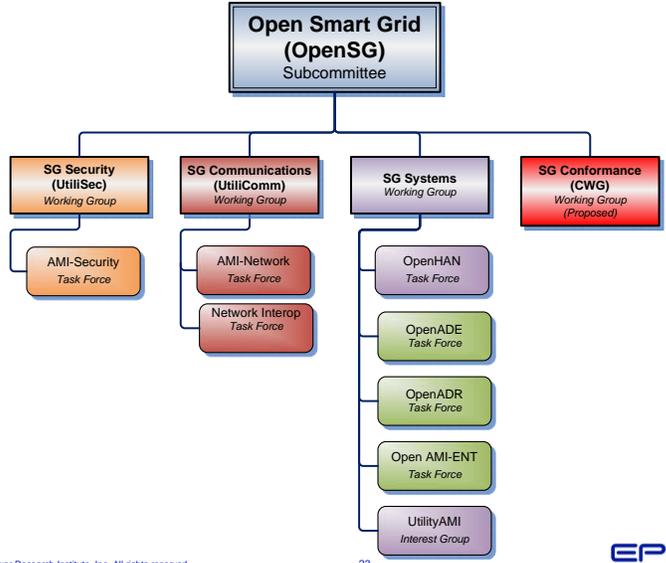
Cyber Security Work Program



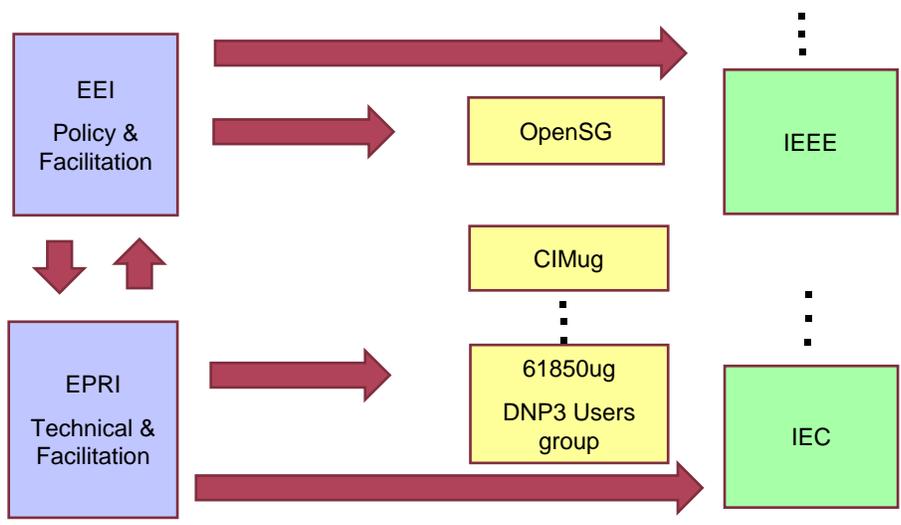
Security Requirements Development



Open Smart Grid



Standards Development Coordination – Getting Utility Input



EPRI Smart Grid Resource Center

www.smartgrid.epri.com - & Use Case Repository

The screenshot shows the EPRI Smart Grid Resource Center website. The page title is "Use Case Repository". The main content area includes a description of the repository, a list of use case categories with counts, and a table of use cases under the "Customer Services" category.

Use Case Repository

The EPRI Use Case Repository is a collection of use cases and requirements developed within the industry as well as through EPRI's smart grid demonstration initiative. All use cases are delivered as PDFs. You may use the [NIST Use Case Template](#) (Doc 6406) to create your own use cases and submit them to grwaldfeld@epri.com.

Use Case Categories

- Customer Services (29)
- Distributed Energy Resources (18)
- Distribution Operations (18)
- Federated System Management Functions (7)
- Market Operations (32)
- Transmission Operations (36)

Name	Size	Published
Customer Services		
Consumer Portal P6 Customer Needs Meter Device	88k	1/6/09
Consumer Portal Scenario P4 Customer Account Move	75k	1/6/09
Consumer Portal Scenario P5 Customer Sign-Up for Demand Reduction Program	78k	1/6/09
Consumer Portal Scenario P7	113k	1/6/09

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Some important conferences for coordination

- Microgrids Symposium
 - 2009 San Diego
 - 2010 Vancouver
 - http://der.lbl.gov/new_site/DER.htm
- IDER Conferences
 - 2006 Napa
 - 2008 Nice, France
 - 2010 Albuquerque
 - <http://www.conference-on-integration.com/>
- DOE RDSI Peer Review Meetings
 - 2008 New Jersey (<http://events.energetics.com/rdsi2008/>)
 - 2009 San Diego (with Microgrids Symposium)