

# **Project Set D Advisors Webcast**

**Moderator:  
Erfan Ibrahim – Project Set Lead**

**November 22<sup>nd</sup> 2010**

## **Contributors:**

**Marty Burns - HyperTek**

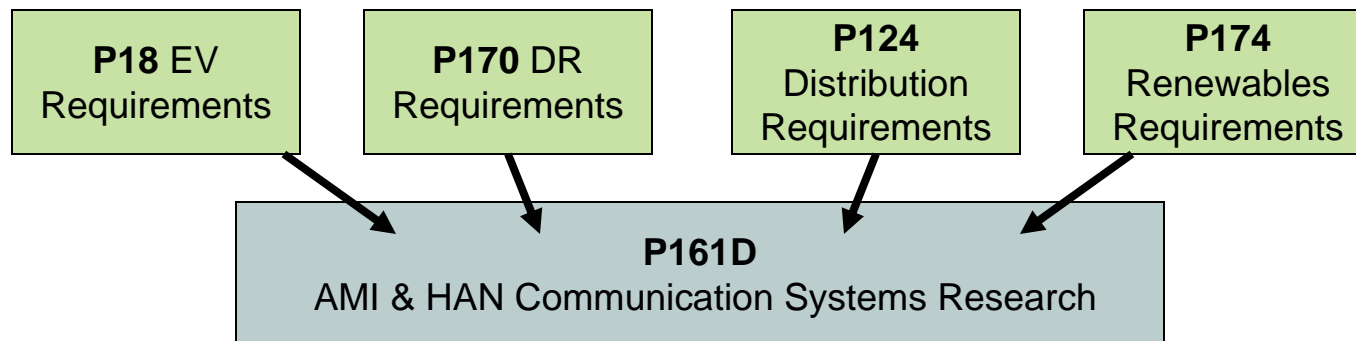
**Joe Hughes - EPRI**

**Sylvie Mallet - Electricite De France**

**Jamal Alrawi – Ur Electronics**

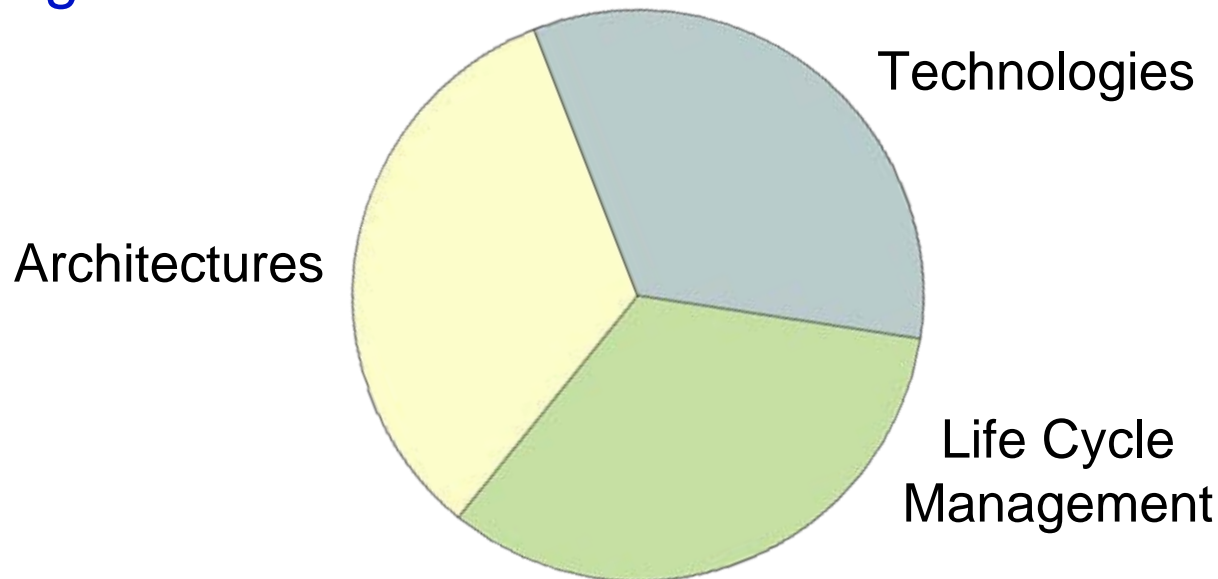
# P161D – Place in the Overall Portfolio

- Application requirements are identified in a range of programs, but P161D is the designated place for AMR/AMI communication system research and evaluation.
- P161D is the designated place for all research and evaluation in-premise communication systems.



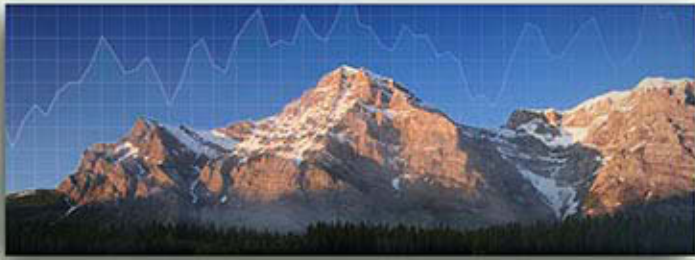
# P161D – Place in the Overall Portfolio

- Scope includes communication architectures, technologies, and protocols
- Covers in-premise residential and commercial networks, AMI networks, and headend software integration
- Ongoing focus areas:



# P161D – 2010 Base Project Summary

- **P161.006** Develop a forum to share AMI and HAN lab test results across member utilities
- **P161.007** Characterize a range of common utility communication architectures, with standards and gaps identified at each interface and layer
- **P161.008** Work with HAN communications chip manufacturers to ensure HAN communication reliability with well defined performance metrics



# **P161.007**

## **Customer Communications Architecture Development: Metrics for Standards and Product Assessment**

Marty Burns, Joe Hughes

# Value

## P161.007 Customer Communications Architecture

- What are we doing in 2010?
  - Defining the Standards landscape for end to end integration of customer communications
    - Assemble structured dictionary of communications requirements metrics for product and standards assessment
    - Analyze prominent product suites against the metrics
    - Identify gaps and overlaps with existing standards and associated implementations
- Why is it valuable?
  - Participants will benefit from improved awareness of the standards for customer communications and how they could be integrated and what the remaining issues are in developing a full customer communications system

# Customer Communications Architecture

## Project 161.007

### Objectives

- Maximize the potential to integrate standards into a coherent and interoperable infrastructure

### Deliverables

- Report on standards integration strategies and issues including graphics of interfaces

### Completion Date

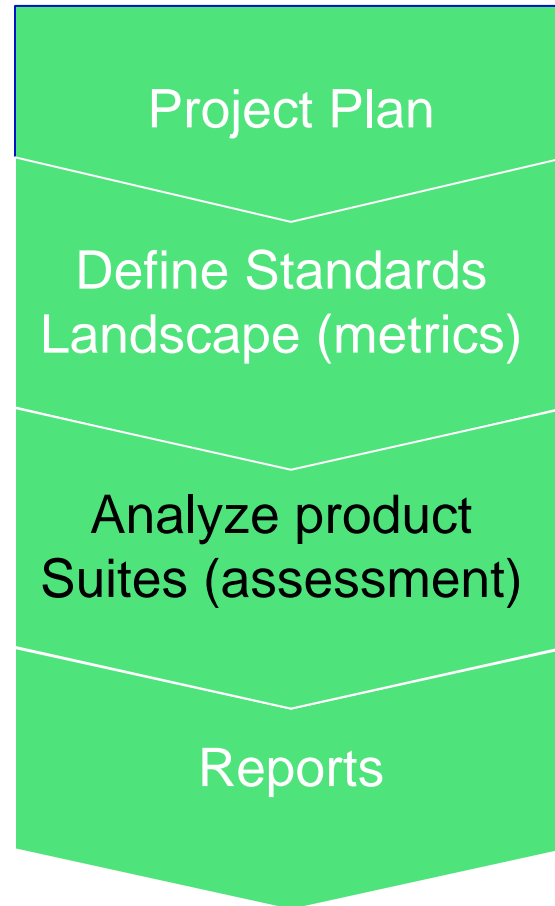
- 7/15/2010 Metrics  
12/31/2010 Assessment

### The Big Picture

- *A standards based AMI & HAN comms. architecture will accelerate the development of vendor products and value derived from DR & EE.*

### Key Tasks and Milestones

- Completed
- In Process
- Upcoming



# Interoperability – what is it?

- Interoperability can be framed by the following abstractions from simple to complex:

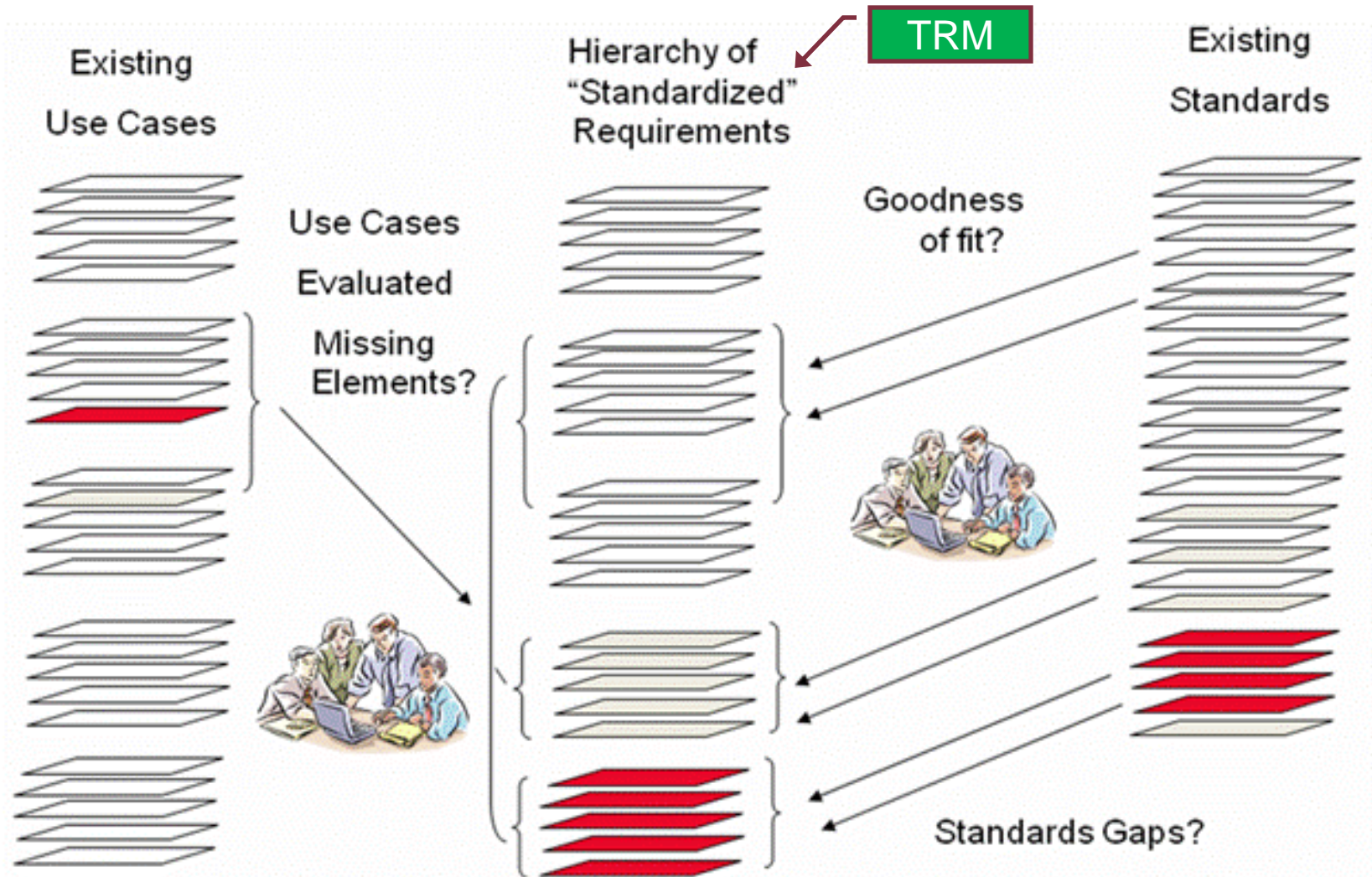


- Interoperability is a continuum between lip service and plug and play interchangeability
- There are three principle types of interoperability -  
- communications, application, and scenario
- The GridWise GWAC Stack goes a step further recognizing 8 interoperability layers, and 10 cross-cutting topics for interoperability  
([http://www.gridwiseac.org/pdfs/interopframework\\_v1\\_1.pdf](http://www.gridwiseac.org/pdfs/interopframework_v1_1.pdf) )

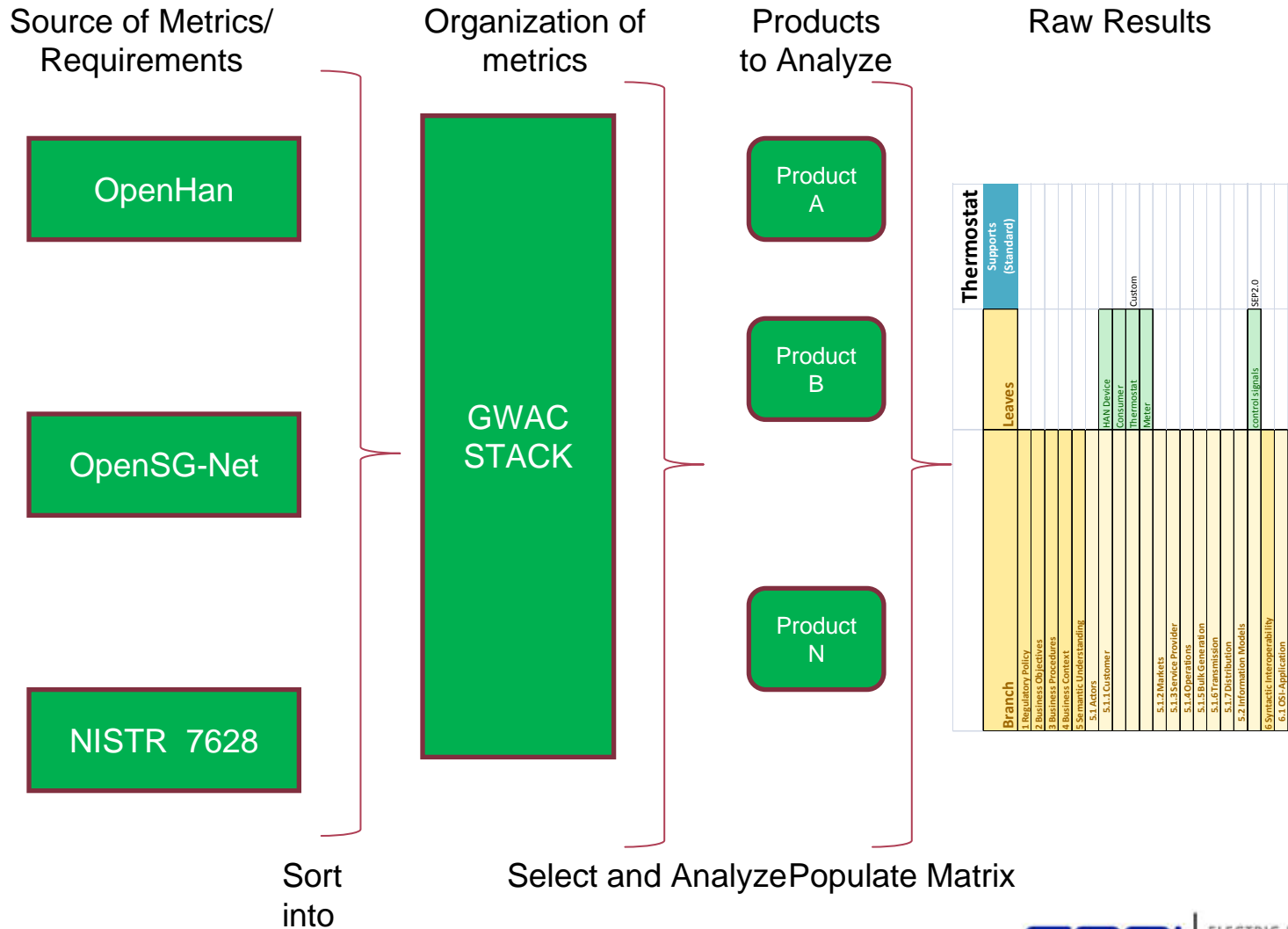
# Without Significant Interoperability

- You Get:
  - Supplier lock-in
  - Gateways and adaptors galore
  - Brittle systems that are hard to maintain
  - Lots and lots of consultants
    - Well maybe a few would be a good thing 😊
- But to get Interoperability, you need to specify it
  - How do you describe it
  - What are the degrees of freedom to declare
  - How to specify what is needed
- Thus, we need an interoperability description mechanism

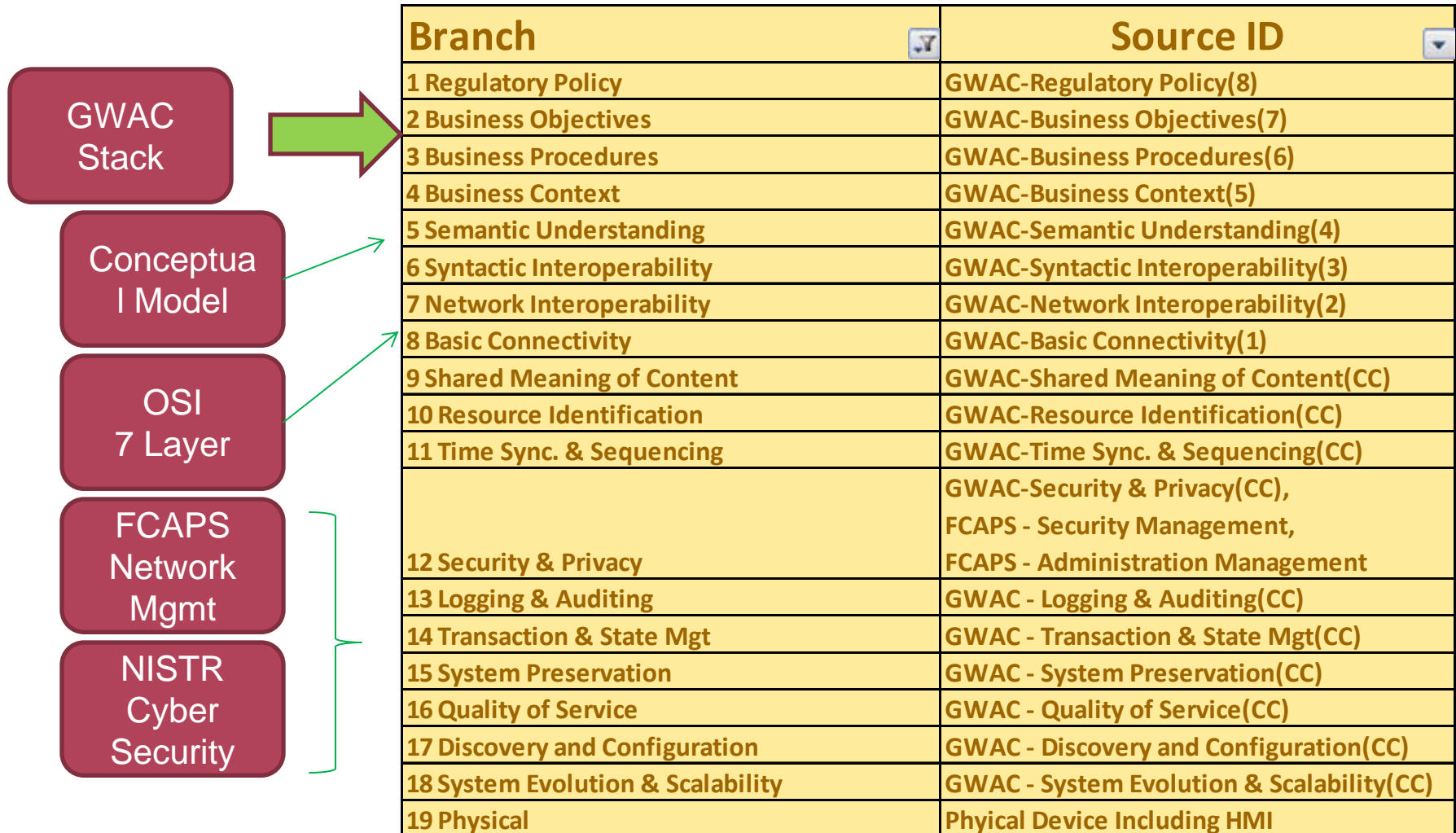
# Uses of “Tree of Requirements Metrics (TRM)”



# Assembly and analysis of requirements



# Tree of Requirements Metrics: Branches



# Full Tree – Autumn View (no leaves)

Branch	Source ID
1 Regulatory Policy	GWAC-Regulatory Policy(8)
2 Business Objectives	GWAC-Business Objectives(7)
3 Business Procedures	GWAC-Business Procedures(6)
3.1 Access Control	NISTIR SG.AC
3.2 Awareness and Training	NISTIR SG.AT
3.3 Audit and Accountability	NISTIR SG.AU
3.4 Security Assessment and Authorization	NISTIR SG.CA
3.5 Configuration Management	NISTIR SG.CM
3.6 Continuity of Operations	NISTIR SG.CP
3.7 Identification and Authentication	NISTIR SG.IA
3.8 Information and Document Management	NISTIR SG.ID
3.9 Incident Response	NISTIR SG.IR
3.10 Smart Grid Information System Development and Maintenance	NISTIR SG.MA
3.11 Media Protection	NISTIR SG.MP
3.12 Physical and Environmental Security	NISTIR SG.PE
3.13 Planning	NISTIR SG.PL
3.14 Security Program Management	NISTIR SG.PM
3.15 Personnel Security	NISTIR SG.PS
3.16 Risk Management and Assessment	NISTIR SG.RA
3.17 Smart Grid Information System and Services Acquisition	NISTIR SG.SA
3.18 Smart Grid Information System and Communication Protection	NISTIR SG.SC
3.19 Smart Grid Information System and Information Integrity	NISTIR SG.SI
4 Business Context	GWAC-Business Context(5)
5 Semantic Understanding	GWAC-Semantic Understanding(4)
5.1 Actors	IKB Actors
5.2 Information Models	IKB Data Models
6 Syntactic Interoperability	GWAC-Syntactic Interoperability(3)
6.1 OSI-Application	OSI-Application(7)
6.2 OSI-Presentation	OSI-Presentation(6)
7 Network Interoperability	GWAC-Network Interoperability(2)
7.1 OSI-Session	OSI-Session(5)
7.2 OSI-Transport	OSI-Transport(4)
7.3 OSI-Network	OSI-Network(3)
8 Basic Connectivity	GWAC-Basic Connectivity(1)
8.1 OSI-Data Link	OSI-Data Link(2)
8.2 OSI-Physical	OSI-Physical(1)

Branch	Source ID
9 Shared Meaning of Content	GWAC-Shared Meaning of Content(CC)
10 Resource Identification	GWAC-Resource Identification(CC)
10.1 Identification and Authentication	NISTIR SG.IA
11 Time Sync. & Sequencing	GWAC-Time Sync. & Sequencing(CC)
12 Security & Privacy	GWAC-Security & Privacy(CC), FCAPS - Security Management, FCAPS - Administration Management
12.1 Access Control	NISTIR SG.AC
12.2 Audit and Accountability	NISTIR SG.AU
12.3 Smart Grid Information System and Services Acquisition	NISTIR SG.SA
12.4 Smart Grid Information System and Communication Protection	NISTIR SG.SC
12.5 Smart Grid Information System and Information Integrity	NISTIR SG.SI
13 Logging & Auditing	GWAC - Logging & Auditing(CC)
13.1 Audit and Accountability	NISTIR SG.AU
14 Transaction & State Mgt	GWAC - Transaction & State Mgt(CC)
15 System Preservation	GWAC - System Preservation(CC)
15.1 Smart Grid Information System and Communication Protection	NISTIR SG.SC
15.2 Smart Grid Information System and Information Integrity	NISTIR SG.SI
15.3 Fault Management	FCAPS - Fault Management
16 Quality of Service	GWAC - Quality of Service(CC)
16.1 Smart Grid Information System and Communication Protection	NISTIR SG.SC
16.2 Performance Management	FCAPS - Performance Management
17 Discovery and Configuration	GWAC - Discovery and Configuration(CC)
17.1 Configuration Management	FCAPS - Configuration Management, FCAPS - Administration Management, NISTIR SG.CM
18 System Evolution & Scalability	GWAC - System Evolution & Scalability(CC)
19 Physical	Physical Device Including HMI
19.1 Smart Grid Information System and Communication Protection	NISTIR SG.SC

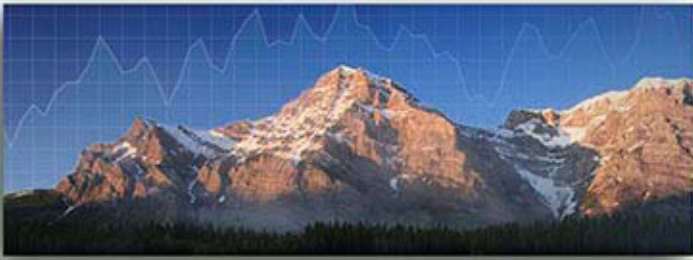
# Full Tree – Summer View (with leaves)

The screenshot shows an Excel spreadsheet titled "EPRITreeOfRequirementsMetrics.xlsm - Microsoft Excel". The spreadsheet is titled "Tree Of Requirements Metrics: With Leaf Requirements". It displays a hierarchical tree structure of requirements metrics. The columns are labeled "Branch", "Leaves", and "Source ID".

	Branch	Leaves	Source ID
1	<b>Tree Of Requirements Metrics: With Leaf Requirements</b>		
2	<b>Branch</b>	<b>Leaves</b>	<b>Source ID</b>
1752	15 System Preservation		GWAC - System Preservation(CC)
1753		detect performance impairment	OpenHAN_Security.Integrity.25
1754		maintain communications availability	OpenHAN_Perf.1
1755		provide adequate computational performance	OpenHAN_Perf.4
1756		shall not hamper overall operational state	OpenHAN_Perf.4
1757		support operational states/modes	OpenHAN_OML.Maintain.3
1758	15.1 Smart Grid Information System and Communication Protection		NISTIR_SG.SC
1759	15.1.1 Fail in Known State		NISTIR_SG.SC-22
1760		take appropriate action upon failure	OpenHAN_Security.Integrity.25
1761		The Smart Grid information system fails to a known state for defined failures.	NISTIR_SG.SC-22_1
1762		The Smart Grid information system preserves defined system state information in failure.	NISTIR_SG.SC-22_2
1763	15.2 Smart Grid Information System and Information Integrity		NISTIR_SG.SI
1764	15.2.1 Error Handling		NISTIR_SG.SI-9
1765		attempt to correct an error, or conditions around an error	OpenHAN_Security.Integrity.7
1766		revert to a prior system image if system update not successful	OpenHAN_Security.Integrity.21
1767		permanently retain a known default system image	OpenHAN_Security.Integrity.22
1768		detect authentication violations	OpenHAN_Security.Account.1
1769		detect integrity violations	OpenHAN_Security.Account.1
		The Smart Grid information system identifies error	

# Tree of Requirements Metrics: Summary

- 259 individual requirements from OpenHAN (expanded into ~1294 primitive requirements),
- 1454 requirements from OpenSG (expanded into ~20000 primitive requirements)
- 216 sub-branches and 598 requirements from entire NISTR 7268
- Resulting in: ~2000 unique primitive requirements



## P161.006 Utility Laboratory Testing Coordination

Contributed by:

Erfan Ibrahim – EPRI

Sylvie Mallet - EdF Project Manager

# Value

## P161.006 Utility Laboratory Testing Coordination

- What are we doing in 2010?
  - Provide an ongoing means by which results of testing being conducted in utility laboratories can be shared and aligned
    - Focused on AMI and HAN
    - No red-tape: Easy to participate, No obligations
- Why is it valuable?
  - Participants will benefit from improved awareness of tests being conducted in utility labs and from the opportunity to share in the learnings from these tests

# Utility Laboratory Testing Coordination

Project 161.006

## Objectives

- Maximize the industry benefit of ongoing laboratory tests of AMI and HAN technologies.

## Deliverables

- Utility lab testing webcasts, test reports.

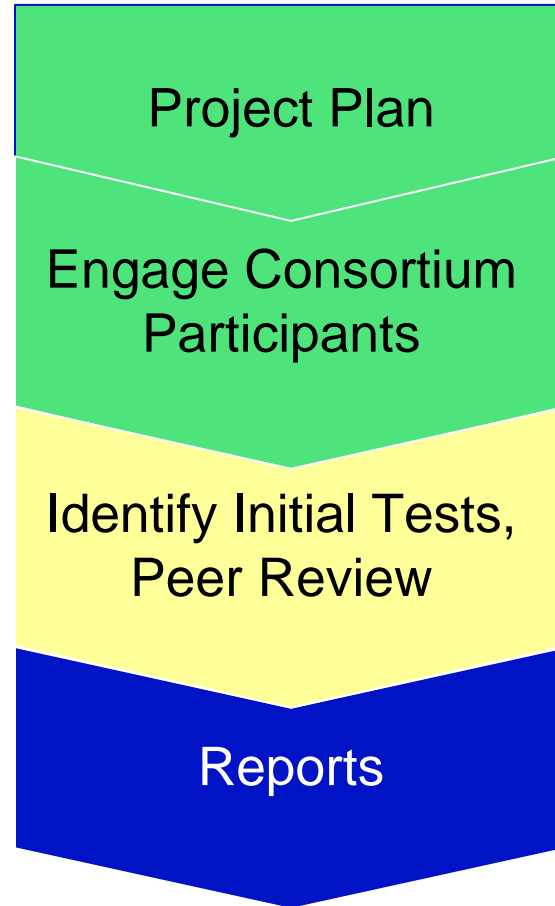
## Completion Date

- Ongoing with 2010 deliverables TBD

## The Big Picture

- *Utilities have developed laboratories with unique capabilities and are conducting technology evaluations that may be shared with other interested parties.*

## Key Tasks and Milestones



# The EDF R&D MENOFIS Platform

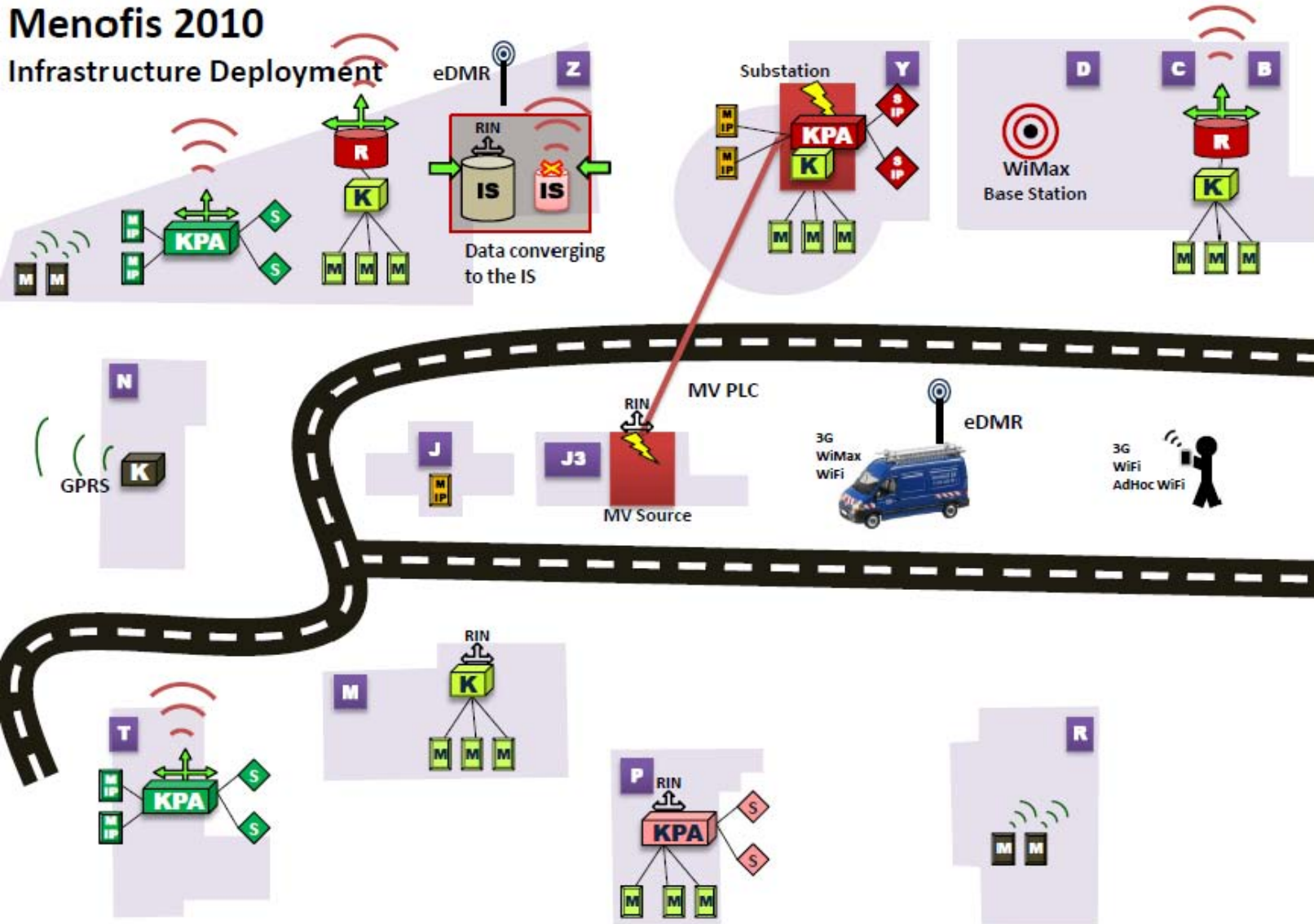
(MEtering, Network and On the Field operations and Information System)

- Objectives:
  - This platform is common for different needs
    - Smart Metering,
    - Smart Grid
    - Smart wireless agent on the network
  - This platform will allow to test different technologies and architectures
    - We will try to mutualize the materials in the MV/LV transformers for smart grid and metering needs
  - Next phase, we will try to implement other services using the metering data (i.e demand-response,..) and the network data (i.e LV monitoring, default detection,..)

# The R&D MENOFIS Platform

## Menofis 2010

### Infrastructure Deployment



A unique platform for 3 different needs:

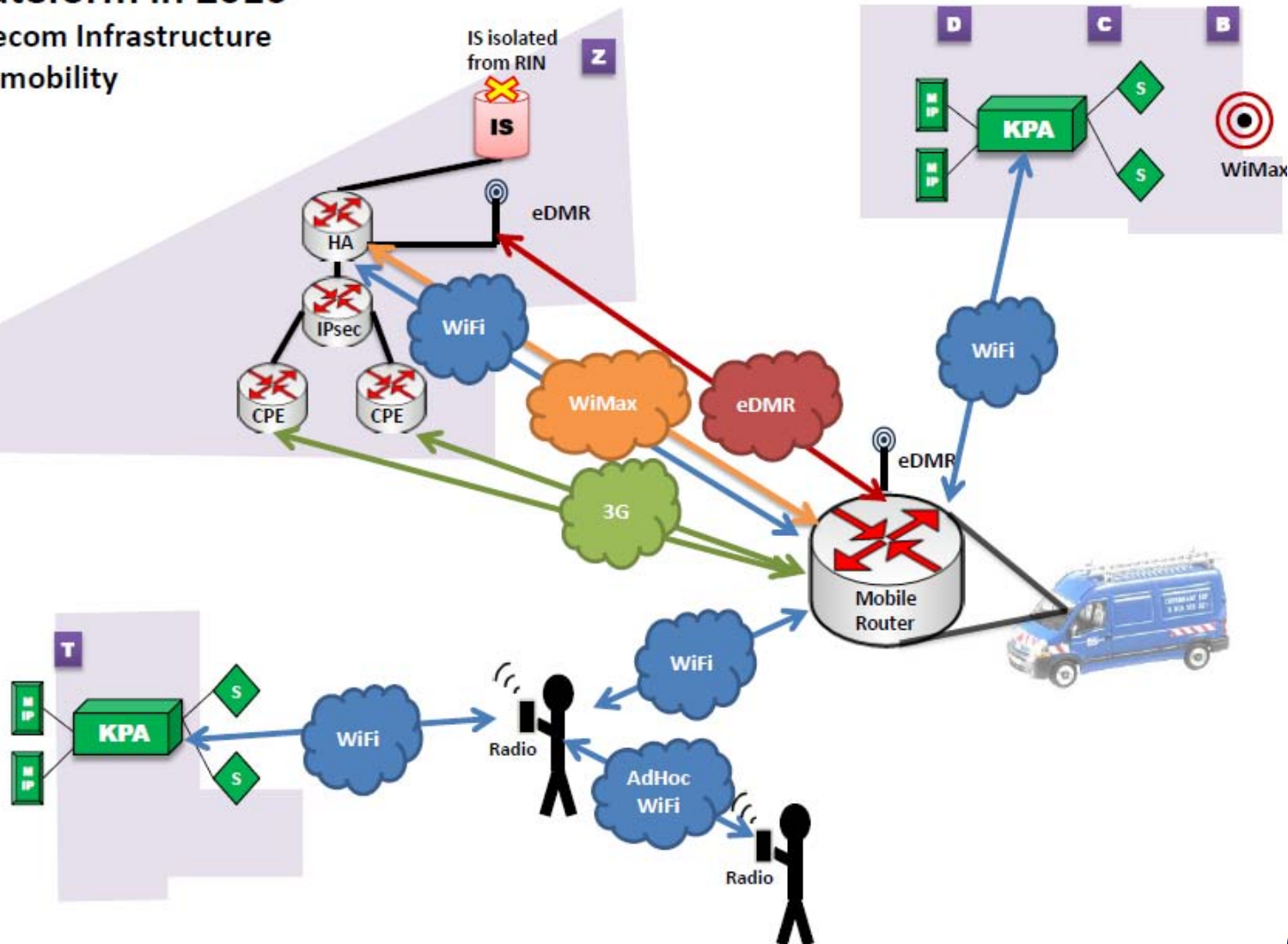
- Metering,
- Network operations
- On the field operations



# The use of wireless communication medias

## Platform in 2010

Telecom Infrastructure for mobility



# EDF Deliverables Deadlines

- The process for delivering the reports is the following:
- Report on the 2010 tests:
  - o Draft version: January 15th, 2011
  - o Final version: March 31<sup>st</sup>, 2011
- Report on the 2011 tests:
  - o Draft version: August 15<sup>th</sup>, 2011
  - o Final version: September 30<sup>th</sup>, 2011



## P161.008 Standards and Software for HAN Evaluation

Contributed by:

Erfan Ibrahim – EPRI

Jamal Alrawi – UR Electronics

# Value

## P161.008 Standards and Software for HAN Evaluation

- What are we doing in 2010?
  - Driving standards and platforms for monitoring HAN performance and reliability
    - Including IEEE 802.15.4 (Zigbee), IEEE 802.11 (WiFi), HP-AV/GP and IEEE P1901 (PLC)
    - Involves close collaboration with SDOs, technology alliances, and HAN silicon and appliance vendors
- Why is it valuable?
  - Enables participants to validate HAN communications reliability in support of Retail Energy Services: PH/EV Charging, Demand Response
  - Provides critical infrastructure for utility in-home trials under P161D HAN Supplemental

# Standards and Software for HAN Evaluation

## Project 161.008 Status

- Power Line Evaluation Tool (PET) A Home Plug AV (HPAV) test tool
  - Accomplishments
    - Local (no networking) and central (remote monitoring) support for PET has been implemented. Both are being tested and evaluated .
    - Beside providing HPAV nodes traffic statistics it also provides SNR and Tone Map graphically as well as the ability to log received HPAV data to file in both the local and the central programs.

# Standards and Software for HAN Evaluation

## Project 161.008 Status-continued

- Wireless Evaluation tool (IEEE 802.15.4) ZigBee
- Accomplishments
  - Local (no networking) and Central (remote monitoring) versions have been implemented and are being tested.
  - Beside providing latency, RSSI and ED monitoring and logging, it also supports Proposed IEEE 802.15.4 statistics and all 802.15.4 ED channels measurements.

# Standards and Software for HAN Evaluation

## Project 161.008

### Objectives

- Establish standard metrics and methods for HAN performance and reliability monitoring.

### Deliverables

- Standards, prototype software, vendor and utility support.

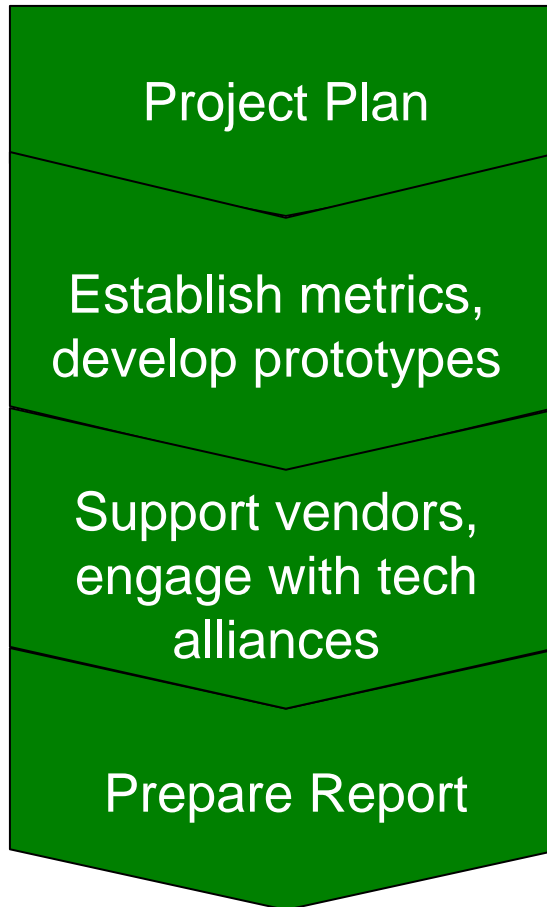
### Completion Date

- 12/31/2010

### The Big Picture

- *Utilities need to determine whether they can rely on HAN technologies for Retail Energy Services. We are delivering that capability with a set of SDO standards, network monitoring prototypes, and HAN technology/device vendor engagements and support.*

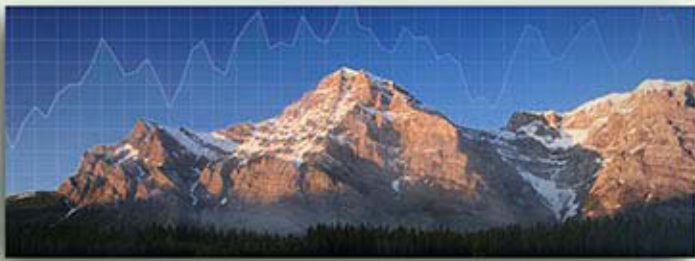
### Key Tasks and Milestones



# Standards and Software for HAN Evaluation

## Project 161.008 Status-continued

- Central HAN Metrics Remote Monitoring Tool
- Accomplishments
  - Remote monitoring via two way Internet communication has been established and is being evaluated for reliability. Internet communication via Mobile (CELL) data communication has been established.
  - Central program is able to support WET and PET simultaneously..
  - Logging and logging processor has been implemented.



## P161

# Home Area Network Supplemental Project

Contributed by:

Erfan Ibrahim – EPRI

Jamal Alrawi – UR Electronics

# Home Area Network Supplemental Project

**Problem Statement:** Some technologies proposed for home area networks are new and it is unknown how well they will work in a diverse range of homes. These systems need to work reliably with no customer hassle, yet there are attenuation and interference concerns.

**Project Plan:** This project will leverage the standard metrics from P161.008, and will work with vendors and participating utilities to get a wide range of products installed in a wide range of scenarios and monitored continuously for connectivity.

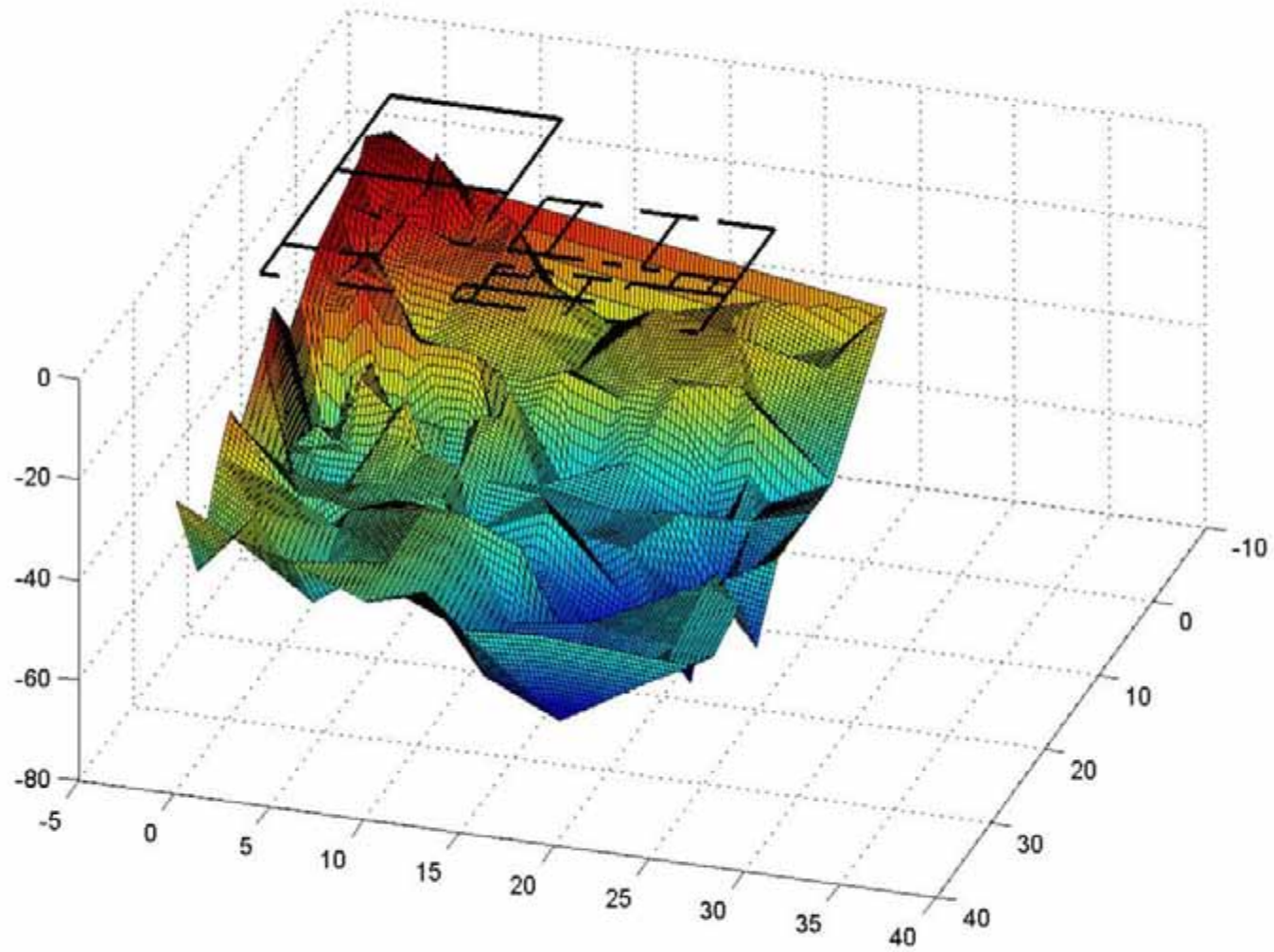
Technologies to be evaluated are HomePlug, Wi-Fi, and Zigbee. EPRI-provided software on a local laptop computer will capture results.

Goal is 10-50 homes per utility, 10 utilities.

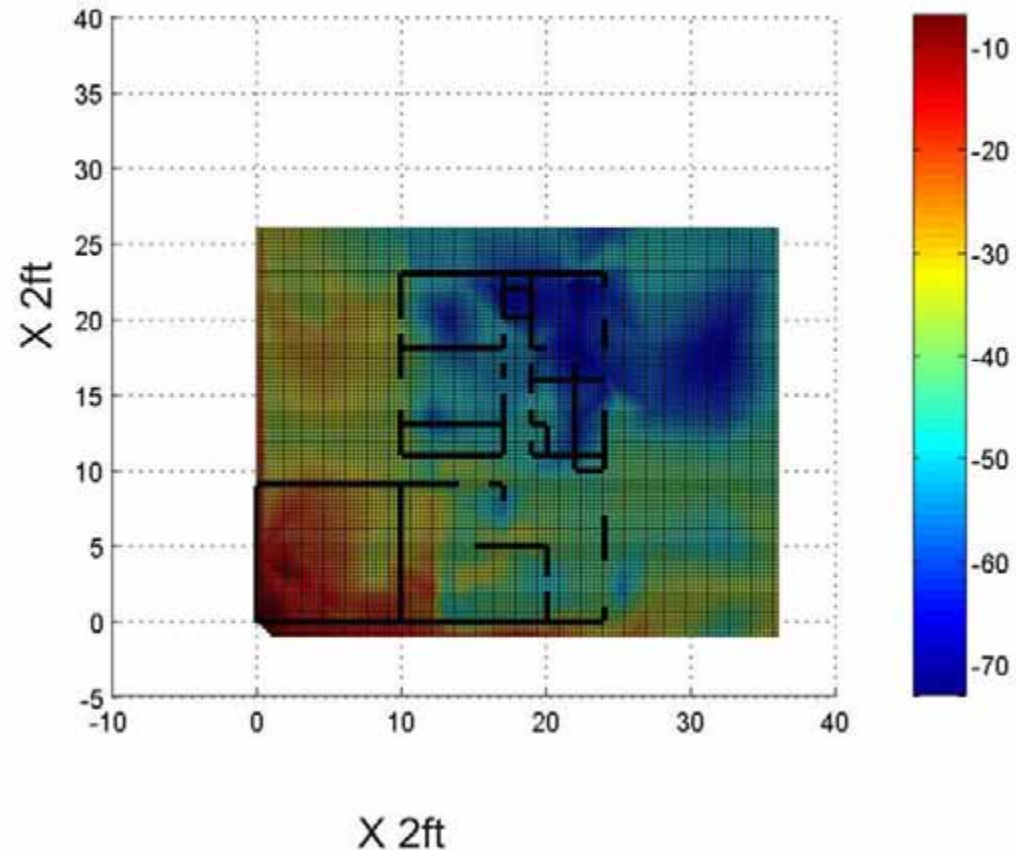
# Home Area Network Supplemental Project Status

- Tools for HAN local and remote monitoring are in the advance stages of testing and evolution.
- Will be soliciting participating Utilities to evaluate HAN test tools and provide their feed back.
- Will Indentify vendors whom are willing to provide HAN metrics software supporting application within their utilities targeted products. (Utilities guidance and assistance will be needed)
- . **Help 161.008 Project in defining its architecture and requirements to ensure its suitability to support this project.**

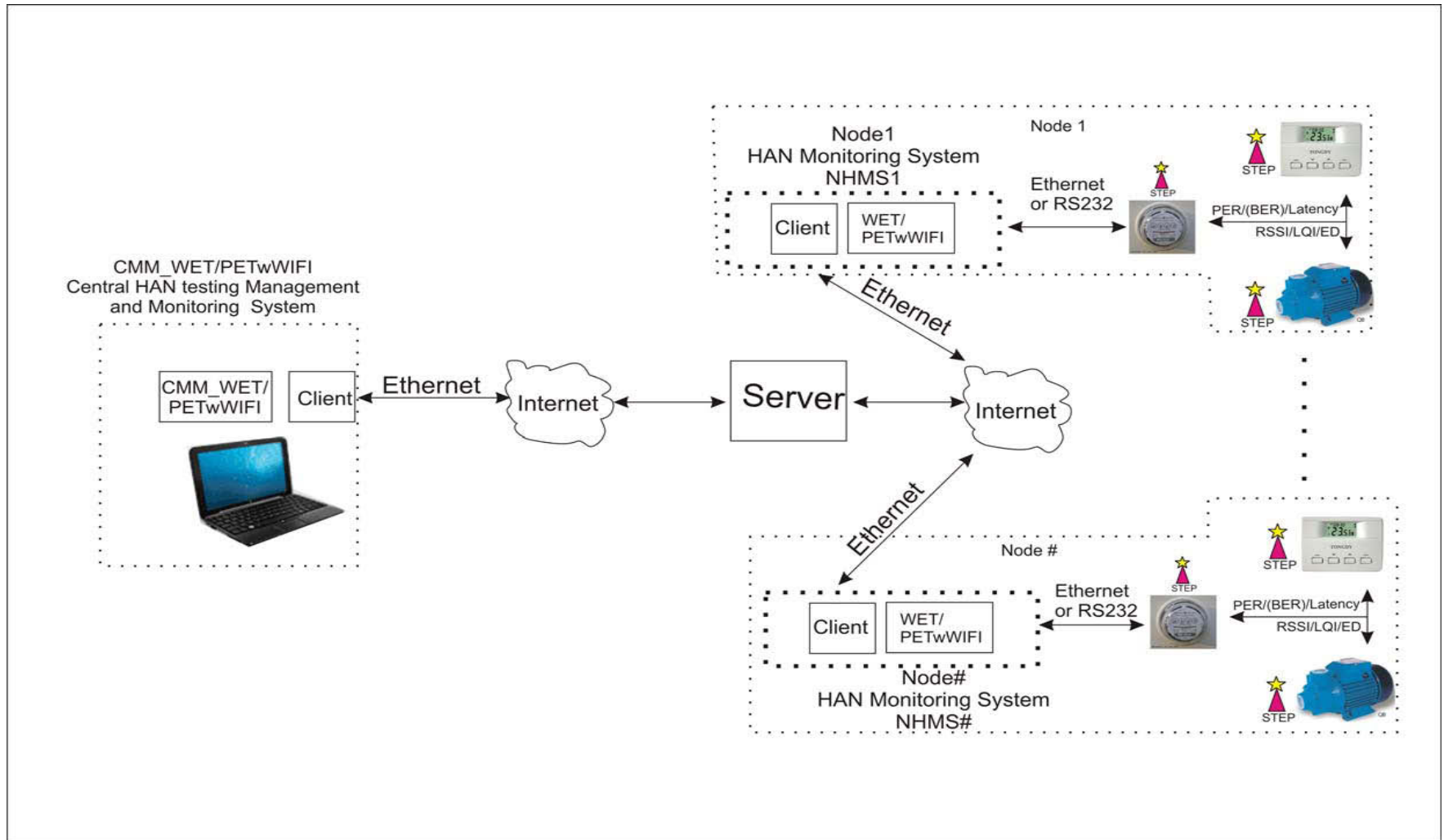
# 3-D Isometric View of RSSI Plot of Single Family Home using IEEE 802.15.4 Radio at the Electric Meter (db)



## 2-D Plan View of RSSI Plot of Single Family Home using IEEE 802.15.4 Radio at the Electric Meter (db)



# Proposed HAN Communication Monitoring Architecture



# P 161d Projects in 2011

- 161.006 Communications Infrastructure
  - 161.006 – 1: Evaluation of Communication Technologies (Continuation of EdF AMI Communications Project)
  - 161.006 – 2: Architecture Issues (PEV, PV, Storage, and Internet Based Gateway Communications Architecture Specs)
  - 161.006 – 3: Lifecycle Management (Home Area Network Communications Testing – ZigBee SEP2.0, HPAV, Wi-Fi)
- 161.007 Data Integration for Home Area Networks
  - Evaluation of Smart Energy Profile 2.0 Specification and Interoperability Testing using SEP 2.0 Enabled HAN Devices

# 161D Outreach Efforts To Members & Industry at Large

- 4 Quarterly Webcasts (Feb 23<sup>rd</sup> , May 13<sup>th</sup>, August 2<sup>nd</sup>, November 22<sup>nd</sup>)
- 2 face to face meetings (March 2<sup>nd</sup> @ AEP & September 13<sup>th</sup> in Orlando)
- Direct E-mail Updates for Project Set Advisors, Site Visits and Conference calls to Project Set Advisors
- Utility & Vendor Collaboration
- Contact Info:
  - Erfan Ibrahim – [eibrahim@epri.com](mailto:eibrahim@epri.com)
  - Joe Hughes – [jhughes@epri.com](mailto:jhughes@epri.com)

# Together...Shaping the Future of Electricity