

# 6LowApp Bar BOF

- Tue 18:30 Room 202 (“IESG Room”)
- Please read:
  - <http://u.nu/6jfh>
  - draft-bormann-6lowpan-6lowapp-problem-01.txt
- Group to bus to social leaves 19:25
  - follow Zach!

# IP in small nodes

- Constrained nodes:
  - say, 48K, 10K, 8 MHz, Double-AA battery
  - e.g., IEEE 802.15.4 ( $\leq 250$  kbit/s, 0.9 or 2.4 GHz)
  - Packet size:  $< 128$  Bytes
- 6LoWPAN (INT)
- ROLL (RTG)
- ???? (APP)

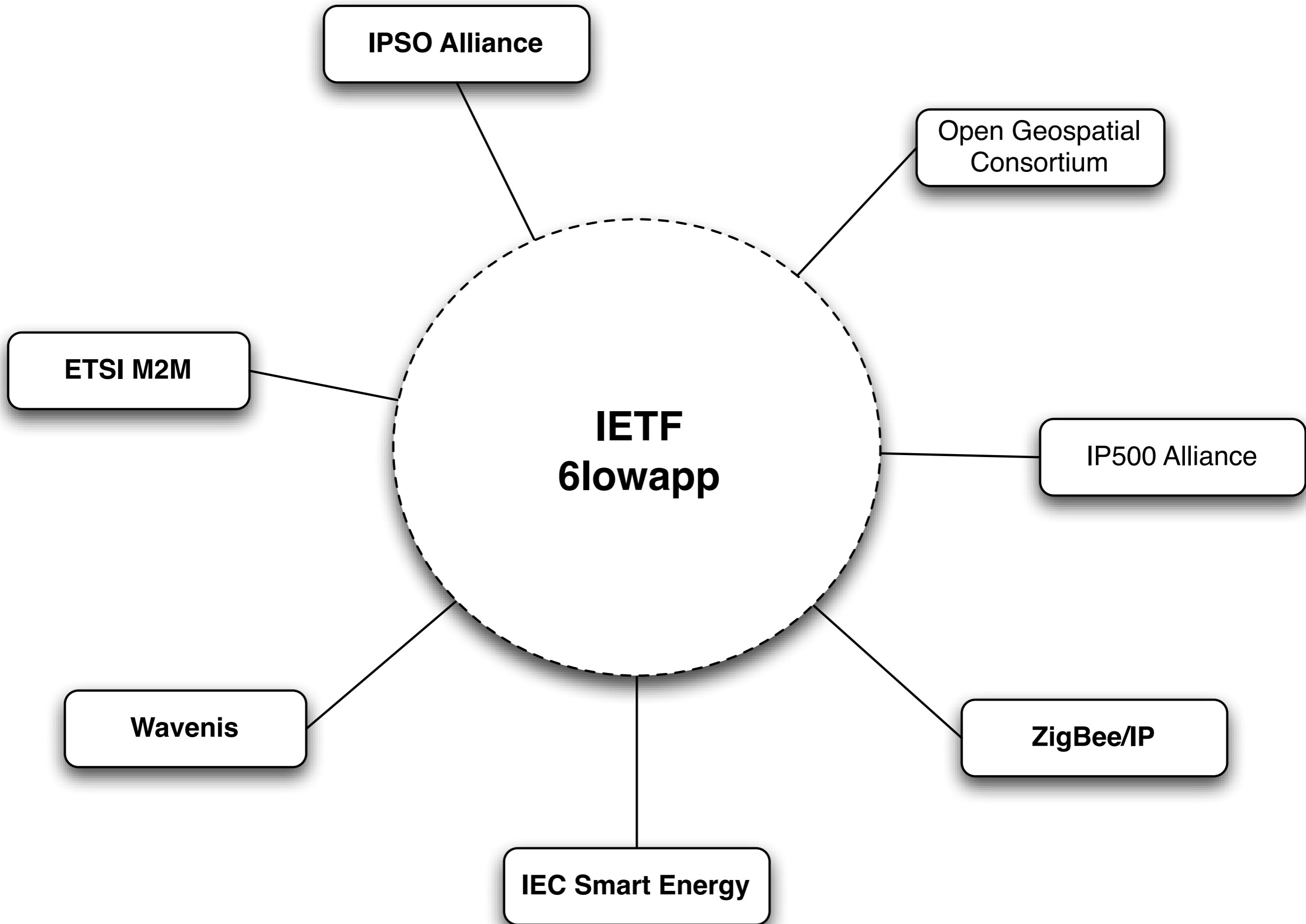
Smart Grid  
Industrial  
HAN  
Urban  
...embedded...

# Scares

- Request-response protocols like HTTP:
  - vs. sensor networks communication model
  - vs. battery-operated, mostly sleeping nodes
- Data formats (headers and body):
  - too chatty for 50-60 byte payloads in LoWPANs
  - too much code for the 8-/16-bit processors dominating the Internet of Things.
- Yet another silo of application protocols:
  - no benefit from vast APP area Internet experience

# Benefits

- Defragment Embedded Application Space
- Integration into vast Internet application space
  - Global Naming — URIs?
  - Globally operating Protocols (The Web)
- Enable sharing of Wireless Embedded Internet
- Service Discovery as Integration Point



# 6LowAPP Bar BOF

*ZigBee/HomePlug Smart Energy  
Application Support Needs for 6LowPAN*

Don Sturek  
e-mail: [d.sturek@att.net](mailto:d.sturek@att.net)  
July 28, 2009

On behalf of:  
Pacific Gas and Electric Company

# Background

---

## ▶ **Pacific Gas and Electric Company**

- ▶ Northern and Central California Gas and Electric Utility Company (including San Francisco Bay Area)
- ▶ Around 5.1 million electric service customer accounts and 4.2 gas service customer accounts
- ▶ Members of UCA International OpenSG, ZigBee and HomePlug to define an IETF based Smart Metering solution

## ▶ **ZigBee/HomePlug membership**

- ▶ Consortium of members from the ZigBee Alliance and HomePlug Alliance
- ▶ Representing key utility and vendor companies (see the full list of members on the ZigBee and HomePlug Alliance sites)

## ▶ **Presenter:**

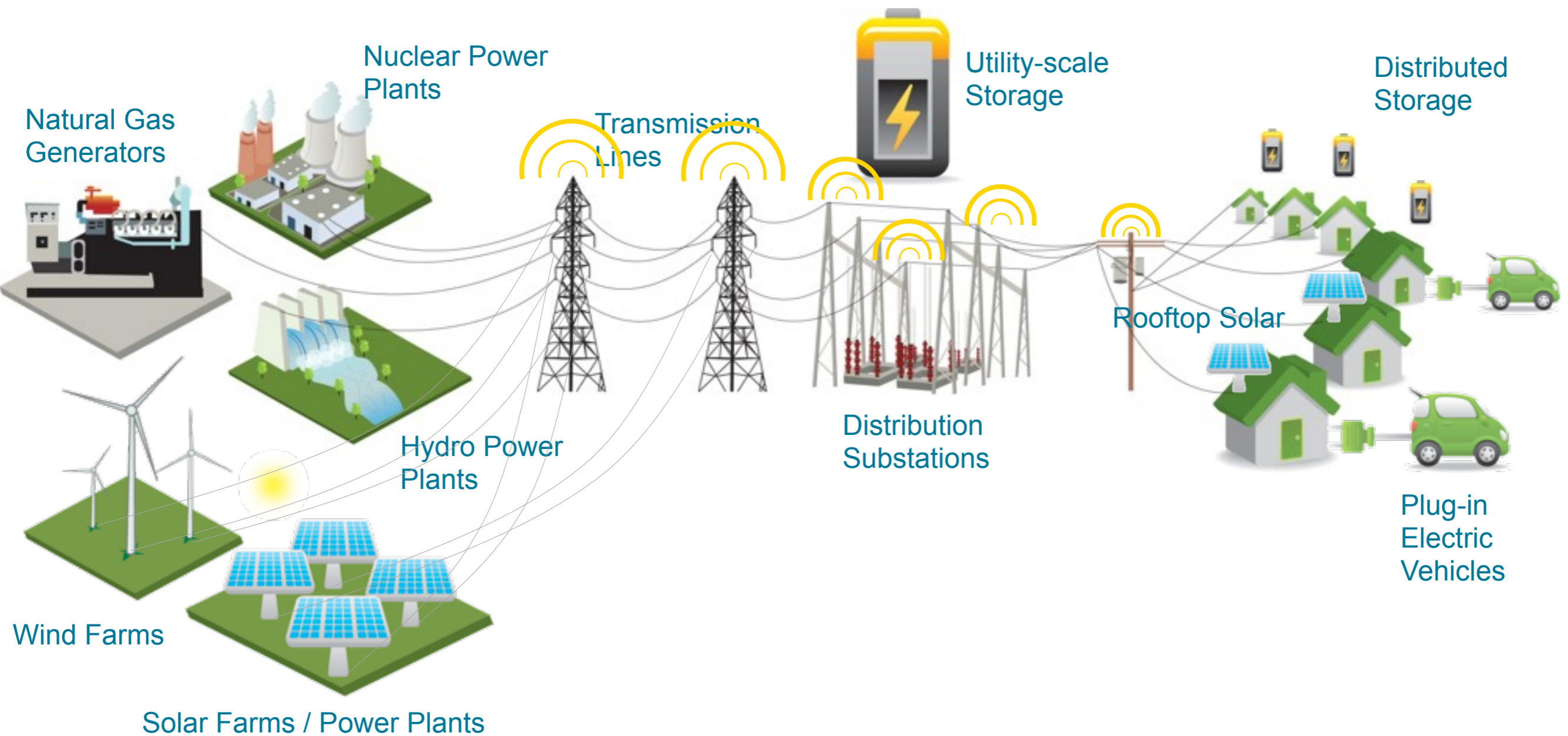
- ▶ Don Sturek, consultant for PG&E
- ▶ Chair of the ZigBee/HomePlug Technical Working Group Platform team and ZigBee Core Stack Working Group (ZigBee IP)

# Moving To A Sustainable Electric System

Power Plants

Electric Grid

Customers





# A Smart Grid

*Smart*

Overlay with an “Intelligent” Infrastructure

- Pervasive sensing and measurement devices
- Pervasive control devices
- Advanced data communications
- Computing and information management



Power  
Plants



Transmission  
Networks



Substations



Distribution  
Networks



Consumers

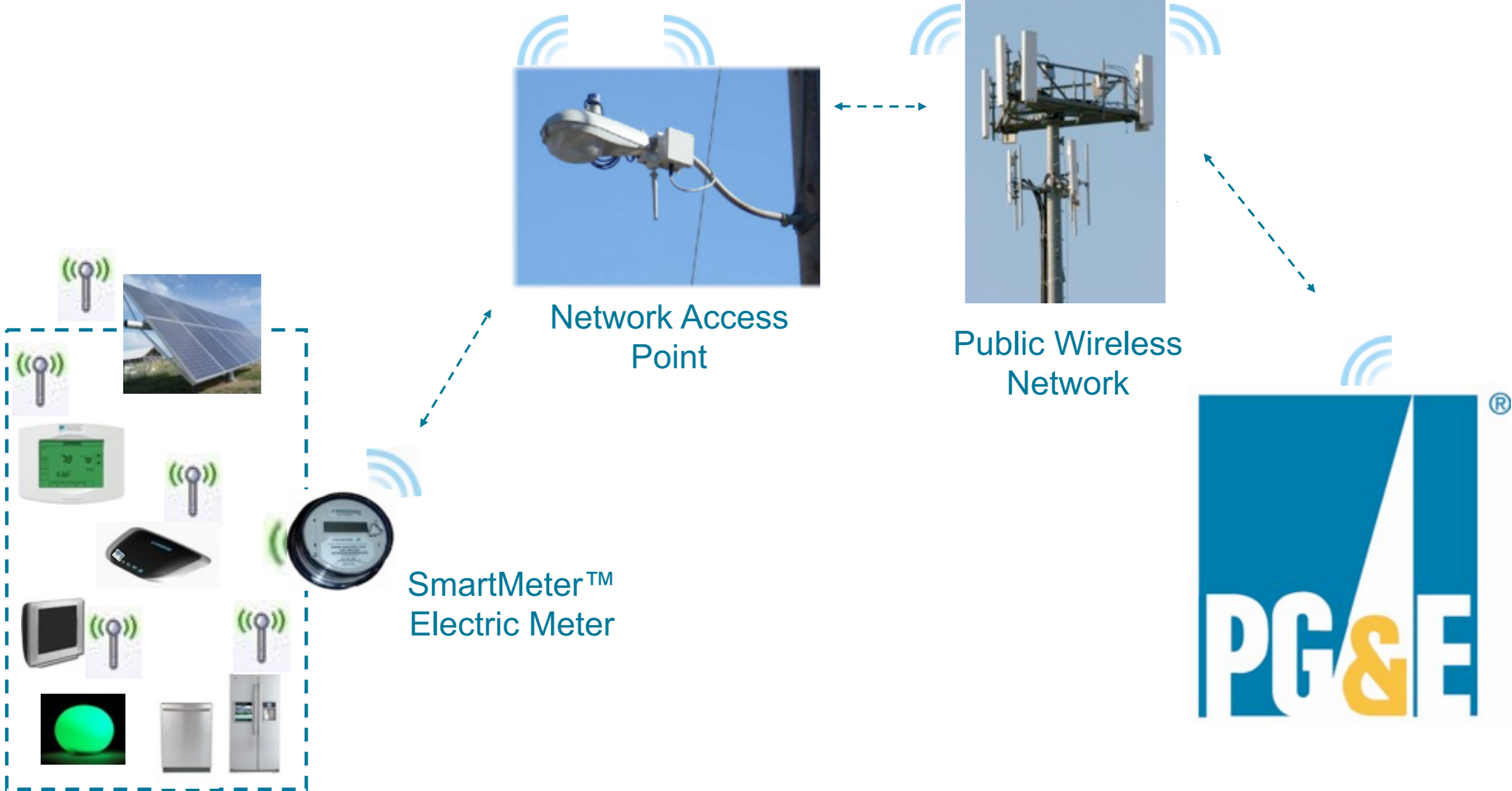
## Smart Grid Foundation: Largest US Smart Meter Deployment

- Automated meter reading for all customers
  - 10 million meter upgrades by 2012
- Frequent meter reads
  - daily for gas
  - hourly or 15 minute intervals for electric
- Enhanced customer energy management

PG&E  
SmartMeter



# A Two-way Communications Network



*Premise Area Network*

# Organization for Smart Energy HAN Development

- ▶ US National Institute of Standards and Technology (NIST)
  - ▶ Direction on standards selection
- ▶ UCA International OpenSG
  - ▶ OpenHAN Requirements
  - ▶ Market Requirements Document (MRD) for Smart Energy V2 created by 9 North American Utilities plus 2 ZigBee vendor companies and 2 HomePlug vendor companies (ZigBee/HomePlug liaison)
- ▶ ZigBee
  - ▶ Developing IETF based IP stack for IEEE 802.15.4 based platforms based on OpenHAN and Smart Energy V2 MRD
- ▶ HomePlug
  - ▶ Development IEEE P1901 compliant powerline carrier solutions: HomePlug AV and HomePlug SE
- ▶ Recognized Standards Development Organizations (SDOs)
  - ▶ IETF
  - ▶ IEC
  - ▶ IEEE
  - ▶ W3C

# Technical Requirements

- ▶ Clean layered architecture
- ▶ Source standards from approved SDOs (IEEE, IETF, IEC, W3C)
- ▶ Support multiple MAC/PHYs with preference for:
  - ▶ IEEE 802.15.4
  - ▶ HomePlug AV/SE (IEEE P1901)
- ▶ Meet Market Requirements from ZigBee/HomePlug MRD and MRD Use Cases (now part of UCA International)
- ▶ Detailed Technical Requirements Document underway, expect draft in August
- ▶ Technology selection to date:
  - ▶ IEEE 802.15.4
    - ▶ 6LowPAN (mesh over)
    - ▶ ROLL
    - ▶ IPv6 + UDP + (maybe) TCP
  - ▶ HomePlug AV/SE
    - ▶ IPv6 + UDP + TCP



# Timelines

- ▶ Completed now
  - ▶ ZigBee/HomePlug Market Requirements Document (MRD) and Use Cases
- ▶ January 2010
  - ▶ Start of interop on ZigBee IP
- ▶ July 2010
  - ▶ Start of certification on ZigBee IP
  
- ▶ More timeline data needed:
  - ▶ Start of interop on IPv6 over HomePlug AV/SE with Smart Energy V2 application
  - ▶ End product certification for devices using ZigBee IP and Smart Energy V2 over HomePlug AV/SE

# Standards Selection needs for Smart Energy V2

- ▶ Immediate standards selection needs (end of 2009)
  - ▶ Tokenized XML (need to pick one of these existing technologies)
    - ▶ W3C EXI
    - ▶ OBiX
    - ▶ FastInfoSet
  - ▶ Service Discovery for small footprint devices (need to pick one)
    - ▶ Binary version of Service Location Protocol (SLP)
    - ▶ CAP I-D for use of existing ZigBee service discovery over 6LowPAN networks
    - ▶ SSDP (though it is an expired I-D)
  - ▶ Security (need to select based on layer security requirements)
    - ▶ EAP with security method support for ECC or other computational efficient key establishment
    - ▶ Simplified X.509 certificates
  - ▶ Guaranteed delivery and packet duplicate detection if TCP cannot be supported
    - ▶ UDP with packet sequence numbers and application level guaranteed delivery

# Future Needs for ZigBee/Smart Energy V2

## ▶ Desired features

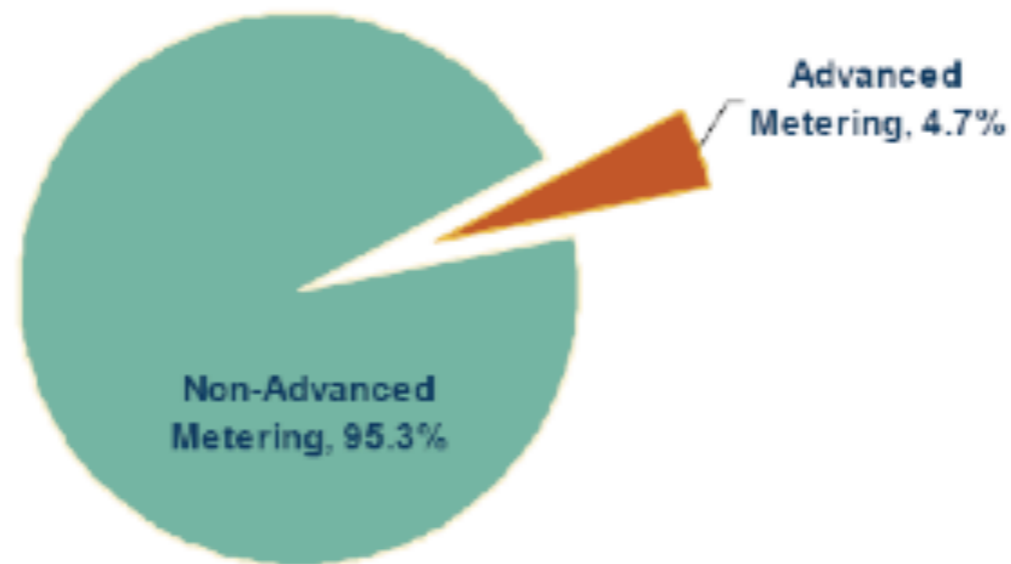
- ▶ Efficient web services support (condensed HTTP with tokenized XML data)
- ▶ SNMP support with security (particularly if TCP cannot be supported)
- ▶ Standardized Service Discovery (particularly if an IETF standard was not used for initial release)

## ▶ Future Smart Metering deployment needs

- ▶ Initial Smart Metering deployment numbers addressed 5% of the US Smart Metering market through 2008 (see next slide)
- ▶ Though ZigBee/HomePlug will select technology for our initial Smart Metering deployment by the end of 2009, need to have ongoing work in IETF to address the larger market



# Future Smart Meter Deployment in the US



Source: 2008 FERC Survey

**Table II-1. AMI meters: AMI-capable meters versus AMI In actual use**

	AMI-capable	Actually being used for AMI	Total customer meters (AMI-capable, actual AMI, and all other meters)
2006	8,398,455	947,224	141,994,039
2008	unavailable	6,733,151	144,385,392

Source: 2006 FERC Survey and 2008 FERC Survey

# Background on why ZigBee IP needs a separate specification.....

- ▶ Need to have a set of services present in each deployed network to prevent support calls
  - ▶ No browsing for networks by customers (eg, SSID selection in WiFi)
  - ▶ No customer selection of DHCP or fixed address
  - ▶ Automatic address assignment, security provisioning, service discovery and utility trust establishment (where requested) for devices added to the network
- ▶ Need to have a common configuration for devices
  - ▶ Network settings and resources need to accommodate HAN topologies in all utility markets
  - ▶ Support retail HAN device sale and customer self installation
- ▶ Please see the UCA International OpenHAN requirements at:  
<http://osgug.ucaiug.org/utilityami/openhan/HAN%20Requirements/UtilityAMI%20HAN%20SRS%20-%20v1.04%20-%20080819-1.pdf>

# 2-minute standups on app protocol reqs

- SENSEI (Zach)
- ETSI-M2M (Zach)
- IPSO Alliance (Geoff)
- Wavenis (Dominique)
- \_\_\_\_\_

# Timeline

- Now:
  - Start mailing list `6lowapp@ietf.org`
  - Develop solid charter proposal(s)
    - Find name(s)
    - Find people to do the work
  - Collect requirements, solutionlets
- Official BOF in Hiroshima
- Full WG meeting in Anaheim