

## Outline of Broadcast-based H2G Communication Solutions

### An Examination of RDS and NOAA weather radio and others for smart grid communications

#### 1. Background:

1. Value proposition of the broadcast architecture for the smart grid
  1. High value low costs solution desired for economic benefits to utility and consumers
  2. Leveraging existing infrastructure cuts time and costs required for mass deployment
  3. Fast response time of a broadcast system would enable
    1. Demand Response (Hourly, minutes, seconds)
    2. Frequency regulation and spinning reserve applications
    3. Integration of renewable generation
    4. Hourly and more advanced dynamic pricing schemes
  4. Broadcast with group addressing enables locational response to:
    1. Reflect time & location specific marginal costs
    2. Alleviate specific distribution constraints
  5. Leverage/Harmonize with SGIP Business & Policy Working Group: Broadcast of real time price data
    1. <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/BnPSystemsandDevicesSubGroup>
  6. Inform consumers while preserving privacy
  7. Minimize consumer actions required (GE slider might be an option here)

8. Leverage/Harmonize with “demand Responsive Residential Applications Interface” work:

1. <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/H2G>

2. Value of broadcast: Efficacy comparison to biologic and social analogies

2. Overview of requirements

1. Desired characteristics

1. Single nation wide standard

1. [Do you mean standard data format (or a set of) or system with equal access to all aggregators/utilities?] I really see this as protocol agnostic, more equal access for all types of traffic a nationwide standard applies more at the physical layer with the RDS (base level interoperability) in my view.

2. International compatibility for OEMs

3. Full market coverage

4. Redundancy and reliability

5. Time stability of solution

6. Time to deployment

7. Availability of Hardware

8. Ease of System integration

9. Low Capital and operating cost of infrastructure

10. Low Capital and operating cost to consumer devices

2. Technical requirements

1. Authentication

1. Encryption capable

2. Security of infrastructure

1. Physical

2. Cyber

1. Defenses against hacking
  3. Multiple broadcast frequencies/towers to minimize risk of too many MW on one tower
  4. Redundancy of key elements
  5. Role of network paths in hybrid broadcast/2-way system [Where 2-way might be AMI or Internet]
  6. Stability of solution
    1. Decades of stability desired (belongs above?)
7. Performance specifications
  1. Actual field (in a variety of home structures) performance
  2. Location filtering/targeting
  3. Types of control packets (use cases)
  4. Packet length constraints for each technology class
  5. Missed packet expectations/consequences
  6. Enable IP packet protocol?
    1. Flow through
    2. Translation
      1. Bearer Application protocol
3. Technology overview of FM broadcasting
  1. Sample architecture diagram of an FM-RDS or FM HD solution
  2. Strengths and weakness of this approach
4. Technology overview of weather radio
  1. Sample architecture diagram of a NOAA radio based solution
  2. Strengths and weakness of this approach
5. Technology overview of other broadcast based solutions
  1. Paging
  2. Others

## Appendix 1

### 1. *Parables and analogies*

#### 1. *Biological systems as design inspiration*

1. *Biological systems tend to be highly optimized as to survive the test of time*
2. *Human physiology as inspirational model (as outlined verbally by Conrad during SGIP H2G call of Sep 7<sup>th</sup> 2012)*
3. *Sample numerical analysis of suitable biological analogue to electrical system Demand Response here. (amount and speed of data vs. application needs)*

#### 2. *Another view (social)*

1. *A parent can be “connected” to their college aged kids without the need for highly detailed “whereabouts”.*
2. *The kids don’t want nor would consent to “detailed” whereabouts. In fact the insistence on “whereabouts” would harm the relationship*