

**Outline for a Paper to support an SGIP recommendation that the
Free Market choose the Appropriate Physical Layer Communication Method**

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Market

1. Nearly zero experience exists with typical customers using Smart Appliances.
2. Consumer acceptance of appliances with two-way (versus one-way) appliance communications unknown.
3. Specification of specific communication techniques now would severely limit market innovation in a currently immature market.

Technical

4. No wireless or power line carrier technology is the best choice for all physical environments and applications.
5. Appliances last much longer than the period during which typical communications methods become obsolete, resulting in orphaned technology with limited support.

6. Leading electronics manufacturers (e.g., IBM, HP, Dell, Sony, Samsung) design products with external communications options (dial-up modems in the early days, wireless PC technologies such as Wi-Fi and Bluetooth and wireless video technologies more recently) to minimize risk and hasten market acceptance in the formative years of a technology. Only after the free market has deemed a technology successful do manufacturers risk integration of a communication method inside the product.
7. Most appliance OEMs have limited engineering experience implementing mass market communication capability in their products.

Risk

8. Points 1 through 5 suggest that it is imprudent to mandate a physical layer solution at this time; further, mandate of a solution which does not achieve worldwide adoption results in higher-priced components and less widely adopted solutions.
9. Mandating the use of a specific protocol now will create a barrier to experimenting with a standardized physical interface.
10. Failure to exercise standard practice in Step 6
 - a. Creates the risk of appliances with an unusable communication interface implemented using early versions of a problematic device.
 - b. Creates a high cost to fix security or functional problems in the first versions of an embedded communication device.
 - c. Places development risk on OEMs and customers instead of utilities, the benefactors of demand response.

Recommendations

1. Encourage trials of various wired, wireless, and power line carrier technologies.
2. Gather extensive field experience in a variety of homes with various building materials, infrastructures, and climates rather than declaring a winning technology or choosing a standard; if a solution presents itself head and shoulders above the competition, NIST could consider a recommendation, but remember that innovation occurs in leapfrog phases, and that any winner NIST declares now (at a peak) may fall out of favor in as little as 12-24 months (in a valley).

3. Avoid embedding short-lived communications technologies in long-lived appliances without a plan to accommodate upgrades; most communications products (e.g., home routers, cable/DSL modems) have maximum five to seven year lifecycles, whereas appliances have life spans twice to three times as long.
4. Focus on the interface (gateway) between the energy management service provider (outside the house) and the home network (inside the house).
5. Leave the interface to home appliances open to investigation, field trials, and market testing. NIST could provide a forum to compare results, encourage cooperation, and eventually focus on a limited set of choices. It is too soon to mandate one interface because we do not know what works in the widest set of environments and cost-sensitive appliances.
6. Solicit the inputs of a diverse cross-section of the appliance industry, including manufacturers of white goods (large kitchen and laundry appliances), consumer electronics, and small appliances that consume significant energy (such as portable heaters, fans, window air conditioners and de-humidifiers).
7. Educate the appliance and consumer electronics industry about the value of an interface to a home network for energy management and other services. Urge product designers to include such interfaces in future product and application designs.