Smart Meters: *The Rest of the Story*

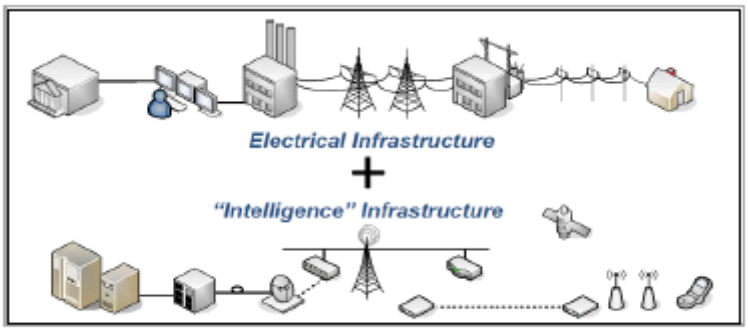
On August 31, 2011, an Idaho Power Contractor asked permission to enter my yard to install a smart meter. I refused permission for that purpose. After several phone conversations and letters back and forth, Chris Bell, a customer service representative for Idaho Power showed up at my door with a Deputy Sheriff to force the installation of the smart meter. I filed a formal complaint with the Idaho Public Utilities Commission that resulted in the opening of IPC-E-12-04.

The meter that Idaho Power installed is the Landis+Gyr residential with the Aclara Two-Way Automated Communications (TWACS) software and circuit board for communications using power line carrier communications (PLCC) protocol. The TWACS components were shipped directly to Landis+Gyr to be installed in the meters before delivery to Idaho Power per Idaho Power direct testimony of Mark C. Heintzelman to the IPUC, Case IPC-E-08-16.

Photo Source: http://www.electricnet.com/doc/electric-metering-transponders-aclara-twacs-0003

In general, the term 'Smart' as a noun refers to integrated computer hardware and/or software. The Smart Meter for utilities is a computerized device that includes data collection, data storage, data communications for transmission of meter data to the utility company. The data collection tables conform to ANSI Standard C12.19 Utility Industry End Device Data tables.

The Smart Meter is the end-use component of the Smart Grid which includes a hardware and software overlay on top of the electric grid. At the industrial interface points where mechanical equipment is installed, Supervisory Control and Data Acquisition (SCADA) systems are used to control the intelligent (synonym for smart) mechanical devices and processes.



Source: EPRI Intelligrid Architecture

The objective of Smart Grid infrastructure is to have total 'Situational Awareness' over the entire electric grid right down to the level of recording a "toast event" at your house at 7:10 am on Tuesday. Situational Awareness is for the purpose of managing and controlling the use of electricity (demand management). Toward that end, electrical devices of all types are being designed to include smart grid interfaces to allow control of them from remote locations.

Manufacturers are still in the early stages of development for these interfaces, but the direction is clear. The following are excerpts from a study performed by the Pacific Northwest National Laboratory operated by Battelle for the U.S. Department of Energy:

> Pacific Northwest Gridwise Testbed Demonstration Project
> Part II. Grid Friendly Appliances Project
> Report published October 2007
> Project for the U.S. DOE under Contract DE-AC05-76RL01830
> https://www.smartgrid.gov/sites/default/files/doc/files/Pacific_Northwest_GridWise_Testbed_Demonstration_Projects_Pa_200701.pdf
>
> The Grid Friendly Appliance Project tested the hypothesis that the GFA controller could directly contribute to frequency protection on the electric power grid. It performed a function similar to what is now practiced at some substations where underfrequency relays autonomously react to shed the load of entire feeders when low-frequency thresholds are crossed--
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> From early 2006 through March 2007, Pacific Northwest National Laboratory (PNNL) managed the Grid Friendly Appliance Project, a field demonstration of autonomous, grid-responsive controller called the Grid Friendly appliance (GFA) controller. This device is a small electronic controller board that autonomously detects underfrequency events and requests that load be shed by the appliance that it serves.
>
> The study used 150 new residential clothes dryers that were manufactured for the project by Whirlpool Corporation and 50 retrofitted residential water heaters. The appliances were modified to shed portions of their electrical loads when they received signals from their GFA controllers...

Whirlpool Project

Here is another project for smart appliance development using federal grant money. Notice that the Key Targeted Benefit was reduced peak consumption – otherwise known as peak shaving. Also notice, 'wireless communications and advanced control software'.

Whirlpool Corporation

Smart Appliance Project

Abstract

In the Smart Appliance project, Whirlpool Corporation (Whirlpool) seeks to develop and commercialize home appliances with wireless communications and advanced control software. The objectives are to (1) develop a wireless communications protocol for home appliances, (2) design appliance control and interface software optimized for demand response and time-based rate programs, and (3) produce cost-effective communications hardware for appliances. With the development of the new appliances and systems, Whirlpool aims to provide cost-effective options for residential customers that can enhance the effectiveness of time-based rate and load management programs to reduce peak demand.

At-A-Glance

Recipient: Whirlpool Corporation

Company Headquarters: Benton Harbor, Michigan

Total Budget: $39,096,275

Federal Share: $19,330,000

Project Type: Customer Systems

Equipment Manufactured

- **Smart Appliances (Wireless Communications and Advanced Control Software)**
  - **Clothes dryers**
  - **Dishwashers**
  - **Refrigerators**

Key Targeted Benefits

- **Reduced Peak Consumption**

Smart Grid Features

Communications infrastructure includes developing new communications hardware and software for smart appliances. A standard protocol for wireless communication by appliances has not yet been developed. As part of this project, Whirlpool is working with the Association of Home Appliance Manufacturers Smart Grid Task Force to develop a common protocol, which is intended for products across many major manufacturers. This communications system for appliances uses radio frequency systems to interface appliances with home Internet networks and smart meters.

The project enables ***advanced electricity service options*** through the development of hardware and software for home appliances to interface with smart meters and home area networks. Clothes dryers, dishwashers, and refrigerators are the first set of appliances targeted for these upgrades, though the technology developed is likely usable in a wide range of other home appliances. Smart appliances provide two-way communication with the power company through home Internet networks and advanced metering infrastructure. A customer interface allows users to program their appliances to automatically defer electricity use to reduce electric costs, based on electric rates or pricing alerts.

Timeline

Key Milestones	Target Dates
Equipment development completed	Q3 2012
Commercial market integration completed	Q4 2012

Source: https://www.smartgrid.gov/sites/default/files/pdfs/project_desc/09-0372-whirlpool-project-description-06-15-12.pdf

The significance of wireless communications on appliances is that remote control of the device can be triggered not just by low frequency as described in the Pacific Northwest Project, but can be triggered by the smart meter with software and the TWACS communications capability. The Aclara TWACS communications hardware and software with the Landis+Gyr meter can be

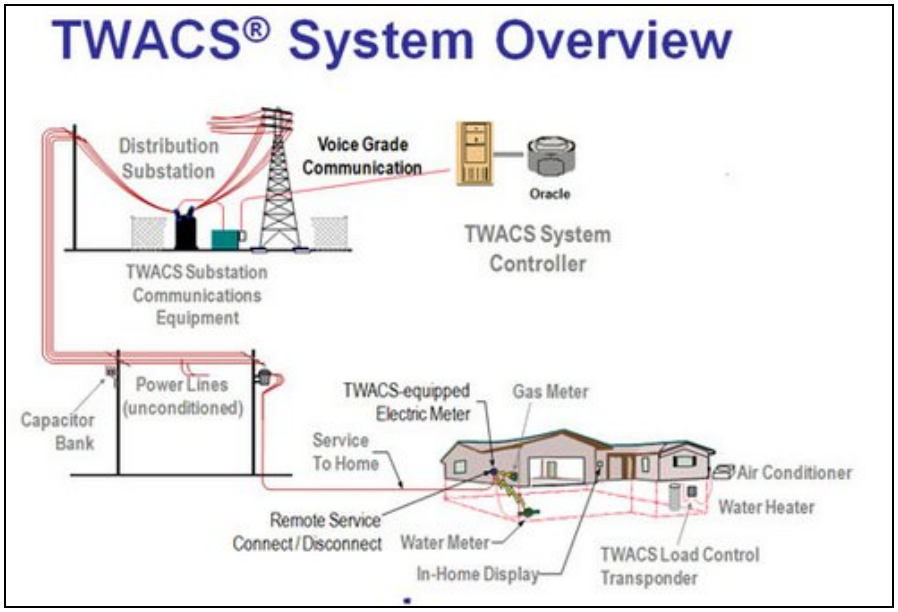
configured to collect water and gas meter usage information when combined with the Badger water meter with Orion software. This demonstrates the fact that the smart meter is a gateway device to all of the "smart devices" in a person's home. It should be noted that the wireless communications with smart devices at a residence does not mean that it operates instead of PLCC protocol for communications with the utility. Rather, it is in addition to PLCC in the same way that your computer can wirelessly communicate with your modem or mouse in addition to communicating through the internet over a phone line or cable connection.

Aclara™ TWACS® Technology and Badger® ORION® RF

WATER AND GAS METERING SOLUTION

Customers with existing TWACS power-line communications system can extend their fixed network to gas and water meters by simply adding Badger ORION RF transmitters. Using this short-hop solution to collect total consumption data simplifies billing and allows better resource management.

The system employs a radio-frequency link to transmit data from the Badger ORION gas and water transmitters to an Aclara TWACS EMT (Electric Meter Transceiver) or a TWACS UMT (Universal Meter Transceiver). The TWACS EMT or TWACS UMT store the readings, transmitting them through the TWACS network to the master station on a user-defined schedule.



Source: http://www.generalpacific.com/services/metering/aclara-twacs