Scenario: Private Distribution Grid

Toby Considine
University of North Carolina
toby.considine@unc.edu

Commodity Housing In Neighborhoods (CHIN) is a large builder of spec housing that wants to extend its branding to a series of new neighborhoods marketed to the green while providing enhanced reliability and perhaps reduced cost.

The houses in these planned neighborhoods are built to use sustainable materials, to take advantage of passive solar, and are connected by community green space. Houses are well insulated, have low e windows, energy star appliances, efficient lighting, radiant heat in the floors, overhangs, etc. Each house as well as the community facilities have solar power (PV) collection. (Well they could have solar thermal Sterling engines, too..) and some local power storage. CHIN considered a DC-wall in each house, but feels that the standards are not quite ready. Taking advantage of the local DC storage, CHIN supplies persistent LED lighting in safety/traffic areas to limit use of normal lighting to evening hours. CHIN has used its purchasing clout to get contracts for DC "white boxes" as options on standard appliances to enhance performance when running off of stored power. For now, the appliance areas are "double wired" to preserve re-sale value.

The houses are marketed as components of a safe, walk-able community with big shade trees, and bike paths. In this tree-lined development, the distribution grid is entirely underground. Community green space includes wind generation above the playgrounds. A larger energy storage system is installed under the community pool. CHIN has funded a start-up to manage the energy management for the community, as they do not wish to be in that business. The energy management company has an initial 5-year contract with the Home-owners association, and can manage several such communities from a common control center using web services to remotely perform operational configuration.

The key to this environment is the Green focus of the marketing of the community and the charter of the homeowners association. The houses are marketed as components of a safe, walk-able community with big shade trees, and bike paths. Buyers are sold the rewards of lower costs for their power and better reliability. Aggregate buying, off-grid energy storage allow the community to purchase power according to the values of the Homeowner's Association, be they guaranteed load shaving contracts, green power purchases, or lowest price. Through the local storage and distribution, they have power when surrounding communities lose it during ice storms or after bad electric/wind storms. The homeowner enjoys economic green results without sacrifice of amenity.

Web based analytics of energy usage are available from the energy management company. Because the remote operations is based open web services standards, there is minimal friction in switching to a different energy manager. Over time, a competitive environment develops for providing neighborhood energy management.

Third Party Customer Face

Interoperability Category	Tools, Systems, Key Actors	Examples of interoperation across organizational boundaries where agreements must be reached
Organizational		
Economic/Regulatory Policy Political and economic objectives as embodied in policy and regulation	Local Regulatory Authority Insurance Markets Commodity Builders Lawyers	• Policies enabling local generators to manage local energy storage. Frequency management makes local distribution difficult • Insurance policies required by Power Company in case of damage must distinguish between net metering and self-contained micro-grid. • Live customer access to direct metering data using e-commerce protocols • Legal framework for community access to live power consumption. • Direct client side access to distribution head-end metering.
Business Objectives Strategic and tactical objectives shared between businesses	Home Builders Energy Storage System providers Standards Bodies	• Branded green housing communities with high amenities. • Increased reliability by local storage/distribution • Neighborhood aggregation able to take entire micro-grid off-line during peak load/congestion. • Premium sales price likely unattainable; reduced days on market increases profitability. • Standards-based neighborhood control system access enables competitive market in system management
Business Procedures Alignment between Operational Business Processes and Procedures		• Aggregation of power consumers in neighborhoods controlled. • Homeowners Association contracts for energy management and analytics • Shared Energy Analytics within community.

Informational		
Business Context Awareness of the business knowledge related to a specific interaction		• New virtual companies of web-service consisting of web-based neighborhood aggregators, purveyors of control analytics, and maintenance professionals. • Standards-based common access to home-based systems, generation systems and storage systems using e-commerce style protocols (oBIX). • Market Pricing infrastructure
Semantic Understanding Understanding of concepts contained in the message data structures		• NBIMS classification of building • OASIS ebXML ontology • BPEL to express community rules during extreme outages. • OASIS oBIX contracts
Technical		
Syntactic Interoperability Understanding of data structure of messages exchanged between systems		• OASIS EBXML • W3C SOAP syntax • WS-security and business protocols sufficient to enforce signatures and non-repudiation • OASIS oBIX • BPEL • WS-Federation
Network Interoperability Mechanism to exchange messages between multiple systems across a variety of networks		• SOAP • TCP-IP
Basic Connectivity Mechanism to establish physical and logical connections between systems		• Any commercially available data connectivity Messaging infrastructure