CASE STUDY

Residential Demand Response Load Control

CHALLENGE

The **Tendril Residential Energy Ecosystem** (TREE) enables consumers to better understand their energy consumption patterns and make energy saving decisions. TREE also allows energy suppliers to establish a deeper relationship with their customers and deploy smart energy conservation programs designed to meet the individual needs of their consumers.

Tendril Networks, Inc.
Energy Management Technology Provider
Boulder, CO

Tendril provides its service to consumers in partnership with public utilities. To do this, TREE must be integrated with each utility's data center and web portals, and support the features of the utility's **Advanced Metering Infrastructure** (AMI). When Tendril found itself in the position of needing to accomplish two utility customer integrations in the same short timeframe, development resources were feeling the strain. Tendril turned to its software development partner of choice, Green Energy Corp (GEC), to design and implement the custom **Demand Response Load Control** (DRLC) module for one of the utilities.

TASK

Deliver custom module on time—The DRLC module of TREE, compliant with the *ZigBee Smart Energy Profile 1.0*, allows utilities who monitor power usage to enlist their consumers as energy management partners. TREE sends out requests for consumers to shed load at predetermined times. The load shed results in cost savings for the utility because they do not need to bring standby generators on line if the overall load on the main system can be controlled. The utility can incent consumers to participate by passing cost savings along through discounted rates. A typical DRLC event might adjust the set point on home thermostats and turn specified smart outlets off (or duty cycle them) for a specified time and duration.

DELIVERED

The GEC team developed the software to implement this functionality including the web–based interface used by the utility. This interface schedules and controls load control events and contains the back–office business logic for storing DRLC requests and responses from the customer devices in the TREE database. It also includes the low-level networking software to send and receive this information from residences. The web presentation and server components of the DRLC module were written in Java. GEC implemented the DRLC code in embedded C for the **Tendril Volt** smart outlet and provided technical consulting to a Tendril partner who created a smart thermostat.

RESULTS

The GEC team successfully integrated with the Tendril development team, following Tendril's development process independently and minimizing the impact of this project on other engineering efforts. The first deliverable, two weeks into the project, was an analysis of the Tendril code base and how the GEC–supplied code would integrate into it. Two weeks later, GEC facilitated a successful demonstration of the DRLC feature set with the Tendril customer. The project handoff, including documentation and a fully automated test suite, occurred only two months after the first demonstration.

From GEC's efforts, Tendril gained more than just timely delivery of the features they needed to satisfy their customer. Because GEC's participation in the project placed little burden on Tendril's team, other features were delivered in parallel so the overall project success increased exponentially. The GEC–developed initial demonstration was so well conceived and packaged that Tendril was able to use it as a sales tool and traveling road-show for trade shows and prospective customers.

> "We are extremely happy with the quality talent that Green Energy Corp has been able to lend to our engineering effort."
> **- Tendril**

The partnership was extended, with Green Energy Corp assisting Tendril in more *Smart Energy* work, including further additions to Tendril devices in the area of Text Messaging, Time of Use Pricing, data backhaul using Broadband Over Power Lines (BPL) and creating the **Tendril Device Developer Kit**, which allows partner integration of ZigBee devices.

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