A Smart Approach to Integrating with the Smart Grid

Lighting control is a key demand response strategy

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As national attention turns increasingly from an aging energy grid and toward a Smart Grid, questions emerge as to which are the most effective models for delivering the performance and efficiency of an integrated and interactive energy distribution structure.

According to the Modern Grid Strategy project of the National Energy Technology Laboratory, Smart Grid should meet the following seven criteria:

1. Self-healing from power disturbance events
2. Enabling active participation by consumers in demand response
3. Operating resiliently against physical and cyber attack
4. Providing power quality for twenty-first century needs
5. Accommodating all generation and storage options
6. Enabling new products, services, and markets
7. Optimizing assets and operating efficiently

For manufacturers and consumers, one of the greatest opportunities for participating in the development of a national Smart Grid is the second criteria—finding ways to enable active participation by end users of electricity through demand response.

Demand response is any action taken on the part of an electricity consumer to reduce power usage, or shed load, at the request of a utility. The major benefit of demand response for utilities is that it contributes to the prevention of brownouts and blackouts. For consumers, the benefit comes in the form of lower energy costs. Because peak usage costs are significantly higher than average, demand response is a strategy consumers can use to directly prevent the accrual of peak usage charges.

FOCUS ON LIGHTING

One of the most effective methods of executing demand response is by focusing on the building lighting system. Lighting accounts for more electricity use than any other commercial building system—38 percent—according to the U.S. Department of Energy. And lighting is a significant source of electricity usage in homes.

Controlling is a better demand response strategy than adjusting HVAC settings because while reducing HVAC load can have a detrimental effect on occupant comfort, lowering lighting levels can actually improve occupant comfort. If executed over a period of several minutes, a drop in lighting usage of 40 percent or more will go completely unnoticed by building occupants. On the other hand, an adjustment by just a degree or two in building temperature will have a noticeable and sometimes negative effect.

HOW IT WORKS

The key component in connecting a building to the Smart Grid is the smart meter, which serves as a point of communication back to the utility, and as a source of real-time power usage analysis. Through the smart meter, an intelligent lighting control system can be programmed to communicate directly with a utility or energy aggregator. The end user can configure the appropriate setting once, and allow the system to operate automatically thereafter. Settings can include demand response or real-time pricing logic that determines how to respond to various energy events.

Then, in a peak-usage scenario, the utility or energy aggregator sends a signal to the smart meter to shed load. The lighting system—already programmed with the appropriate response—sheds load strategically throughout the home or building. Peak-demand charges are avoided, the end users are doing their part to prevent power supply disruption, and the occupants in the space don't even know it's happening.

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