



## DEMAND RESPONSE: A GOOD THING FOR EVERYBODY

Phil Holt, Proposal Writer, Marketing Communications;  
Dan Merilatt, Manager, Demand Response Systems; and  
Charles Parsons, Business Development Manager, Demand Response Solutions – Cooper Power Systems

Stories about environmental issues and global warming are in the news headlines every day. Behind the headlines lurk the very real challenges of addressing these large-scale issues of preserving the environment on a local level while balancing the need for sound economic energy management. The Cannon demand response solution by Cooper Power Systems is uniquely positioned to help utilities address these tough problems, while bringing balance to the equation.

Reducing emissions is the key to address the challenge of preserving the environment. Cooper Power Systems has the tools required to handle this important task. Assuming 100 hours of control per year, each megawatt of control (about 1,000 residences allowing some reduction in their air conditioning usage) has the potential to eliminate approximately 700,000 pounds of carbon dioxide (CO<sub>2</sub>), 700 pounds of nitrogen oxide (NO<sub>x</sub>), and 3,000 pounds of sulfur dioxide (SO<sub>2</sub>). This reduction is crucial because both CO<sub>2</sub> and NO<sub>x</sub> are greenhouse gasses while SO<sub>2</sub> is the main component of acid rain. The significant environmental impact of these reductions is seen in the fact that currently the United States has over 3,600 MW of residential demand under control.

Cannon's demand response (DR) solution significantly impacts the local environment by decreasing pollutants. These pollutants contribute on a global scale as well. This benefit pleases users and as a result they are more inclined to enroll and stay enrolled in these programs. The DR solution using the Cannon programmable communicating thermostats (PCTs) will create greater benefits for the environment through documented energy savings. There are documented energy savings from 10% to 15%—provided participants use the programming features.

DR programs can displace the need for some new peaking capacity. With wide deployment, they can reduce the likelihood for brownouts and rolling blackouts. Many consumers welcome an opportunity to participate in DR programs due to these benefits, because they want to help keep electricity costs manageable, and they view these programs as environmentally benign.

To be sure, it is vitally important to balance the need to preserve the environment with the needs for sound economic energy management. Today, our national electric grid stresses because of generation and transmission capacity constraints—growing demand pressing against fixed capacity. The cost for peaking generation continues to rise. Today it varies between \$650 and \$850 per kW while DR networks are from one- to two-thirds less. Part of the solution will be to grow the grid in an economical and environmentally responsible way. Another part of the answer lies in the further promotion of peak demand

management programs—demand response programs. Cooper Power Systems is working toward the goal of finding this balance.

### Cannon Demand Response

With Cannon solutions, Cooper Power Systems currently offers one of the largest and fastest-growing brands of peak-load management tools in North America. DR/load management solutions include load control relays (LCRs). These devices are for the direct load control of electric HVAC systems, electric water heaters, and electric pumps and motors. Cooper also offers advanced programmable communicating thermostats (PCTs) enabling the more efficient use of HVAC systems. Utilities can also use our PCTs for the direct load control of customers' HVAC systems or for implementing dynamic and innovative pricing options.

Networks of load management devices (as well as other "smart grid" equipment of various kinds) require management. Cooper's network management system is a versatile energy-management software platform known as *Yukon*. This platform helps improve important parts of the electrical distribution network while connecting utilities with their customers through its load management products.

### Why Demand Response?

That's a fair question. Cooper has been successful in selling its demand response solutions to utilities throughout North America. Why? Why would utilities be interested in reducing their peak demand? Why would their consumers voluntarily relinquish some control over their air conditioning, water heating, and other major electrical loads to the electric utility serving them? The answers to these questions illustrate the benefits that DR provides.

### Benefits of Mass-Market Demand Response

A successful mass-market DR program is beneficial to both the utility and its customers. Many customers like these programs because they lead to reduced outages. These programs provide opportunities to participate in environmentally friendly programs. Utilities are happy because peak-load management programs do not materially affect kWh sales. They help utilities avoid using interruptible contracts and they help avoid spot market purchases while sometimes allowing additional spot market sales. Mass-market demand response programs support many utility goals including community value, environmental responsibility, saving scarce resources, increasing system reliability, and increasing customer satisfaction.

## Peak Load Reduction

The purpose of mass-market DR programs is to reduce the peak demand placed on utility systems. This peak demand typically occurs on the hottest summer days. Research has shown that a load management network of LCRs or PCTs can significantly reduce this peak demand and provide greater stability to the electrical system, while reducing the need for new peaking capacity.

## Customer Satisfaction

One of the misconceptions of demand response programs is that customers become uncomfortable and therefore unhappy with their participation in the program. Metered evidence has shown that with air conditioning load controlled, indoor temperatures only rise slightly as shown in figure 1.

Participants in well-run demand response programs are more satisfied with their utility than are its non-participating consumers. Consumers appreciate it when utilities introduce programs designed to help keep the lights on and electricity cost low—especially when they are not discomforted.

## Environmental Considerations

Cooper's Cannon DR Solution has a significant impact on the local environment by decreasing pollutants and contributing on a global scale as well.

## The Economic Bottom Line

In addition to the environmental benefits, perhaps the most surprising thing about this impressive list of benefits is the cost. The total cost for mass-market peak-demand reduction programs is lower than the cost of supplying those peak demands from generation. They are not just a little lower, but can be one-third to two-thirds as much. The total present-value cost for a mass-market DR program including the costs for program management, marketing, recruitment, equipment, installation, service, and maintenance will vary from about \$250 per kW of peak reduction to about \$500 depending on the DR equipment used and the overall size of the program. When peaking-capacity costs about \$750 per kW installed plus its annual operations and maintenance costs, the value of mass-market DR becomes obvious.

## The Market for Demand Response

Is the market nearly saturated or will it grow? If it will grow, at what rate will it

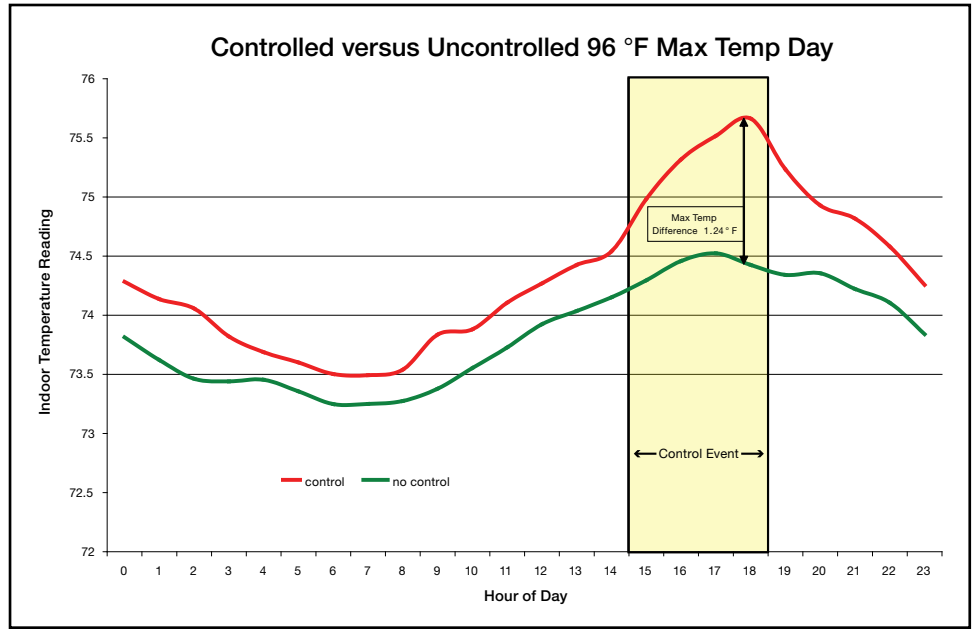


Figure 1. Indoor temperature variation between controlled and uncontrolled electricity loads using Demand Response systems.

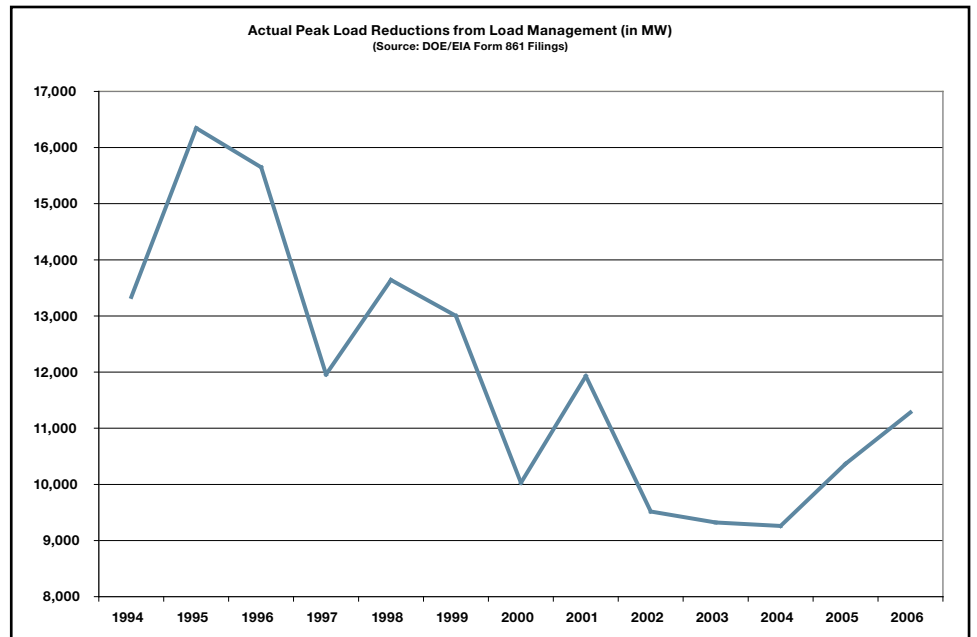


Figure 2. The residential Demand Response market has room for growth.

grow and for how long? These are difficult questions because they involve anticipating the future. Some contributors to the answers are in the facts.

## Recent Demand Response Activity

- In 2006, the latest year for which data is available from the United States (U.S.) Department of Energy (DOE), North American utilities delivered 11,281 MW of peak-period load reductions.

- This amount of demand response is encouraging but not record-breaking and far short of the over 16,000 MW of peak-period load reductions recorded for 1995.
- Of the 11,281 MW of peak-period load reductions delivered in 2006:
  - The industrial sector delivered 53%.
  - The commercial sector delivered 15%.

Continued on page 17

## FR3 FLUID PROVIDES SUSTAINABLE ALTERNATIVE FOR REDUCING CARBON FOOTPRINT

From page 7.

By utilizing a soy-based dielectric fluid, utilities across the nation are able to deliver reliable service to their customers and participate in the global effort of reducing atmospheric levels of CO<sub>2</sub>. Public owned utilities are also using FR3 fluid in their distribution transformers, including the California-based electrical utility Sacramento Municipal Utility District.

### Regulation

In the current political climate, FR3 fluid has the potential to do more than just reduce a company's carbon footprint. The volume of domestic and international carbon regulatory bodies, such as the Regional Greenhouse Gas Initiative, the Carbon Climax Exchange, and the European Union Emission Trading Scheme, has been increasing substantially in recent years. In many cases, these institutions place limits to the amount of carbon that can be emitted into the environment—allowing for companies to purchase carbon offsets to reduce their carbon footprint. Examples of carbon offset projects include those which incorporate wind generation, contain methane generated by farm animals and landfills, include planting trees, or enhance energy efficiency.

Carbon regulation has also manifested

into policy at the local level. California, Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont are taking the first steps to limit carbon emissions, while Massachusetts and Kansas are in the process of developing CO<sub>2</sub> regulatory legislation. Oregon and Washington have already mandated that power plants are required to offset a certain percentage of anticipated carbon emissions.<sup>4</sup> Considering the carbon political activity at the local level, a national policy that implements a carbon cap and trade system is likely to occur within the next presidential administration. If a national cap and trade policy were to be passed, the value of a carbon credit has been estimated to reach or exceed \$40 USD per carbon ton. Under these circumstances, a utility making annual distribution transformer purchases of \$1,000,000 would yield a potential carbon credit value of \$19,000. Companies would be gaining roughly a two percent rebate on their transformer purchase.

### FR3 Fluid and the Future

There are many environmental and economic benefits to be gained by using a biobased fluid in distribution transformers. Using FR3 fluid would allow for a

significant reduction in greenhouse gases as compared to mineral oil. From reducing the harmful effects of transformer spills and avoiding fires to reducing a company's carbon output, it is evident that FR3 fluid not only enhances safety and reliability for the electrical grid but assists utilities in implementing sustainable business practices. ■

1. "Building for Environmental and Economic Sustainability Technical Manual and User Guide" National Institute of Standards and Technology. August 2007.
2. "International Energy Outlook 2007" Energy Information Agency. (May 2007) <<http://www.eia.doe.gov/oiaf/ieo/oil.html>>
3. "Alliant Energy makes the move to FR3 fluid for its distribution transformers." 26 February 2008. <<http://www.alliantenergy.com/docs/groups/public/documents/pub/p016407.hcsp>>
4. "States with a Carbon Cap or Offset Requirement for Power Plants" PEW Center on Global Climate Change. (2 April 2001) <[http://www.pewclimate.org/what\\_s\\_being\\_done/in\\_the\\_states/cap\\_and\\_offset\\_map.cfm](http://www.pewclimate.org/what_s_being_done/in_the_states/cap_and_offset_map.cfm)>

## DEMAND RESPONSE: A GOOD THING FOR EVERYBODY

From page 12.

- The residential sector delivered 32% or 3,600 MW.
- These results are encouraging because:
  - DR has risen steadily since 2004.
  - 2007 results may well exceed 13,000 MW.
  - DR in Canada is increasing.
- These results indicate that the residential sector's market potential for DR is primarily untapped.
- 46 million of them have central electric air conditioning.
- 24 million have electric water heating.
- 18 million have central electric heating systems.
- Assuming that 25% of these candidates could be persuaded to participate in summer peak-period demand response programs:
  - 11.5 million families having more than 12.5 million central air conditioning units would provide over 12,500 MW of summer peak-demand relief.
  - The U.S. has yet to tap over 70% of the air conditioning load control potential.

### The Residential Demand Response Potential

- The U.S. has about 66 million families living in single-family, owner-occupied housing units.
- These 66 million families are the primary candidates for participation in utility-sponsored residential demand response programs.

### The Emerging Demand Response Market—Cooper Power Systems' Role

Numerous utilities across the United

States have made large investments in load management systems. Cooper is supporting these existing systems with its Cannon Yukon software platform alongside its newest technologies—allowing utilities to migrate smoothly from older to new technology without needing to replace the entire investment immediately.

Secure hosted Web access through the Yukon advanced energy services platform supports our entire suite of intelligent devices. The widely used Yukon DR platform fully supports thermostat programming, meter data integration for dynamic pricing, consumer access, and much more.

Cooper Power Systems looks forward to building on its history for innovation while solidifying its position as a leading demand response solutions provider in North America. ■