

*US utility PacifiCorp has implemented an innovative load management programme to manage air conditioning load during peak periods. The Cool Keeper programme enables it to address peak demand and grid congestion issues.*

## LOAD MANAGEMENT: BRIDGING THE GAP

*(This is an article published in PEI – Power Engineering International)*

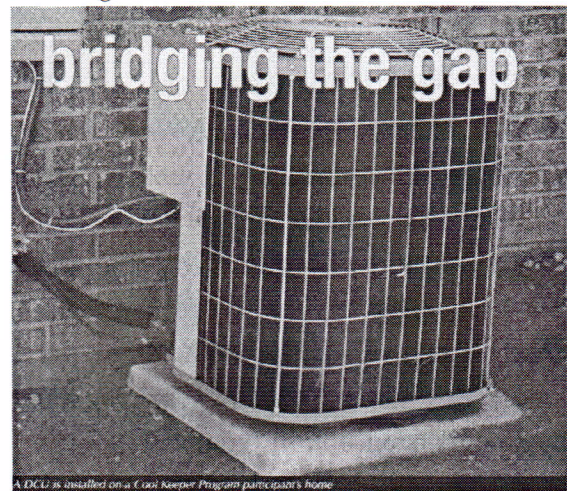
Utility companies, regardless of location, have one goal of paramount importance, “Keep the lights on!” To keep customers happy and businesses running smoothly, utility companies allocate innumerable man-hours and expend significant resources when formulating their Integrated Resource Plan (IRP). These plans are devised to make certain that both short and long-term consumer demand for power is being met in a cost effective manner via a reliable and stable infrastructure that adheres to all regulatory guidelines.

When formulating IRPs, more and more utilities are finding that they have a common challenge: the growth in peak energy demand is significantly outpacing the growth in base load demand. This base load demand is met by base load resources - typically a portfolio of large coal fired, hydroelectric, and nuclear power plants. Inevitably, there are periods in which the total power demanded by customers exceeds the supply of power produced by base load resources. Utilities refer to these instances as periods of “peak demand”.

The difference between peak energy demand and base load resources (the “peak differential”) is typically managed by a combination of expensive and relatively inefficient power generators. To the extent that the peak differential escalates, the utility is challenged with securing increasing amounts of expensive generation, either by construction of new power plants expected to run for only

brief periods of time or by purchasing peak power in the volatile peak electricity wholesale markets.

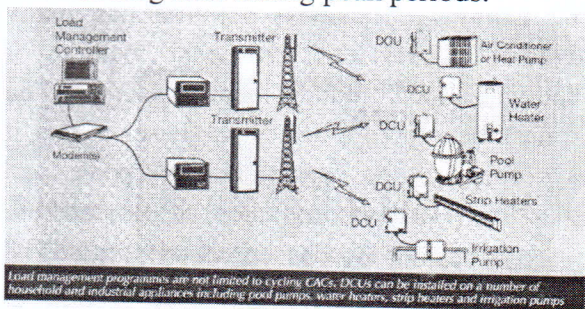
*“In times of emergency the utility can send out a 100 per cent cycle signal yielding more than twice the amount of load reduction available on a regular basis”*



### Staying cool

In most cases peak demand occurs on hot weekdays when air conditioners are working. The primary reason that the peak demand-base load demand differential is escalating is generally due to the increasing use of central air conditioning. A study conducted by the Energy Information Administration (EIA) found that, in 1997, 47 per cent of all US homes had central air conditioning, up from only 23 per cent in 1978. This is very significant given that air conditioning load can account for as much as 70 per cent of total

household energy consumption during hot summer months. As central air conditioning has become more affordable and therefore more prevalent and accessible to the average consumer, peak demand loads have grown dramatically. For example in 2001, PacifiCorp found peak demand in its Utah Power service territory grew by more than 2.5 times its average historical system growth rate. A study confirmed that the saturation of central air conditioning was on the rise in the area due to the installation of Central Air Conditioners (CACs) in newly constructed homes as well as the conversion to CACs from evaporative coolers in existing homes. Utilities like PacifiCorp have realized that an effective way to manage the peak differential caused by central air conditioning is to employ load management systems targeted at managing air conditioning load during peak periods.



Matching supply and demand in an increasing peak demand environment is only part of the utility's quandary. With the increasingly elevated peak demand, transmission and distribution bottlenecks or "load pockets" have become a serious concern. As peak demand grows the transmission and distribution assets of a utility become ever more strained. As such, it is possible for a utility to have supply in excess of its peak demand and still have problems delivering power to customers. Thus increased investments in transmission and distribution infrastructure may be necessary to deliver electricity to local homes and businesses for brief peak periods. Load

pockets, if not given due attention can degrade service reliability.

Utilities have several options to resolve the problems created by rapid peak demand growth. The viable options include building combustion turbine "peaker" plants that are used primarily at times of peak demand, buying power from often opportunistic power merchants in the spot market during peak demand periods, deploying distributed generation power plants located in load pockets, or implementing some type of load management programme. For PacifiCorp, priding itself as "one of the lowest-cost electricity producers in the US," the solution to its peak demand and grid reliability issues was required to be both cost-effective and environmentally friendly. Having evaluated the alternatives, PacifiCorp opted to implement a load management programme.

### Load reduction

Instead of focusing on the supply side of the equation, load reduction programmes seek to shift the demand for power by reducing the customer's energy needs during peak hours of consumption. A programme of this kind allows the utility to send a signal, via a radio network, to intelligent devices that have been installed on thousands of customer's homes. The intelligent device called a digital control unit (in PacifiCorp's case the Converge SuperSwitch) receives the signal and adjusts the duty cycle of the customer's CAC unit to run exactly 50 per cent of the time that it was running in the previous hour. This reduction in run time, occurring synchronously at thousands of customer's homes, reduces the peak demand and alleviates the strain on the electric grid. Load management programmes are particularly effective in addressing

transmission and distribution problems because they can be focused in the areas of greatest need on a substation basis. By deploying this programme, marketed to its customers as the Cool Keeper Program, PacifiCorp is able to address both the peak ie demand and the grid congestion issues with cost effective, environmentally friendly solution.

In addition to resolving these key issues, load reduction programmes have many ancillary benefits. First, the utility does not have to deal with the hassle of finding a site and subsequently permitting a power plant.

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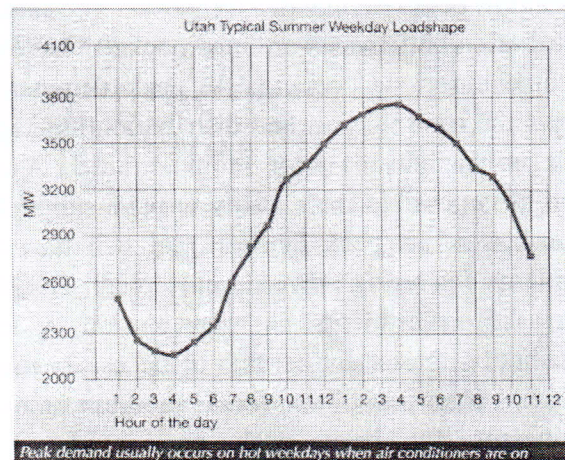
At the same time, customer goodwill is created as customers become empowered by doing their part to reduce energy demand. And importantly, in times of emergency the utility can send out a 100 per cent cycle signal yielding more than twice the amount of load reduction available on a regular basis.

The benefits of load reduction programmes can be generalised to include just about any load reduction programme; however there is one key aspect of PacifiCorp’s Cool Keeper Program that is truly innovative - the programme is completely outsourced to Comverge, Inc. In fact, Comverge actually owns all the components of the load reduction system and is contracted to sell capacity to PacifiCorp on a long term basis much like a power plant supplier would engage in a power purchase agreement (PPA).

## Business solutions

The Comverge Enterprises Group has been focused on this outsourced business solution for several years. The Comverge business solution is predicated on the sale of peak load capacity reduction to electric providers via long-term contracts. Traditionally, utilities looking to deploy a load management programme of this kind would buy all of the components of the system from a technology provider and utilize internal resources to market and recruit programme participants, install the RF communication network and remote devices and operate the system on a daily basis. In the new business arrangement Comverge is responsible for performing all of these duties as well as assuming all risks associated with the programme.

The Comverge business solution has many advantages over the traditional method of deploying load management systems. The primary benefit to a utility purchaser is that it pays only for the desired result - peak load reduction - with one payment stream and no concern for derivative or unforeseen costs. The contract between Comverge and PacifiCorp is on a pay for performance basis -Comverge only gets paid for the demand reduction it delivers.



The Comverge business solution allows the utility and Comverge to focus on their core competencies. Instead, a team of load management experts, who have been involved in every aspect of the programme from its design, financing, and installation, execute the deployment of the system. The scenario in which the utility invests a great deal of money into a load reduction programme but does not get the desired peak demand reduction is avoided all together.

When it is fully deployed, PacifiCorp's Cool Keeper Program will deliver 90 MW of peak load reduction. The programme has had early success within the Salt Lake City community. Initial marketing to recruit participants has been well received and by the summer of 2004 (only its second summer of operation) it will be capable of delivering approximately 25 MW of load reduction. Other utilities are taking notice - in September of 2003 San Diego Gas & Electric executed a contract with Comverge to deliver 30 MW of peak load reduction.

Utilities must have various strategies to ensure the integrity of their grid and address demand during critical times. Given the success of the Cool Keeper Program as witnessed by PacifiCorp, and the continually increasing adoption of central air conditioning there inevitably will be more and more utilities taking advantage of this fully outsourced solution when formulating their IRPs.