District Thermal Ice Storage-DSM Success

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Introduction

In 2002, commercial customers in Denver utilized incentives through Xcel Energy's demand side management (DSM) program, Bid 2001, to shift the loads associated with chilled water production to off-peak hours. In exchange, Xcel Energy cost effectively acquired 11 MW of peak demand reduction.

Process

In 2001, Denver District Cooling Plant (DDCP) generated and distributed chilled water to 16 customers on a multi-building chilled water loop. The load was met using two 2,000 horsepower brine chillers while keeping one 37,500 ton-hour ice tank fully charged for reserve. By the summer of 2002, 14 new customers were added to the loop, 11 of which were participating in Xcel Energy's Bid 2001 DSM program. To handle the additional load, a new 37,500 ton-hour ice tank was added. In exchange for district chilled water, the additional buildings leased their existing central chilled water plants to DDCP to serve as remote cooling plants on the loop. The 11 customers received incentives from the utility for shifting their load during the defined summer peak period (3-7 p.m., M-F, June – August) to the ice tanks located at the DDCP. The DDCP also received incentives for improving the efficiency of the loop by shifting the existing customers' loads to ice or high efficiency pre-cooling chillers.

The verified demand savings for the entire system during the summer peak period was calculated as the difference between the total system demand during the 2001 and 2002 summer peak periods. The total system demand savings was then divvied up between the 11 existing buildings and DDCP. The savings for each of the 11 existing buildings was calculated as the difference between the measured demand of distributing the chilled water and the estimated demand use to provide the same load by the existing central plant located at that facility. The DDCP's savings were calculated using the difference between the efficiency of the plant in 2001 versus 2002.

Impacts and Results

The load shifting results of this analysis reveal three key issues:

1. The savings associated with shifting all of the customers on the loop (new plus existing customers) to ice (approximately 10,000 peak tons), was approximately 11 MW of peak demand reduction.
2. Cooperation between the DDCP, customers, and publicly-funded utility incentives can provide for: a sizable expansion in the DDCP infrastructure, a reduction in customers' energy costs through lowering their demand ratchets and consumption, and harnessing the benefits of low temperature chilled water design, and significant cost-effective demand savings for the utility.
3. Complex and robust M&V methodologies can be developed and successfully implemented.