Section 7 State Buildings and Public Universities Program Element

7.1 PROGRAM ELEMENT INTRODUCTION

This AB 970-funded program element provided funds specifically to state agencies and public universities in order to encourage energy efficiency improvements and demand responsive activities that collectively would reduce demand during the Summer 2001 peak period.[1] As noted in Nexant's December 2001 Annual Report, approximately $5.3M of the program element's $5.5M funding allocation was subscribed during 2001, and resulted in 57.1 MW of demand savings, according to Nexant's revised savings estimation methodology. Four state agencies and one private firm were state building and public university program element grant recipients. These included;

California State University (CSU) system: The CSU system received funds to install efficient lighting systems and controls, variable speed drives, controls on building fans, and the replacement of rooftop air conditioning units with efficient central-plant cooling. The six CSU campuses involved were Fullerton, Long Beach, Northridge, Pomona, San Diego State, and Sonoma State.

University of California (UC) system: Three UC campuses received funds; UCLA used theirs to install efficient lighting (T8 lamps along with electronic ballasts) systems; UC Santa Barbara used theirs to install chiller controls and a portion of a chilled water loop, thereby improving the overall efficiency of the campus cooling plants; and UC San Francisco received funds to install efficient lighting, but opted out of pursuing the project within the timeframe allotted. Subsequent feedback from UC San Francisco indicates that they have completed the lighting project..

Department of General Services (DGS): DGS received funds to develop Peak Load Reduction Plans as well as install various energy efficiency technologies including vending misers, watt stoppers and some automated meter reading equipment that provides real time access to utility meters located at 174 DGS buildings around the state.

Department of Corrections (DOC): costs. DOC received funds to develop demand curtailment plans at 33 prisons. In addition, funds were allocated for the installation of heat pumps on emergency generators, a project not pursued due to high costs and questionable savings.

Grueneich Resource Advocates (GRA): Grueneich received funds to facilitate the aggregation of 31 CSU and UC campuses for participation in a statewide plan for emergency demand curtailment. Actual load aggregation services were to be provided by Infotility, Inc.

As the program element was almost fully subscribed and all the actual projects implemented in 2001, Nexant's measurement and verification activities in this arena were limited to those

[1] As for all other program elements, the summer peak period is defined as non-holiday weekdays between June 1 and September 30, between the hours of 2:00 p.m. and 6:00 p.m.

completed and reported on in the December 2001 report. With limited additional program implementation activity in 2002 (additional projects were installed at UCSF and CDC), the major function to pursue within the state and public universities program element was to perform the requisite persistence verification assessment.

7.2 PERSISTENCE VERIFICATION REPORT

7.2.1 Introduction

Nexant conducted persistence verification activities for the State Buildings and Public Universities program element to verify that all participating projects were still successfully participating in load reduction activities as of December 31, 2002. As noted above, original measurement and verification (M&V) site visits and analysis activities were performed throughout 2001 as the involved projects were completed. For 2002, Nexant focused on verifying the projects' savings persistence via a telephone survey that was conducted with a sample of project participant facility managers. Four basic lines of questioning were pursued as noted below:

- Is the measure still in place and operating?
- Has the project been performing well relative to expectations?
- Have there been any operational changes to the project or the balance of the facility, which would affect energy or demand savings?
- Were the savings achieved in 2002 consistent with those attained in 2001?

Beyond these specific lines of questioning, Nexant also solicited and compiled participant comments and feedback on the program. This survey work was conducted in December 2002.

7.2.2 Overview of Nexant's Persistence Verification Results

In order to retain the comparative nature of the 2001 versus 2002 results, Nexant surveyed the same five participants who had been identified as the program element's M&V sample. The respondents and an overview of their projects and survey results are provided in Table 7-1.

Table 7-1: State Buildings and Public Universities Program Element – Persistence Summary

Participant Site	Project Technology	2001 Verified Demand Savings (kW)	2002 Verified Demand Savings (kW)
CSU-Fullerton	Variable speed drives	392	392
CSU-San Diego	Variable speed drives and lighting retrofits	214	232
UC-Los Angeles	Lighting retrofits	525	525
UC-Santa Barbara	Chilled water loop/ Chiller upgrade	57	57
Dept. of General Services (174 buildings)	Meter network system	22,000	22,000

7.2.3 Summary of Results

CSU-Fullerton

Nexant spoke with CSU-Fullerton's Assistant Director of Projects and Programs – Physical Plant. The campus' variable speed drives are still in place and operating. Energy savings are being realized continuously during their normal operation. In the event of a California ISO curtailment notification, the ability to further reduce demand is still present. According to the Assistant Director, CSU-Fullerton has increased the use of the project's variable speed drives, which has lead to increased *energy* savings in 2002. The increased energy savings have in turn allowed the campus to reduce their baseline demand level by approximately 10 percent. On top of that, when called upon by the ISO, the campus is still able to ratchet down their demand by an additional 10 percent. By combining these two attributes, CSU-Fullerton is able to maintain the approximate 392 kW demand reduction verified for 2001.

CSU-San Diego

Nexant spoke with CSU-San Diego's Manager of Electrical Services. The campus' variable speed drive and lighting projects are still in place and operating, and it noted that savings in 2002 were slightly higher than 2001 because of better than expected results from the lighting controls measures in the two involved parking garages. The Manager of Electrical Services indicated that the voltage reducers on lights in Parking Garage #3 provided 21.8 kW in demand savings as compared to the estimated 6.0 kW that had been anticipated. Likewise, in Parking Garage #4, the savings amounted to 6.3 kW whereas 4.2 kW had been expected. These savings when combined equate to an incremental additional savings of 18 kW above the 2001 verified savings. The project's vast majority of savings are associated with its variable speed drive component, which, per the Manager of Electrical Services, continues to perform as designed, with savings equivalent to those noted for 2001. Therefore, the overall project can be viewed as having increased demand reductions to 232 kW (214 + 18).

UC-Los Angeles

Nexant contacted the University of California System Campus Energy Manager regarding both the UCLA and UC-Santa Barbara projects. According to this contact, the efficient lighting

upgrade project at UCLA is still in place and performing satisfactorily. Energy and demand savings are being realized continuously during normal operation. The UC Energy Manager also commented that they are retrofitting other campus buildings with energy efficient lighting systems, based on their positive experience with the project and the lighting technologies. Based upon the positive feedback from the Energy Manager and his staff's confirmation that the operating hours associated with the lighting upgrades have not changed, Nexant concludes that the associated 2001 demand savings of 525 kW remain in place.

UC-Santa Barbara

As noted above, Nexant contacted the UC System Campus Energy Manager regarding this project as well. In the December 2001 report, Nexant noted that the UCSB chilled water loop project was experiencing some commissioning problems related to the level of cooling actually provided. Due to this, (along with addressing that the original application's proposed demand reductions were based upon connected load[2]) Nexant was able to verify only 57 kW of the 190 kW estimate reported by UCSB. In order to improve the cooling water loop's operation, small booster pumps were added in October 2001 to increase the loop's output. That revision along with utilization of the system's heat exchangers and some chilled water plumbing corrections, now allow the more efficient cooling water loop to fulfill its role, according to the UCSB project manager. The project was completed and operational on May 17, 2002 and is now functioning well.

The 57 kW verified demand savings value noted in the December 2001 report took into account that the system appeared to be approaching fully operational status when determining the verified savings. Therefore, based on the May 2002 commissioning work completed and the UCSB level of satisfaction in the system's performance, Nexant concludes that the verified 2002 demand savings for the AB 970 funded portion of UCSB's cooling water loop remains about 57 kW.

Now that the system is fully operational, the Project Manager has indicated that they have increased the number of buildings served off the cooling loop to nine. The Project Manager also indicated that, based upon the system's performance, the campus is looking to extend the loop to other buildings rather than add more chillers. However, while this is good news in terms of market transformation and increased utilization of the efficiency technology, it does not affect the demand savings associated with the equipment funded under this AB 970 program element.

Department of General Services

Nexant spoke with the Business Operations Support Manager in DGS' Energy Management Division. The DGS installed a web-based meter network that allowed remote real-time demand readings of each building's energy use. This system was functional in late 2001 and met expectations, however, they are still learning how to use the system to obtain the maximum benefit. An independent consultant is assisting with further development and refinement of the

[2] When calculating demand reductions from air conditioning changes, the total demand reduction is *not* the sum of the nameplate ratings of the individual units. Air conditioners cycle on and off to meet the cooling load; this reduces the aggregate campus demand and therefore the demand reduction that can be achieved.

system and performance is expected to improve with time. The Building Operations Support Manager confirms that the system is in place and operating with no major confirmable changes relative to its performance in 2001.

The ability to read energy use in real-time does not automatically reduce energy use. Rather, it provides information on building operation that can be used to reduce energy use. This is an ongoing process. Prior to the system's completion, DGS made changes at its facilities to reduce energy use for Summer 2001. As detailed in the December 2001 report, Nexant reviewed two years of utility bills associated with 37 DGS facilities (roughly 21 percent of their participating buildings). The analysis showed that for June through September 2001, they reduced their energy use by more than 13 million kWh, which equates to 25 percent of their 2000 energy use. This result was extrapolated to the remaining facilities on a square-foot basis to obtain the 2001 verified demand reduction. Nexant attempted to obtain similar DGS data for the 2002 summer peak period, but was rebuffed by DGS due to more pressing workloads. . Therefore, based on the DGS responses to the persistence verification survey, and subsequent calls to confirm its results indicating no change in operations or demand reductions, Nexant concludes that the 2001 demand reductions have persisted through 2002.

7.2.3.1 Participant Feedback

All respondents gave constructive comments. The CSU representative said that the program was administered well, but some campuses (particularly Long Beach) were not happy with the M&V premises in the program's reporting, in that the assumptions utilized cast some projects in a negative light. The UC representative stated that the deadline for installation was short, which meant that some projects had to be undertaken without utilizing a competitive bid process. The DGS complained about divergent expectations, which led to initial difficulties in satisfying the needs of the Energy Commission. The problems began with the DGS Project Manager having certain understandings of their responsibilities under the original contract, while Energy Commission staff disagreed. Regarding the original project premises, DGS looked at the program's goal as being based upon shedding load, while concurrently keeping buildings operating as normally as possible. From DGS perspective, they felt that the Energy Commission's goal was to see how far they could push the buildings (and their occupants), even considering a full shutdown. A DGS respondent recommended holding more meetings throughout the process to minimize communication breakdowns and the resultant lack of common expectations on both parties' parts; as is apparent from the feedback received from both parties in this matter, communication could have been improved..

7.2.4 Conclusions/Lessons Learned

The consistency of answers from the phone surveys leads Nexant to conclude that the demand savings from the State program have persisted. The technologies installed at the UC and CSU campuses- T8 efficient lighting and electronic ballasts, variable speed drives, and central plant cooling- all provide similar occupant-sensitive performance to the prior systems and technologies, while reducing the demand associated with the involved end-uses.

Variable speed drives are not trivial to install but can yield significant and continuous savings. They can also play a role in demand reduction systems that are able to respond immediately to curtailment calls. So long as the sensors and control systems that operate the variable speed drives continue to function, the VSDs should continue to reduce demand and provide energy as well as cost savings.

Conversion from roof-mounted air conditioners to central-plant cooling has resulted in persistent savings during the cooling season. However, this type of application is only applicable where a central cooling plant exists and can be used without incurring inordinate expenses.

The addition of remote-monitoring systems allows immediate feedback of building energy use. However, savings are only realized when this information is observed, analyzed, and acted upon. The DGS is learning how to use this tool to monitor and control their buildings. By changing how their buildings operate, they were able to reduce summer energy use by 25 percent in 2001, but further reductions will take more effort. The DGS should be commended for their efforts and encouraged to continue them. If the DGS does not continue to monitor building operation, energy use may increase and savings deteriorate.