Measurement & Verification Load Impact Study for NCPA SB5X Commercial and Industrial Refrigeration Incentive Programs

Study ID: NCP0001.04

FINAL REPORT

Prepared for
John Berlin, Project Manager
Northern California Power Agency
Roseville, California

Prepared by
Principal Investigators: Robert Mowris and Kathleen Carlson
Robert Mowris & Associates
Olympic Valley, California

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Acknowledgements

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1. Executive Summary

This study was conducted at the request of Northern California Power Agency (NCPA) and the California Energy Commission (CEC). The study was managed by NCPA. It was funded by Senate Bill 5X (SB5X) and is available online at www.calmac.org. This report provides Measurement and Verification (M&V) load impact study results for the NCPA SB5X Commercial and Industrial (C&I) Refrigeration Incentive Program implemented by Lodi. The program realized peak kW and kWh savings by paying incentives for energy efficient refrigeration projects. This custom program provided incentives for multiple measures in 2001 with $380,000 of SB5X funds administered by NCPA.

Ex ante program savings are summarized in **Table 1.1**, and ex post savings are summarized in **Table 1.2**. The ex ante program savings are 1,194,000 kWh/yr and 765 kW. The gross ex post program savings are 838,477 ± 118,943 kWh/yr and 907 ± 40 kW. The net ex post program savings are 821,708 ± 116,564 kWh/yr and 889 ± 39.2 kW. The effective useful life for the refrigeration process overhaul is 20 years.[1] Therefore, the net ex post lifecycle savings are 16,434,160 ± 2,331,275 kWh. Ex post kWh and kW savings are based on billing data, production, and engineering analyses for 2000 and 2001. The net-to-gross ratio is calculated based on decision maker surveys regarding whether or not the unit would have been installed without rebates from the programs. The net-to-gross ratio is 98 percent indicating approximately 2 percent of the high efficiency refrigeration measures would have been purchased without the program.[2] The realization rates are 0.69 for kWh savings and 1.16 for kW savings.

Table 1.1 Ex Ante Savings for NCPA SB5X C&I Refrigeration Rebate Programs

NCPA Utility	Qty.	Ex Ante Savings kWh/yr	Ex Ante Savings kW	Ex Ante Net-to-Gross Ratio kWh/y	Ex Ante Net-to-Gross Ratio kW	Ex Ante Savings kWh/y	Ex Ante Savings kW
Lodi	1	1,194,000	765	1.0	1.0	1,194,000	765

Table 1.2 Ex Post Savings for NCPA SB5X C&I Refrigeration Rebate Programs

NCPA Utility	Qty.	M&V Gross Ex Post Savings kWh/y	M&V Gross Ex Post Savings kW	Net-to-Gross Ratio kWh/y	Net-to-Gross Ratio kW	M&V Net Ex Post Savings kWh/y	M&V Net Ex Post Savings kW	Net Realization Rate kWh/y	Net Realization Rate kW
Lodi	1	838,477	907	0.98	0.98	821,708	889	0.69	1.16

The M&V study provides average gross savings per unit and net-to-gross ratios. The gross savings are based on billing data, engineering analyses, and true RMS power measurements. The peak kW for each unit was taken as the maximum kW that occurs during the 2 PM to 6 PM weekday time frame from the billing data and engineering analyses. A participant telephone survey was used to evaluate program performance criteria and net-to-gross ratios.

Section 2 presents the M&V approach, field measurement methodology, findings of the field measurements, and M&V savings. **Section 3** presents participant survey results and the

[1] See *Energy Efficiency Policy Manual*, Chapter 4, pages 21-22, prepared by the California Public Utilities Commission, 2001.
[2] The net-to-gross ratios reflect what customers would have done in the absence of the program (see Section 3).

methodology used to develop net-to-gross ratios for kWh and kW savings. **Section 4** presents the M&V methodology used for the sample design, database, baseline, impact analysis, and program evaluation savings estimates. **Appendix A** provides the Refrigeration Decision-Maker Survey. **Appendix B** provides the M&V report for the SB5X refrigeration project sponsored by Lodi.

2. M&V Approach and Results for C&I Refrigeration

The measurement and verification approach for the study was based on the *International Performance Measurement & Verification Protocols* (IPMVP) defined in **Table 2.1**.[3] Ex post energy and peak demand savings were determined using IPMVP Option B (i.e., retrofit isolation) and Option C (whole facility billing analysis). Whole facility billing data was used to develop baseline kWh energy use. Billing and engineering analyses were used to estimate gross kWh/yr savings. Field measurements of kW were used to estimate gross peak kW savings.

Table 2.1 IPMVP M&V Options

M&V Option	How Savings are Calculated	Typical Applications
Option A. Partially Measured Retrofit Isolation Savings are determined by partial field measurement of energy use of system(s) to which a measure was applied, separate from facility energy use. Measurements may be either short-term or continuous. Partial measurement means that some but not all parameters may be stipulated, if total impact of possible stipulation errors is not significant to resultant savings. Careful review of measure design and installation will ensure that stipulated values fairly represent the probable actual value.	Engineering calculations using short term or continuous post-retrofit measurements or stipulations.	Pre- and post-retrofit values are measured with a kW meter and operating hours are based on interviews with occupants or stipulated values.
Option B. Retrofit Isolation Savings are determined by field measurement of the energy use of the systems to which the measure was applied; separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken throughout the post-retrofit period.	Engineering calculations using short term or continuous measurements	Electricity use is measured with kW meters. Hours of operation are measured with motor loggers.
Option C. Whole Facility Savings are determined by measuring energy use (and production) at the whole facility level. Short-term or continuous measurements are taken throughout the post-retrofit period. Continuous measurements are based on whole-facility billing data.	Analysis of whole facility utility meter or sub-meter data using techniques from simple comparison to regression analysis or conditional demand analysis.	Energy management program affecting many systems in a building. Utility meters measure energy use for 12-month base year and throughout post-retrofit period.
Option D. Calibrated Simulation Savings are determined through simulation of the energy use of components or the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility. This option usually requires considerable skill in calibrated simulation.	Energy use simulation, calibrated with hourly or monthly utility billing data and/or end-use metering.	Project affecting systems in a building but where pre or post year data are unavailable. Utility billing meters measure pre- or post-retrofit energy use. Savings are determined by simulation using a model calibrated with utility billing data.

2.1 Field Measurement Methodology

Field measurements were made to verify in-situ power usage on a sample of energy efficient refrigeration equipment (i.e., VFD fans, chillers, cooling tower). Field measurements, measurement equipment, and measurement tolerances are provided in **Table 2.2**.

[3] See *International Performance Measurement & Verification Protocols*, DOE/GO-102000-1132, October 2000.

Table 2.2 Field Measurements, Measurement Equipment, and Tolerances

Field Measurement	Measurement Equipment	Measurement Tolerances
Total power in kilowatts (kW) of affected equipment	True RMS 4-channel power data loggers and 4-channel power analyzer	Data loggers, CTs, PTs: ± 1% Power analyzer: ± 1%

2.2 Findings of Field Measurements

Billing data and field measurements were used to determine in-situ energy and peak demand savings. Multiple data loggers were installed at the site to measure peak demand and energy use.

2.2.1 Findings for the C&I Refrigeration Project

Site #1 was the only site and accounted for 100 percent of total ex ante savings for the SB5X C&I Refrigeration Incentives Programs. Data loggers were installed at the site to measure peak demand and energy use. Peak kW savings are based on billing data and kW measurements as shown in **Figure 2.1** for a variable frequency drive (VFD) fan at Site #1.

Figure 2.1 Power Measurements of a VFD Fan at Site #1

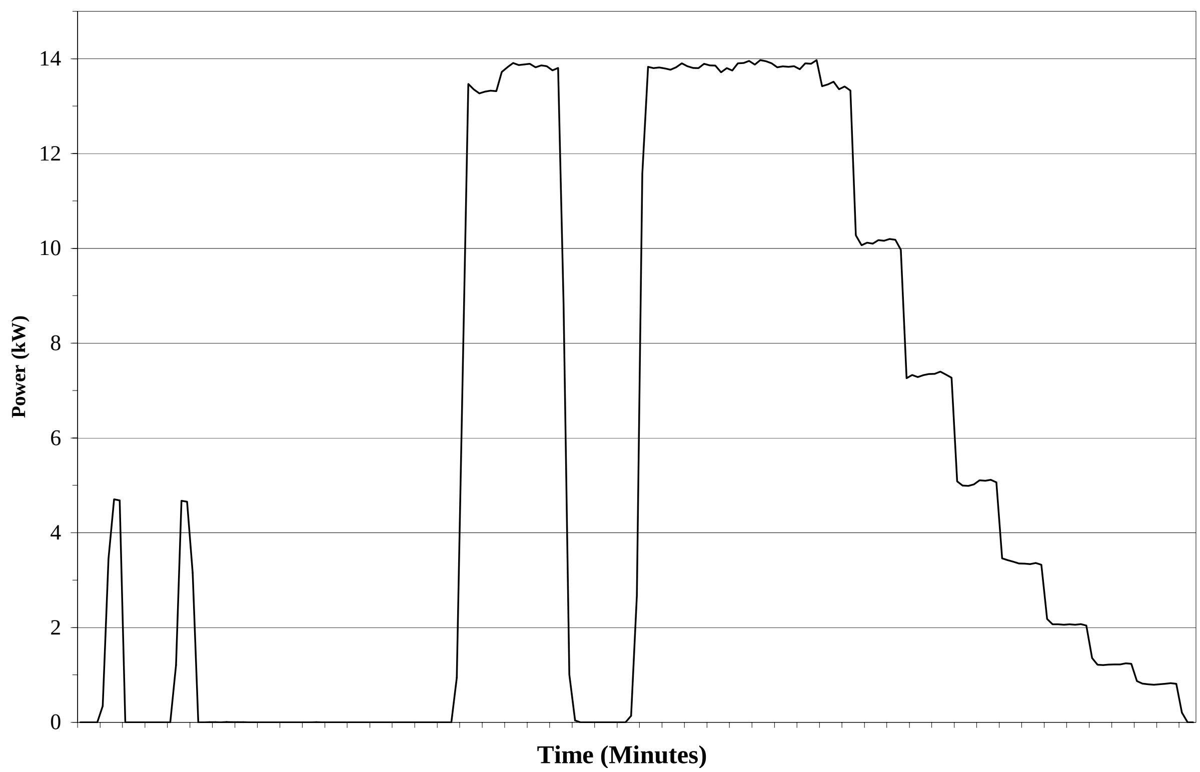

Figure 2.2 shows the old hydro-cooling refrigeration system at site #1. The old system involved pouring chilled water over the top of bins of fruit that traveled slowly down a conveyor. These bins were then taken inside the cold storage building and stored until processing. **Figure 2.3** shows the new internal air-cooling system. With computer control, variable-frequency and two-speed drives, and air versus water cooling, the new air-cooling system was designed to save 56 percent on peak electric demand and 67 percent on electrical usage.

Figure 2.2 Old Hydro-Cooling Refrigeration

Figure 2.3 New Internal Air-Cooling System

Data loggers were installed at the site to measure peak demand and energy use. Billing data were collected and these data were used along with short-term kW metering data and engineering analyses to develop baseline values. The kWh savings for the site are based on billing data and engineering analyses. Peak demand (kW) savings are based on the difference between the pre-retrofit and post-retrofit kW demand. Savings were verified with monthly utility demand data.

In 2000, Site #1 processed 19,263 bins of fruit and electrical consumption for the pre-installation hydro-cooling fruit storage system was 325,539 kWh and 563 kW (see **Table 2.3**, 2000 actual).

Table 2.3 Historical Billing Data in 2000/2001 and Estimated Savings in 2001[4]

			A	B	C	D	A - C	B – D
Month	**2000 Actual kW**	**2000 Actual kWh/yr**	**2001 M&V Baseline kW**	**2001 M&V Baseline kWh/yr**	**2001 Actual As-Built kW**	**2001 Actual As-Built kWh/yr**	**2001 M&V Savings kW**	**2001 M&V Savings kWh/yr**
Jan								
Feb								
Mar								
Apr								
May								
Jun	163	50,019	1,533	258,941	691	127,440	842	131,501
Jul	400	126,560	1,652	350,131	745	172,320	907	177,811
Aug	563	126,560	1,557	553,967	702	272,640	855	281,327
Sep	319	22,400	565	75,585	255	37,200	310	38,385
Oct								
Nov								
Dec								
Total	563	325,539	1,652	1,238,624	745	609,600	**907**	**629,024**

In 2001, Site #1 processed 56,865 bins of fruit using the new internal air-cooling process. If Site #1 would have used the existing hydro-cooling system to chill 56,865 bins to the same

[4] Historical electricity use and estimated savings are based on actual 2000 and 2001 billing and production data. Billing data for 2001 has been adjusted for the new 240 current transformer (CT) multiplier (i.e., 1,200 to 5) from the pre-2001 CT multiplier of 160 (i.e., 800 to 5). The new CT multiplier is from Rod Brown, Power Quality Technician, City of Lodi Electric Utility 11-29-01.

temperature (58 DF) as the new forced-air system, then the equivalent electrical consumption would have been 1,238,624 kWh and 1,652 kW (see **Table 2.3**, 2001 M&V baseline). With the new internal air-cooling system the 2001 actual as-built electrical consumption was 609,600 kWh and 745 kW, and the 2001 M&V savings are 629,024 kWh and 907 kW (see **Table 2.3**).

The new internal air-cooling system is designed to handle 75,800 bins of fruit per season. Full production was not met in 2001 due to harvest shortfall of 11% or 24,860 bins. With full production of 75,800 bins of fruit in 2002, the M&V baseline would have been 1,651,063 kWh and 1,652 kW based on increasing the existing hydro-cooling system from 70 bins per hour to 207 bins per hour and also increasing product quality cooling requirements from 45 to 58 degrees Fahrenheit delta T (DF). The M&V as-built electricity use was 812,586 kWh and 745 kW. Therefore, the gross M&V savings are 838,477 ± 92,233 kWh/yr and 907 ± 81 kW for the new internal air-cooling system (see **Table 2.4** and **Appendix B**).

Table 2.4 M&V Estimate of Electrical Use and Savings in 2002

	A	B	C	D	A - C	B - D
Month	**2002 M&V Baseline kW**	**2002 M&V Baseline kWh/yr**	**2002 M&V As-Built kW**	**2002 M&V As-Built kWh/yr**	**2002 M&V Savings kW**	**2002 M&V Savings kWh/yr**
Jan						
Feb						
Mar						
Apr						
May						
Jun	1,533	345,163	691	169,875	842	175,288
Jul	1,652	466,718	745	229,699	907	237,019
Aug	1,557	738,428	702	363,424	855	375,004
Sep	565	100,754	255	49,587	310	51,167
Oct						
Nov						
Dec						
Total	**1,652**	**1,651,063**	**745**	**812,586**	**907**	**838,477**

Baseline and savings values for each measure at Site #1 are summarized in **Table 2.5**. The gross ex post savings are 838,477 ± 118,943 kWh/yr and 907 ± 40 kW.

Table 2.5 Site #1 Baseline and Savings for C&I Energy Efficient Refrigeration

Site	Baseline (kWh/yr)	Base kW	Rebated Measure	Ex Ante Savings kWh/yr	Ex Ante Savings kW	M&V Gross Ex Post Savings kWh/yr	M&V Gross Ex Post Savings kW	IPMVP Option or Report
1	1,084,385	1,085	Chillers	817,502	524	574,084	621	B, C
1	20,988	21	Tower	-23,696	-15	-16,640	-18	B, C
1	537,695	538	VFD Fans	397,561	254	279,184	302	B, C
1	7,995	8	Lighting	2,633	2	1,849	2	B, C
Total	**1,651,063**	**1,652**		**1,194,000**	**765**	**838,477**	**907**	
90% CI						118,943	40.0	

3. Participant Survey Results

A decision-maker survey was completed for the project to measure the net-to-gross ratio (NTGR). The NTGR was applied to the gross savings estimate to develop a net kW and kWh savings estimate for the program.

3.1 Participant Survey Methodology

A participant survey was used to develop the net-to-gross ratio (NTGR) for calculating net kW and kWh savings. The net-to-gross ratio is used to estimate the fraction of free riders who would have otherwise implemented lighting improvements in the absence of the program. Ten participant survey questions were used to assess the net-to-gross ratio as shown in **Table 3.1**. The NTGR score is the average score based on answers to questions 2 through 10. No score was assigned to responses of "don't know", "refused to answer," or "other."

Table 3.1 Net-to-Gross Ratio Participant Survey Questions and Scoring

#	Question	Answer	Score
2	Did you understand the value of the program BEFORE or AFTER you installed the efficiency upgrades?	Before	1
		After	0
3	Did you install the efficiency upgrade BEFORE or AFTER you heard about the Incentives Program?	Before	0
		After	1
4	On a scale from 0 to 10, with 0 being no influence at all and 10 being very influential, how much influence did the Utility or Incentives have on your decision to install the efficiency upgrades?	0 to 10	0=0, 10=1
5	If the rebates had not been available, how likely is it you would have done exactly the *same* thing. Please use a scale from 0 to 10, with 0 being not at all likely and 10 being very likely.	0 to 10	0=1, 10=0
6	What role did the Utility Program play in your decision to install the upgrades?	1 = Reminded	0.25
		2 = Speeded Up (i.e., early replacement)	0.5
		3 = Showed Benefits Didn't Know Before	1
		4 = Clarified Benefits	0.75
		5 = No role	0
7	The Utility Program was nice but it was unnecessary to get the efficiency upgrades installed.	0 to 10	0=1, 10=0
8	The Utility Program was a critical factor in installing the efficiency upgrades.	0 to 10	0=0, 10=1
9	We would not have installed the efficiency upgrades without the Utility Program.	0 to 10	0=0, 10=1
10	If you had not received the [rebate or service] from the Utility, would you have installed upgrades?	Within 6 months	0
		< 1 year	0.125
		1 to 2 years	0.25
		2 to 3 years	0.5
		3 to 4 years	0.75
		4 or more years	1
		Never	1

3.2 Findings of the Participant Surveys

Findings of the participant survey are presented in **Table 3.2**. The net-to-gross ratio is 0.98 based on participant survey results.

Table 3.2 Findings of Participant Surveys

NCPA Utility	Rebates	Completed Surveys	M&V Gross Ex Post Savings kWh/yr	M&V Gross Ex Post Savings kW	Weighting Factor	Actual Net-to-Gross Ratio	Weighted Net-to-Gross Ratio
Lodi	1	1	838,477	907	1.00	.98	.98
Total	**1**	**1**	**838,477**	**907**	**1.00**	**.98**	**.98**

4. M&V Methodology

The M&V methodology for the metering and participant survey tasks are discussed above in **Sections 2** and **3**. The M&V methodology for sample design, database tracking, baseline, and program evaluation savings estimates are discussed below.

4.1 Sample Design

There was only one site in this program so no sample design was required.

4.2 Database

Data for the C&I refrigeration incentive program was tracked and archived in the NCPA Tracking Database. Data for all programs of this type are summarized within the database for M&V sampling and reporting purposes. The tracking system data is based on reports provided by the utility. The database includes general customer information, quantity and type of measures installed, make and model number, kWh/DF/Bin, and NCPA account number (if available). Tracking data was delivered electronically by utility program staff and entered into the database after the programs were completed.

4.3 Baseline

There are no standards governing the efficiency of custom refrigeration equipment so the baseline was the pre-installation equipment. The baseline kWh values are based on billing data analyses. The baseline kW values are based on metering results (monthly kW from billing data), and the appropriate baseline prior to retrofit of custom measures (see **Section 2**).

4.4 Program Evaluation Savings Estimates

Gross ex post kWh savings are based on billing data analysis. Gross ex post peak kW savings are based on field measurements of peak kW. Gross savings for the sampled units were compared to ARI ratings and other sources. Net program evaluation savings are based on the participant decision-maker survey results that were analyzed to develop net-to-gross ratios for kWh and kW savings. Methods used to develop net-to-gross ratios are described above in **Section 3**. Ex ante program savings are summarized in **Table 4.1**, and ex post savings are summarized in **Table 4.2**.

Table 4.1 Ex Ante Savings for NCPA SB5X C&I Refrigeration Rebate Programs

NCPA Utility	Qty.	Ex Ante Savings kWh/yr	Ex Ante Savings kW	Ex Ante Net-to-Gross Ratio kWh/y	Ex Ante Net-to-Gross Ratio kW	Ex Ante Savings kWh/y	Ex Ante Savings kW
Lodi	1	1,194,000	765	1.0	1.0	1,194,000	765

Table 4.2 Ex Post Savings for NCPA SB5X C&I Refrigeration Rebate Programs

NCPA Utility	Qty.	M&V Gross Ex Post Savings kWh/y	M&V Gross Ex Post Savings kW	Net-to-Gross Ratio kWh/y	Net-to-Gross Ratio kW	M&V Net Ex Post Savings kWh/y	M&V Net Ex Post Savings kW	Net Realization Rate kWh/y	Net Realization Rate kW
Lodi	1	838,477	907	0.98	0.98	821,708	889	0.69	1.16

The ex ante program savings are 1,194,000 kWh/yr and 765 kW. The gross ex post program savings are 838,477 ± 118,943 kWh/yr and 907 ± 40 kW. The net-to-gross ratio is 0.98 and the net ex post program savings are 821,708 ± 116,564 kWh/yr and 889 ± 39.2 kW. The effective useful life for the refrigeration process overhaul is 20 years.[5] Therefore, the net ex post lifecycle savings are 16,434,160 ± 2,331,275 kWh. The net-to-gross ratio is calculated based on decision maker survey regarding whether or not the measures would have been installed without rebates from the programs. M&V kWh/yr savings and net realization rates are lower than anticipated primarily due to lower baseline usage.

[5] See *Energy Efficiency Policy Manual*, Chapter 4, pages 21-22, prepared by the California Public Utilities Commission, 2001.

Appendix A: NCPA C&I Refrigeration Decision-Maker Survey

Interview Instructions for Decision-Maker Survey

1. Purpose

The purpose of the Decision-Maker Survey is to obtain sufficient information to estimate the Net-to-Gross Ratio (NTGR).

2. Selection of Respondent

The **decision-maker** must be the person who decided to install or implement rebated measures.

3. Two Types of Sites

This survey will be used for two types of sites:

1. **On-Site M&V Only**. Sites that receive an on-site inspection for the M&V evaluation.
2. **Telephone Only**. Sites that only receive a telephone survey.

4. How to Start a Survey

Complete the following steps to start one of these surveys:

1. Review file information for the site (if available).
2. Make sure you understand what was installed prior to initiating the call or visit.
3. Contact the person and explain the purpose of the Survey. Tell them that the data provided by them will be kept strictly confidential and will not be shared with anyone.

C&I REFRIGERATION DECISION-MAKER SURVEY

Customer Name: ______________________________	Date: ______________________________
Business Name: ______________________________	Contact: ______________________________
Phone Number: ______________________________	City: ______________________________
Start Call Time: ______________________________	End Call time: ______________________________
Surveyor Initials: ______________________________	Survey Completed: Y NA R WB BN
	Y = yes, NA = no answer, R = refused, WB = wrong business, BN = bad number

The purpose of the decision-maker survey is to obtain information necessary to calculate a net-to-gross ratio. You will need to interview the customer who was responsible for the decision to implement measures at the site. If this person is not available attempt to locate someone who is at least familiar with how that decision was made.

Introduction

Say: "Hello. My name is [**Anne**] and I am conducting a survey regarding the your participating in the energy efficiency programs funded with SB5X funds. Would you mind spending 5 minutes to answer a few questions?"

Begin Survey

1. When and how did you first learn about the Utility Program? [**Only ask this question <u>once,</u> for the first recommendation for each site.**]

   ____

   1 Didn't know there was a program (**Go to Q.3**)

2. Keeping that in mind, did you understand the value of the program BEFORE or AFTER you installed the efficiency upgrades? (**Circle One**)

   1 Before **2** After (**Go to Q.4**) **98** Don't Know **99** Refused to Answer

3. Did you install the efficiency measure(s) measures BEFORE or AFTER you heard about the Utility Incentives Program? (**Circle One**)

   1 Before **2** After **98** Don't Know **99** Refused to Answer

4. On a scale from 0 to 10, with 0 being no influence at all and 10 being very influential, how much influence did the Utility or Incentives have on your decision to install the efficiency upgrades?

   ___ Response (**0-10**) **98** Don't Know **99** Refused to Answer

5. If the incentives had not been available, how likely is it you would have done exactly the *same* thing. Please use a scale from 0 to 10, with 0 being not at all likely and 10 being very likely.

   ___ Response (**0-10**) **98** Don't Know **99** Refused to Answer

   Notes: ____

C&I REFRIGERATION DECISION-MAKER SURVEY (Continued)

Special Instruction for Contradictory Responses: If [**Q.4 is 0,1,2** *and* **Q.5 is 0,1,2**] *or* [**Q.4 is 8,9,10** *and* **Q.5 is 8,9,10**]. Probe for the reason. However, it is important not to communicate a challenging attitude when posing the question. For example, say,

> When you answered "8" for the question about the influence of the incentives or service, I interpreted that to mean that the Utility Program was important to your decision. Then, when you answered "8" for how likely you would be to take the same action *without* the incentives or service, it sounds like the Utility was *not* very important. I want to check to see if I understand your answers or if the questions may have been unclear.
>
> If they volunteer a helpful answer at this point, respond by changing the appropriate answer. If not, follow up with something like: "Would you explain in your own words, the role the Utility Program played in your decision to take this action?

If possible translate their answer into responses for **Questions 4** and **5** and check these responses with the respondent for accuracy. If the answer doesn't allow you to decide what answer should be changed, write the answer down and continue the interview.

Answer: ____

6. What role did the Utility Program play in your decision to install the upgrades [**describe implemented recommendation**]? [Prompt by reading list if the respondent has trouble answering.]

   1 Reminded us of something we already knew
   2 Speeded up process of what we would have done anyway (i.e., early replacement)
   3 Showed us the benefits of this action that we didn't know before
   4 Clarified benefits that we were *somewhat* aware of before
   5 Recommendation had no role
   6 Other ____
   98 Don't Know
   99 Refused to Answer

Say: Here are some statements that may be more or less applicable for your home about the Utility Program [**or recommendation**]. Please assign a number between 0 and 10 to register how applicable it is. A 10 indicates that you fully agree, and 0 indicates that you completely disagree.

7. The Utility Program was nice but it was unnecessary to get the efficiency upgrades installed.

   ___ Response (**0-10**)   **98** Don't Know   **99** Refused to Answer

8. The Utility Program was a critical factor in installing the efficiency upgrades.

   ___ Response (**0-10**)   **98** Don't Know   **99** Refused to Answer

C&I REFRIGERATION DECISION-MAKER SURVEY (Continued)

9. We would not have installed the efficiency upgrades without the Utility Program.

   ___ Response (**0-10**) **98** Don't Know **99** Refused to Answer

10. If you had not received the [incentives or service] from the Utility, would you have installed upgrades [**or other measures**]...

    1 ..within 6 months?

    2 ..6 months to 1 year?

    3 ..one to two years later?

    4 ..two to three years later?

    5 ..three to four years later?

    6 ..four or more years later?

    7 ..Never

    98 ..Don't Know - **Try less precise response, if still "don't know" use 98**

    8 ...less than one year?

    9 ...one year or more?

    99 ...Refused to Answer

    Time relative to the installation date. For customers with more than one measure ask if their response is the same. If not, obtain a response for each measure. Write answers in margins and enter answers on a new line in the Excel spreadsheet.

Repeat **Questions 2** through **10** for each installed measure or service.

Appendix B: Lodi C&I Refrigeration Incentives Site #1

M&V IMPACT EVALUATION REPORT

**Prepared for the City of Lodi Electric Utility Department
and the Northern California Power Agency**

Prepared by Robert Mowris & Associates

SITE SUMMARY INFORMATION

Company Name:	**Site #1**		
Site Name:	**Site #1 - Lodi**		
Site Address:	**Lodi, CA 95241**		
Principal Site Contact:	**N/A**	**Telephone:**	**N/A**
Principal Contractor Contact:	**N/A**	**Telephone:**	**N/A**
Lodi Electric Utility Contact:	**Rob Lechner**	**Telephone:**	**(209) 333-6800**
Assigned Lead Engineer:	**Robert Mowris, P.E.**	**Telephone:**	**(800) 786-4130**

Site: Site #1, Lodi, CA

PROJECTS PAID BY SB5X FUNDS

Project	Account Number	End Use	NCPA Utility	Program	Project Type
SITE #1 Project	N/A	Process Cooling	City of Lodi	SB5X Priority Project	Custom

MEASURES FOR EACH PROJECT

		Ex Ante Savings Estimate			
Item No.	Efficiency Measure	(kW)	(kWh/yr)	(therms)	Rebate ($)
1	Process Cooling	765	1,194,000	n/a	$380,000

PROGRAM MEASUREMENT AND VERIFICATION SAVINGS ESTIMATE

		M&V Evaluation Savings		
Item No.	Efficiency Measure	(kW)	(kWh/yr)	(therms)
1	Process Cooling	907	838,477	n/a

Evaluation of Spillover

No evidence of spillover was found.

Impact Evaluation Report: Lodi Electric Utility **End Use: Process Cooling**

Introduction

On October 4, 2001 Robert Mowris, P.E., of Robert Mowris & Associates (RMA), conducted an M&V site visit to review the new high-efficiency internal air-cooling fruit process facility at Site #1 (Site #1) located in Lodi, California. Rob Lechner, Manager of Customer Programs for City of Lodi Electric Utility arranged and attended the site visit meeting with Site #1 Vice-President, Senior Production Superintendent, and Production Superintendent. Also in attendance were the industrial refrigeration project contractors. On October 30, 2001, Robert Mowris, P.E. and Shelly Coben, CEM, of RMA, conducted a second M&V site visit. Rob Lechner arranged and attended the second site visit meeting.

The City of Lodi Electric Utility provides electricity to the facility and PG&E provides natural gas. Electricity use for the facility is metered at one panel. The electrical panel indicated electrical demand consistent with design specifications and historical billing data provided by Site #1 and City of Lodi. All equipment that was provided incentives from Lodi's SB5X funds was examined and verified during the two M&V site visits.

Readings of the electric utility meters were obtained from the utility and readings of sub-panels, various gauges, equipment, and controls were made during the site visits. In addition, spot-power and run-time measurements were made to assess equipment operation and energy consumption for the fans and industrial refrigeration system. Model numbers and performance data were obtained for air handling equipment, chillers, and cooling towers. Historical utility billing data for the facility was also reviewed both before and after installation. Historical billing data for Site #1 is provided in **Table 1** and **Attachment 1**.

Business Description

Site #1 has been located in Lodi for 31 years and is a grower-owned cooperative founded in 1971. Today, Site #1 is the largest grower-owned tomato and fruit canning operation in the United States. Site #1 employs over 1,000 people at peak season and is one of the City of Lodi Electric Utility's largest energy users. The facility is used during the fruit harvest season that runs from June through September. The plant receives approximately 2,000 bins[6] (835 tons) of apricots per day and 4,300 bins (2,171 tons) of peaches per day during their respective harvest seasons. Bins of fruit arrive on trucks carrying approximately 48 bins per truck. Typically, the plant cannot immediately process all of this fruit on the day it is received; therefore it is put into cold storage on site until it can be processed.

Scope of Project

Site #1 has used onsite cold storage since the late 1970's to store apricots and peaches for processing at a later date. A hydro-cooling system (manufactured by Reviere Hydronics) was used to pre-cool bins of fruit prior to storage for processing. This system involved pouring cold water over the top of bins of fruit that traveled slowly down a conveyor. These bins were then taken inside the cold storage building and stored until processing. Due to the limited capacity of this system, Site #1 was forced to use several "outside" cold storage companies. Using "outside" cold storage increased the complexity and cost of production and reduced quality control.

[6] An industrial bin of fruit is made of wood or plastic and measures 2 feet by 4 feet by 4 feet or 32 cubic feet. A bin holds roughly 835 pounds of apricots or 1,010 pounds of peaches.

Site #1 is currently in an expansion mode due to increased sales. They have increased their apricot and peach tonnage this past year. This expansion and future expansion required that they increase the capacity of their cold storage system. Site #1 investigated several different avenues for expanding their daily cold storage capacity. The baseline option was to simply expand their existing inefficient hydro-cooling system.

City of Lodi provided incentives from SB5X funds to motivate Site #1 to install the high-efficiency state-of-the-art internal air-cooling system. The new system, designed by Ross and Christopher Refrigeration and Construction, modified Site #1's existing cold storage warehouse to include a pre-cool vestibule room and internal air-cooling tunnels that can handle 1,440 bins of fruit per day. City of Lodi SB5X funds were also used by Site #1 to upgrade their existing refrigeration system and make it more energy efficient.

The new system includes converting Site #1's middle cold storage room into a pre-cool vestibule room. This room includes insulated doors, fruit bin pass-through conveyors for loading, nine air-cooling tunnels each with two fans (an upper two-speed 7/1.9-hp fan and lower 10-hp constant-speed fan), and a vestibule area with rollup doors on each side leading directly into the adjacent cold storage rooms. The two adjacent cold storage rooms and the pre-cool vestibule are also equipped with Variable Frequency Drive (VFD) fans fitted with flexible ducts to distribute cold air evenly throughout the rooms at lower horsepower than the previous fans. A new 250-hp ammonia refrigeration chiller was also added for the extra capacity required for the expanded pre-cool system.[7] An array of sensors throughout the three rooms tied to a computer system controls the system for maximum energy efficiency.

The City of Lodi provided incentives of $380,000 or approximately 38 percent of the $967,500 cost associated with removing the pre-existing hydro-cooling system and installing the high efficiency computer controlled internal air-cooling system.

Method of Delivering Energy Efficiency Improvement

Site #1's daily procedures are designed to maximize the quality of fruit. Each day, from mid-morning to early afternoon, truckloads of fruit arrive at the cold storage facility. Trucks are quickly unloaded and bins of fruit are placed on in feed conveyors leading to the vestibule. Inside the cold storage rooms, electric forklifts (these produce less heat than propane lifts) are used to stack bins into the nine pre-cool cells (each one holds 120 bins). The first four that are filled are turned on to begin the eight-hour pre-cool cycle, which will reduce the temperature of the fruit from ambient temperature to 34 degrees Fahrenheit (DF). The remaining five are loaded, but not turned on until after 7:00 PM to reduce peak electric demand. After pre-cool, the bins are moved to the other two storage rooms (14,128 square feet each), which are designed to maintain 34 degree temperature fruit. As the procedure is repeated each day, a six-day rotation (the old system only provided three days of hold time) is developed so that the cold storage facility remains full, but no fruit is left to store longer than six days. Bins of fruit in the storage locations are transferred to the production facility at night when it is cooler. This minimizes temperature increases in the storage room from outside air infiltration while the door is open. Insulated electric doors and strip curtains are also installed on these doors to help keep the rooms cold. When bins are moved from pre-cool to storage they are then transferred through vestibule doors so that bins never leave the cold environment. This daily procedure works well throughout the packing season.

[7] If Site #1 had simply expanded their baseline hydro-cooling system they would have required two additional hydro-cooling systems and 42,384 square feet of additional cool storage.

The entire project, including projected energy savings, was reviewed by the City of Lodi Electric Utility and Planergy International (the City of Lodi Electric Utility's chosen energy services provider).

Schedule of Key Dates

Full implementation of project was completed in June 2001.

Historical Energy Use and M&V Savings

In 2000, Site #1 processed 19,263 bins of fruit and electrical consumption for the pre-installation hydro-cooling and fruit storage system was 563 kW and 325,539 kWh (see **Table 1**, 2000 actual). In 2001, Site #1 processed 56,865 bins of fruit using the new internal air-cooling process. If Site #1 would have used the existing hydro-cooling system to chill 56,865 bins to the same temperature (58 DF) as the new forced-air system, then the equivalent electrical consumption would have been 1,652 kW and 1,238,624 kWh (see **Table 1**, 2001 M&V baseline). With the new forced air-cooling system the 2001 actual as-built electrical consumption was 745 kW and 609,600 kWh, and the 2001 M&V savings are 907 kW and 629,024 kWh (see **Table 1**).

Table 1. Historical Billing Data in 2000/2001 and Estimated Savings in 2001[8]

			A	B	C	D	A - C	B - D
Month	**2000 Actual kW**	**2000 Actual kWh**	**2001 M&V Baseline kW**	**2001 M&V Baseline kWh**	**2001 Actual As-Built kW**	**2001 Actual As-Built kWh**	**2001 M&V Savings kW**	**2001 M&V Savings kWh**
Jan								
Feb								
Mar								
Apr								
May								
Jun	163	50,019	1,533	258,941	691	127,440	842	131,501
Jul	400	126,560	1,652	350,131	745	172,320	907	177,811
Aug	563	126,560	1,557	553,967	702	272,640	855	281,327
Sep	319	22,400	565	75,585	255	37,200	310	38,385
Oct								
Nov								
Dec								
Total	563	325,539	1,652	1,238,624	745	609,600	**907**	**629,024**

The new internal air-cooling system is designed to handle 75,800 bins of fruit per season. Full production was not met in 2001 due to harvest shortfall of 11% or 24,860 bins. In 2002, Site #1 is anticipating full production of 75,800 bins of fruit. With full production in 2002, the M&V baseline is 1,652 kW and 1,651,063 kWh based on increasing the existing hydro-cooling system from 70 bins per hour to 207 bins per hour and also increasing product quality cooling requirements from 45 to 58 degrees Fahrenheit delta T (DF). The M&V as-built electricity use is

[8] Historical electricity use and estimated savings are based on actual 2000 and 2001 billing and production data. Billing data for 2001 has been adjusted for the new 240 current transformer (CT) multiplier (i.e., 1,200 to 5) from the pre-2001 CT multiplier of 160 (i.e., 800 to 5). The new CT multiplier is from Rod Brown, Power Quality Technician, City of Lodi Electric Utility 11-29-01.

745 kW and 812,586 kWh. Therefore, the M&V impact evaluation savings are 907 kW and 838,477 kWh/yr for the new internal air-cooling system (see **Table 2**).

Table 2. M&V Estimate of Electrical Use and Savings in 2002

	A	B	C	D	A - C	B - D
Month	**2002 M&V Baseline kW**	**2002 M&V Baseline kWh**	**2002 M&V As-Built kW**	**2002 M&V As-Built kWh**	**2002 M&V Savings kW**	**2002 M&V Savings kWh**
Jan						
Feb						
Mar						
Apr						
May						
Jun	1,533	345,163	691	169,875	842	175,288
Jul	1,652	466,718	745	229,699	907	237,019
Aug	1,557	738,428	702	363,424	855	375,004
Sep	565	100,754	255	49,587	310	51,167
Oct						
Nov						
Dec						
Total	1,652	1,651,063	745	812,586	**907**	**838,477**

Measure Description

Efficiency Improvement: The new internal air-cooling system includes converting the middle cold storage room into a pre-cool vestibule and internal air-cooling tunnels. This room includes insulated doors, fruit bin pass-through conveyors for loading, nine air-cooling tunnels each with two fans (an upper two-speed 7/1.9-hp fan and lower 10-hp constant-speed fan), and a vestibule area with rollup doors on each side leading directly into the adjacent cold storage rooms. The two adjacent cold storage rooms and the pre-cool vestibule are also equipped with 7.5-hp VFD fans fitted with flexible ducts to distribute cold air evenly throughout the rooms at lower horsepower than the previous fans. A new 250-hp chiller was also added for the extra capacity required for the pre-cool system. Computer controls have temperature sensors that are inserted into the fruit to automatically shut-off fans when the fruit temperature reaches 34F. Computer controls also control the air temperature of the cold storage area and continuously monitor vital functions of the facility including fruit and air temperatures and kW and kWh usage.

Pre-installation Equipment and Operation: The pre-installation facility included 48,384 square feet of cool storage to hold fruit until it is processed for canning. The walls of the cool storage area are insulated to R-20 and the roof is insulated to R-34. The pre-installation refrigeration equipment included three 125-hp/110-ton reciprocating ammonia chillers (Vilter - Model Number A12K-456D). The chillers were served by one evaporative cooling tower (BAC Model Number VLC-450A) with four 7.5-hp fans. The pre-installation hydro-cooling system (manufactured by Reviere Hydronics) cooled fruit by spraying cold water onto the fruit. The cold water was dumped daily to eliminate cross contamination of fruit. The hydro-cooling system consisted of 365-hp[9] of equipment to cool 70 bins per hour 45 degrees. To meet expanded fruit production from 19,263 bins to 75,800 bins and the product quality cooling requirements of 58 degrees, the pre-installation hydro-cooling system would have had to be expanded to approximately 3 times

[9] Pre-installation hydro-cooling system included 250-hp ammonia chiller, 50-hp water pump, 40-hp condenser fans and pumps, and 25-hp conveyor drives.

its initial size or 1,095-hp of equivalent equipment to cool 207 bins per hour 58 degrees. In addition, a total of six storage rooms would have been necessary for staging of product. Each storage room is 14,128 square feet, so a total of 84,768 square feet of storage would have been required. The historical data (power bills and production records) indicate the pre-existing hydro-cooling system used approximately 0.376 kWh/DF/bin.

As-Built Equipment and Operation: The as-built internal air-cooling system includes new refrigeration equipment, new cooling tower, new variable frequency drive (VFD) fans, and new computer controls. The new refrigeration equipment includes a 250-hp/230-ton screw ammonia chiller (M&M Model Number A65HL). The new chiller is served by a new evaporative condenser (BAC Model Number VC2-642) with one 15-hp fan and one 7.5-hp fan. The new pre-cool vestibule has four 7.5-hp fans and one 15-hp VFD fan. The internal air-cooling system consists of 9 tunnels each with two fans (an upper two-speed 7/1.9-hp fan and lower 10-hp constant speed fan). The computer controls have temperature sensors that are inserted into the fruit to automatically shut-off fans when the fruit temperature reaches 34F. Computer controls also monitor the air temperature of the cool storage area and continuously monitor key operational parameters of the facility including fruit and air temperatures and kW and kWh usage. The three pre-existing 125-ton reciprocating ammonia chillers and pre-existing evaporative cooling tower remain in place to backup the new chiller and evaporative condenser. The pre-cooling vestibule and internal air-cooling areas are 14,128 square feet. The cold storage area is 28,256 square feet. With computer control, variable-frequency and two-speed drives, and air versus water cooling, the new air-cooling system saves 56 percent on peak electric demand and 67 percent on electrical usage. Historical billing data from 2001 indicate that the new forced-air cooling system uses approximately 0.1848 kWh/DF/bin. All rebated equipment was found to be operating as specified by the City of Lodi Electric Utility.

Primary Business and Product: The primary business is fruit processing and canning.

Variability in Schedule and Production: The facility operates four months per year during the fruit harvest season with limited maintenance operations during the remainder of the year.

Square Footage of Affected Area: The affected area includes the rebated chiller, cooling tower, variable-speed/two-speed fans, and computer controls that together comprise the internal air-cooling process and cool storage for fruit. The affected area represents 100 percent of the pre-existing area or 42,384 square feet. The hydro-cooling system baseline affected virtual area would have been 84,768 square feet including 42,384 square feet for three additional storage rooms to stage product (14,128 square feet per additional storage room).

Algorithms for Estimating Energy Savings for Paid Measure

Lodi Electric Utility Algorithm:

City of Lodi Electric Utility assigned savings of 765 kW and 1,194,000 kWh/yr for the new internal air-cooling system. These savings are based on engineering algorithms.

M&V Evaluation Algorithm:

With full production in 2002, the M&V baseline is 1,652 kW and 1,651,063 kWh based on increasing the existing hydro-cooling system from 70 bins per hour to 207 bins per hour and also increasing product quality cooling requirements from 45 to 58 degrees Fahrenheit delta T (DF). The full production 2002 M&V as-built electricity use is estimated to be 745 kW and 812,586 kWh. Therefore, the M&V impact evaluation savings are 907 kW and 838,477 kWh/yr for the new internal air-cooling system (see **Table 2**). M&V engineering algorithms are provided below.

The application file provided the following information: Year 2000 electric use of 563 kW and 325,539 kWh to cool 19,263 bins of fruit or 16.90 kWh/bin at 45DF (see **Table 1**). Year 2001 electric use of 745 kW and 609,600 kWh to cool 56,865 bins of fruit or 10.72 kWh/bin at 58DF (see **Table 1**).

The product quality cooling requirement adjustment from 45 to 58 DF is calculated as follows.

$$\text{DF Adjustment} = 16.90\ \text{kWh/bin}_{\text{45DF}} \times \frac{58\ \text{DF}}{45\ \text{DF}} = 21.78\ \text{kWh/bin}_{\text{58DF}}$$

The 2001 baseline electric use for 56,865 bins (at 58DF) is calculated as follows.

$$\text{2001 Baseline kWh/yr} = 21.78\ \text{kWh/bin}_{\text{58DF}} \times 56{,}865\ \text{bins} = 1{,}238{,}624\ \text{kWh/yr}$$

The 2002 Baseline includes full production at 75,800 bins (at 58DF), and this baseline is used to calculate M&V savings as follows.

$$\text{2002 Baseline kWh/yr} = 21.78\ \text{kWh/bin}_{\text{58DF}} \times 75{,}800\ \text{bins} = 1{,}651{,}063\ \text{kWh/yr}$$

The M&V baseline peak demand of 1,652 kW for 56,865 or 75,800 bins (at 58DF) is calculated based on measuring and calibrating equipment loads to historical demand as shown in Tables 3 through 5.[10]

Table 3. M&V Baseline kW in 2001/2002 (56,865 or 75,800 Bins at 58DF)

Equipment	Hp	Load Factor	KW	Notes
Chillers	375	0.96	268	96% part load due to increased load and 6 rooms at 58DF.
Tower	30	0.96	21	96% part load due to increased load and 6 rooms at 58DF.
Constant-Spd. Fans	960	0.75	538	Eight 20-hp fans per room and 6 rooms and 2 fans per room are off adjacent to doors.
Hydro-Cool System	1,095	1.00	818	Requires two additional 365-hp Hydro-cool Units
Lighting		1.00	8	0.09 W/sf Lighting (70,640 sf)
Total	**2,460**		**1,652**	M&V estimate based on additional equipment loads

Table 4. Actual Pre-Installation kW in 2000 (19,253 Bins at 45DF)

Equipment	Hp	Load Factor	KW	Notes
Chillers	375	0.35	99	Baseline 125-hp chiller served 2 cool rooms.
Tower	30	0.35	8	Baseline tower cycled for one 125-hp chiller.
Constant-Spd. Fans	480	0.50	179	Eight 20-hp fans/room, but only cooled 2 rooms and 2 fans/room are off adjacent to doors.
Hydro-Cool System	365	1.00	273	Engineering estimate calibrated to measured data
Lighting			4	0.09 W/sf Lighting (42,384 sf)
Total	**1,250**		**563**	Billing data shows 563 kW

[10] The 2002 baseline peak demand for 75,800 bins (at 58DF) is equal to demand for 56,865 bins (at 58DF) since no additional baseline equipment would be available (or required) to produce 75,800 bins of fruit (at 58DF).

Table 5. Actual As-Built kW in 2001 (56,865 or 75,800 bins at 58DF)

Equipment	Hp	Load Factor	kW	Notes
Chillers	625	1.00	464	Engineering estimate calibrated to measured data
Tower	52.5	1.00	39	Engineering estimate calibrated to measured data
VFD Fans	228	1.00	169	Engineering estimate calibrated to measured data
Constant-Spd. Fans	90	1.00	67	Engineering estimate calibrated to measured data
Lighting		1.00	6	0.131 W/sf Lighting (42,384 sf)
Total	**433**		**745**	Billing data shows 745 kW

Peak electric demand savings are calculated as follows.

$$\text{Peak Demand Savings kW} = 1{,}652\ \text{kW} - 745\ \text{kW} = 907\ \text{kW}$$

Average annual electric savings are calculated using the 2002 production of 75,800 bins (at 58DF) as follows.

$$\text{Average Annual Savings kWh/yr} = (21.78 - 10.72\ \text{kWh/bin}_{58DF}) \times 75{,}800\ \text{bins} = 838{,}477\ \text{kWh/yr}$$

Data Collection

Site Specific Input Parameters: We collected data during the on-site survey necessary to support the engineering analysis. We verified make and model numbers of rebated equipment (i.e., chillers, cooling towers, fans, and controls). We also verified equipment efficiency and relevant performance. We collected building characteristics data required to assess the UA of the building envelope. We collected data to quantify the capacity, use and schedule of significant internal loads such as lights, equipment, and people. We collected data on the quantity, size, characteristics, and operation schedules of all other equipment, chillers, pumps, and fans.

Data Collection Method: Whenever possible, we used the as-built construction plans as the source of data for building envelope constructions and surface areas. Measurements and observations during the on-site survey were used to verify the data. Inventories by type and schedules of internal lighting and equipment were collected during the on-site survey to estimate internal loads. We gathered one-time power measurements of lighting and equipment loads. We also completed a thorough audit of all lighting and miscellaneous electrical equipment in the building and made notes of equipment that was not operational when the one-time power measurements were made. Seasonal variations in operating schedules were obtained from building operations staff during the survey. Operational characteristics of the cooling system, such as the computer controls strategy, on/off schedule, and thermostats setpoints were obtained from a combination of direct observations and an interview with operations personnel during the survey. Capacity and efficiencies of motors and pumps were obtained from nameplate data. Capacities of cooling systems were based on manufacturer's data. Typical operating hours for pumps and motors were obtained from interviews with the operator.

Customer Cost/Benefit Analysis

Cost and Payback: Payback analysis was performed by Lodi Electric Utility during program implementation. Lodi calculated a simple payback of less than one year. Based on information provided in the file, the total cost for installed equipment is $967,500 and the Lodi Electric Utility rebate was $380,000. The total annual savings in electricity and maintenance is $260,310 and the calculated simple payback is 2.3 years including the rebate (based on 2001 savings). The rebate amount was 39 percent of the total installation cost. The measure lifetime is 15 years.
Non-Energy Costs and Benefits: Annual labor and maintenance benefits are estimated at $173,262 as per calculations provided by Site #1.

Energy Savings

Comparison of Lodi Electric Utility and Evaluation Estimates:

The evaluation estimate of gross savings for the internal air-cooling system is 907 kW and 838,477 kWh/yr. Peak demand savings are 19 percent higher and annual electric savings are 30 percent lower than the Lodi Electric program estimate of 765 kW and 1,194,000 kWh/yr. The program savings were calculated prior to obtaining actual electric billing and production data.

Savings Persistence: The expected lifetime for the internal air-cooling system is 15 years. The customer felt that the measure lifetime of 15 years is reasonable.

ATTACHMENTS

1. City of Lodi Electric Utility Department 2000 and 2001 Historical Billing Data for Site #1

2. City of Lodi Electric Utility Department Claim Voucher for Site #1

3. Site #1 Purchase Order Receipt for Internal Air-Cooling System

CITY COUNCIL

ALAN S. NAKANISHI,
Mayor

PHILLIP A. PENNINO,
Mayor Pro Tempore

SUSAN HITCHCOCK

EMILY HOWARD

KEITH LAND

CITY OF LODI

ELECTRIC UTILITY DEPARTMENT
ALAN N. VALLOW, DIRECTOR
1331 S HAM LANE
LODI, CALIFORNIA 95242-3995
(209) 333-6762
FAX (209) 339-6839

H. DIXON FLYNN,
City Manager

RANDALL A. HAYS
City Attorney

SUSAN J. BLACKSTON,
City Clerk

Shown below is the 2000 historical billing data for Site #1 Lodi facility.

Month	2000 Actual kW	2000 Actual kWh
Jan		
Feb		
Mar		
Apr		
May		
Jun	163	50,019
Jul	400	126,560
Aug	563	126,560
Sep	319	22,400
Oct		
Nov		
Dec		
Total	563	325,539

Shown below is the 2001 historical billing data for Site #1 Lodi facility. Billing data for 2001 has been adjusted for the new 240 current transformer (CT) multiplier (i.e., 1,200 to 5) from the pre-2001 CT multiplier of 160 (i.e., 800 to 5).

Month	2001 Actual kW	2001 Actual kWh
Jan		
Feb		
Mar		
Apr		
May		
Jun	691	127,440
Jul	745	172,320
Aug	702	272,640
Sep	255	37,200
Oct		
Nov		
Dec		
Total	745	609,600

CLAIM VOUCHER

City of Lodi, California

Finance Department
221 West Pine Street, P.O. Box 3006
Lodi, CA 95241-1910

Date: August 15, 2001

Issued To: Site #1
Lodi, CA 95241-0880

Requisition:
Account No:
Department: ELECTRIC UTILITY
Function No:

AUTHORIZED SIGNATURE

QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
		This amount reflects fifty percent of a total $380,000 energy efficiency grant awarded to Site #1 by the California Energy Commission. The grant is part of Senate Bill 5X money provided to commercial customers that embarked upon significant energy conservation projects in the summer of 2001. NOTE: PLEASE RETURN CHECK TO ROB LECHNER IN ELECTRIC UTILITY FOR DELIVERY.		$190,000.00
			TOTAL	$190,000.00
		DISTRIBUTION		DATE PAID
			WARRANT	AMOUNT

Site #1 Purchase Order Receipt for Internal Air-Cooling System

R43500 Purchase Order Print 12/11/01

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Order Number 10764 - 000- OR

Branch/Plant 90

Shipped From

Ship To

Lodi CA 95240

Fax Number

Carrier Number

Ordered 05/21/01 Freight

Requested Ship Date 05/21/01 Order Taken By

Currency Code USD Exchange Rate

Base Currency USD

Delivery

Original

Line	Rev	Description / Supplier Item	Ordered	UOM	Unit Price	PR UM	Extended Price	Requested Ship	Order No	Ty	Ln Ty	Tax Y/N	
1.000	0	COLD STORAGE / PRE-COOL ROOM	1.0000	EA	900,000.0000	EA	900,000.00	05/21/01			J	Y	55

SCOPE DESCRIPTION AS FOLLOWS:

COLD STORAGE AND PRE-COOL ROOM
$900,000.00 TOTAL COST (NOT TO EXCEED)
COMPLETION DATE, JUNE 18TH 2001.
ALL WORK IS TO BE COMPLETED ON OR BY
THIS DATE (6-18-2001). EACH AND EVERY
DAY AFTER 6-18-2001 WILL BE A PENALTY
ASSESSED OF $5,000. PER DAY.
ROOM #1 SHALL BE READY ON JUNE 14TH
COLD STORAGE ONLY (NO PRE-COOL) FOR EARLY
HARVEST AND DELIVERY OF APRICOTS.

Total Order 900,000.00

Tax Group Summary

LOD		7.500 %	900,000.00	67,500.00
			Sales Tax	Total Order
Term Net 30 Days	Tax Rate	7.500	67,500.00	967,500.00