Final

# Residential Refrigerator Recycling Program: Economic Analysis in Support of Idaho Tariff Filing

***Prepared for:***
PacifiCorp

***August 16, 2005***

***Prepared by:***
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# I. Program Description

The Idaho Residential Refrigerator Recycling Program (the Program) will be available to Idaho residential customers and operated by a third-party program administrator. Energy resources will be acquired in the residential market by providing incentives for customers to discontinue use of their second refrigerator and/or upgrade their old primary refrigerators and freezers to new energy-efficient models. The discarded appliances will all be taken out of use permanently and recycled to avoid being resold on the secondary market. The Program administrator is experienced in recycling refrigerators and is able to recycle 92% of appliance parts while complying with U.S. Environmental Protection Agency (EPA) guidelines.

Approximately 15% of Utah Power residential energy use is attributed to refrigeration. A significant portion is from second refrigerators and freezers. Utah Power's Energy Decision 2001 survey indicates that 14% of residential customers own a second refrigerator and 72% own stand alone freezers in Idaho. It is estimated that more than 2,600 inefficient appliances will be removed from use through this offering. Annual kWh savings is estimated to be 1029 kWh[1] per unit or 2,721 MWh in total at the end of the two-year program. Peak reduction is estimated to be 0.5 MW. Total costs over the two-year Program are estimated to be $516,775.

In addition, the Program will provide a leave-behind packet, one per household. The packet will contain written energy efficiency education materials and instant savings measures for a net annual savings of 64 kWh per packet. Annual savings at the end of the two year program from these measures is estimated to be 152 MWh. [2]

## Eligibility Requirements

The Program is open to all residential customers of Utah Power in the state of Idaho served on rate Schedule 1.

## Marketing

A mass-market campaign will launch the offer through the Program administrator with oversight by PacifiCorp's External Communications and Customer Support Services staff. Once commission approval is obtained, the Program will be implemented and will remain in place over a two-year period.

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1 Source: "Evaluation of the Utah Refrigerator and Freezer Recycling Program", Quantec, LLC August 3, 2004

2 Ibid.

The marketing plan will be timed to coincide with the warmest months of the year during which energy efficiency is at the forefront of people's minds. Past experience indicates that the period between Thanksgiving and the end of January have the lowest interest and participation. Consequently, newspaper advertising will focus on the remaining nine months of the year. The combination of newspaper and television advertising will reach 95% of the target market an average of 29 times over each nine-month campaign.

**Promotion Plan**

- Press Releases
- Bill Inserts
- Clipping service
- Newspaper ads
- Program launch event

## Incentives

A $40 incentive will be provided to residential customers for a maximum of two working refrigerators and/or freezers. In addition, participants will receive an energy efficiency packet consisting of an ENERGY STAR®-certified compact fluorescent light bulb, refrigerator/freezer thermometer, and energy education materials.

Table I.1 summarizes the program characteristics.

**Table I.1: Program Characteristics**

| Measure | Total Participants | Annual kWh Savings (per unit) | Measure Life (years) | Customer Incentive ($/participant) |
|---|---|---|---|---|
| Refrigerator Recycling | 2,380 | 1,029 | 8 | $40 |
| Energy Efficiency Packet | | 64 | | |

## Customer Application

Customers may sign up for the Program through either a toll-free number or a Web site.

## Program Delivery

The Program administrator will schedule pick-ups by geographic area to minimize costs. Refrigerators will be picked up and delivered to a central recycling center.

# II. Program Budget

The Residential Refrigerator Recycling Program has a projected two-year budget of $516,775. The Program budget by category is summarized in Table II.1 below.

**Table II.1: Annual Utility Costs and Savings**

| | 3rd-Party Administrator | Program Management | On-Site Inspections | Evaluation | Incentives | Total Utility Cost | Total Savings (kWh) |
|---|---|---|---|---|---|---|---|
| Year 1 | $156,050 | $12,000 | $10,000 | $20,000 | $60,337 | $258,387 | 1,436,735 |
| Year 2 | $156,050 | $12,000 | $10,000 | $20,000 | $60,338 | $258,388 | 1,436,735 |
| ***Total*** | ***$312,100*** | ***$24,000*** | ***$20,000*** | ***$40,000*** | ***$120,675*** | ***$516,775*** | **2,873,470** |

# III. Cost Effectiveness

Table III.1 provides the additional assumptions used in the analysis of cost effectiveness. The discount rates were obtained from two sources. For the TRC, the discount rate used is the US Treasury Long-Term Composite bond rate posted on August 16, 2005. PacifiCorp's cost of capital as reported in the 2004 Integrated Resource Plan served as the discount rate for the other tests (Utility Cost Test, Ratepayers Impact Measure, and Participant). PacifiCorp also provided the values for line losses and the residential retail energy rate.

**Table III.1: Program Inputs**

| Parameter | Value |
|---|---|
| Discount Rate for TRC test | 4.45% |
| Discount Rate for UCT, URIM, PART tests | 7.176% |
| Line Loss | 10.23% |
| 2004 Average Residential Retail Rate ($/kWh) | 0.0404 |

## Results

The cost effectiveness of the Program was calculated using Quantec's Demand Impact and Cost Effectiveness (DICE) model. The model distributes the estimated annual kWh savings across the year based on an hourly residential refrigerator load shape. Each of these hourly savings values is multiplied by the associated hourly-avoided costs from PacifiCorp's market price forecasts. These products are all discounted back to the present. This approach accurately captures the hourly differences in the value of a kWh during the year. Quantec analyzed two avoided cost scenarios.

***The base scenario*** was calculated based on PacifiCorp's official market price forecasts base case for Palo-Verde Hub, dated June 30, 2005.

***The IRP case*** uses annual system value estimates based on the August 2005 update of PacifiCorp's 2004 IRP 65% load factor decrement. The total costs of the IRP model after the load has been decremented are subtracted from the base IRP model costs. This difference is the value specific to PacifiCorp's system from these savings.

The Program passes the TRC, and Utility Cost Tests in both the base market price and the IRP scenario. The Program fails the Rate Impact Test, indicating that the Program will increase average rates slightly. The Participant cost-benefit ratio was not calculated, as participants face no costs in this Program.

## Table III.2: Cost-Effectiveness Results: August 2005 Updated 2004 IRP 65% Load Factor Decrement Scenario

| All Measures | | | | AC: IRP 65% Load Factor | |
|---|---|---|---|---|---|
| | Levelized $/kWh | Costs | Benefits | Net Benefits | Benefit/Cost Ratio |
| Total Resource Cost Test (PTRC) + Conservation Adder | $0.0155 | $357,206 | $1,013,376 | $656,170 | 2.837 |
| Total Resource Cost Test (TRC) No Adder | $0.0155 | $357,206 | $921,251 | $564,045 | 2.579 |
| Utility Cost Test (UCT) | $0.0203 | $466,033 | $810,481 | $344,448 | 1.739 |
| Rate Impact Test (RIM) | | $1,163,716 | $810,481 | -$353,235 | 0.696 |
| Participant Cost Test (PCT) | | ($108,827) | $811,904 | $920,730 | n/a |
| Lifecycle Revenue Impacts ($/kWh) | | | | $0.0000114945 | |

## Table III.3: Cost-Effectiveness Results: June 30, 2005 Base Market Price Scenario

| All Measures | | | | AC: Base Case | |
|---|---|---|---|---|---|
| | Levelized $/kWh | Costs | Benefits | Net Benefits | Benefit/Cost Ratio |
| Total Resource Cost Test (PTRC) + Conservation Adder | $0.0155 | $357,206 | $1,312,277 | $955,071 | 3.674 |
| Total Resource Cost Test (TRC) No Adder | $0.0155 | $357,206 | $1,192,979 | $835,773 | 3.340 |
| Utility Cost Test (UCT) | $0.0203 | $466,033 | $1,057,414 | $591,381 | 2.269 |
| Rate Impact Test (RIM) | | $1,163,716 | $1,057,414 | -$106,302 | 0.909 |
| Participant Cost Test (PCT) | | ($108,827) | $811,904 | $920,730 | n/a |
| Lifecycle Revenue Impacts ($/kWh) | | | | $0.0000034591 | |

# IV. Program Evaluation Plan

The following sections describe the Program's impact evaluation plan.

## Overview

The objective of this evaluation is to develop an estimate of the energy and demand savings due to this Program and its cost effectiveness. A key component in this analysis is the energy consumption of the replaced refrigerators and freezers, or the full-year unit energy consumption (UEC). Secondary data sources are available for estimating the UEC of replaced units.

Because some refrigerator/freezer replacements may have occurred in the absence of this Program, we will include an assessment of the net-to-gross (NTG) ratio.

## Task 1: Data Collection

Several refrigerator studies have been carried out in various parts of the country. These reports present a wide array of information. The first step in this task will be to identify relevant reports, review the data and analysis approaches, and document the findings.

Two primary data collection activities will be carried out including:

1. Unit energy consumption estimation
2. Customer surveys.

### Energy Consumption Measurements

A study of energy use for replaced refrigerators and freezers was conducted in support of a similar program sponsored by Southern California Edison (*Refrigerator/Freezer UEC Estimation, 1996 ARCA/SCE Turn-In Program: In Support of XENERGY Inc.'s Evaluation of the 1996 Appliance Recycling Program,* by John Peterson of Athens Research). This report and Quantec's August 3, 2004, report "Evaluation of the Utah Refrigerator and Freezer Recycling Program," will be used to corroborate the energy savings reported in this Program.

The Program implementer will provide the following information for each unit recycled:

- Customer name and address
- Appliance manufacturer, model number, year, serial number and size

For a minimum of 120 refrigerators and 120 freezers recycled through the Program, the implementer will also provide energy usage information as reported by the Association of Home Appliance Manufacturers (AHAM) for each unit. Degradation curves will be used to estimate the usage based on the age of the unit.

**Participant Survey**

A survey of participating customers will be undertaken to provide data needed to assess the NTG ratio for the Program and customer satisfaction levels. Table 1 shows the data categories and elements that need to be obtained through the survey. The following describe the data needs:

1. ***Customer Information***. These data will be acquired to characterize the participants and allow for extrapolation of the results to the entire Program population.
2. ***Participants' Perceptions and Satisfaction***. These questions will provide information about how the participant became aware of the Program, their satisfaction with its various components and the utility overall, and suggestions for improving Program delivery.
3. ***Free Riders***. Participants will be asked questions about what they would have been most likely to do with their appliance(s) if they had not participated in the Program and when they would have taken action. The key data from this set of questions will be the proportion of customers who would have permanently removed their old appliance(s) from service, whether the customer has recently purchased a new refrigerator/freezer, how many refrigerators/freezers are in the home and the location of the removed refrigerator/freezer. A series of questions will be needed to clarify the specific actions that would have been taken and improve upon the validity of the responses.
4. ***Unit Replacement***. Participants will be asked whether they have or plan to replace the recycled unit and, if so, the manufacturer and model number of the replacement unit.

**Table IV.1: Participant Survey Data Collection**

| Data Category | Data Element |
|---|---|
| Customer Information | • Name • Address<br>• Household size • Annual income<br>• Head of household age • Home type |
| Program Perceptions and Satisfaction | • How did customer become aware of Program?<br>• How satisfied is customer with Program delivery – schedule, communications, implementer performance, incentive, overall?<br>• What improvements would customer recommend?<br>• How satisfied is customer with Utah Power overall? |
| Free-Riders/ Unit Replacement | • What would customer have done with existing refrigerator/freezer without the Program?<br>• When would customer have taken action?<br>• How often would refrigerator/freezer have been operated if it had been kept?<br>• Was the recycled unit replaced and if so the manufacturer and model of the replacement unit. |

To ensure that results can be estimated to provide a 90% confidence and 10% precision level, two participant surveys (with sample sizes of 100 each) will be conducted – one each year of the Program.

## Task 2: Estimate Energy Savings Due to Program

Program energy and demand impacts will be estimated using data collected in Task 1.

In cases where participants recycled an existing appliance but replaced it with a new unit, the savings will be calculated using an average energy consumption value for new units based on refrigerator and freezer energy guide label values. For the proportion of participants who recycled a unit through the Program and did not replace it, gross savings will be the consumption of the recycled unit.

## Task 3: Assess Cost Effectiveness

The cost effectiveness of the Program will be calculated using the estimated savings from Task 2. Demand impacts will be calculated taking into account the average demand estimated for refrigerators and freezers from the energy savings of recycled units.

Because of the uncertainties associated with what participants would have done without the Program, it will be desirable to examine alternative assumptions that affect the NTG calculation and calculate a range of savings.

Prior studies will be used to define reasonable assumptions that merit examination.

The value of energy and demand savings will then be estimated by multiplying the savings by the hourly-avoided costs from PacifiCorp's market price forecasts. The product will then be discounted back to the present. From this and the Program cost data, Total Resource Cost test, Utility Cost test, Ratepayer Impact Measure test, and Participant Cost tests will be derived.

## Task 4: Report Preparation and Presentation (Years 1, 2)

Quantec will prepare a draft and final report that will summarize the findings of this evaluation at the end of first Program year and at the end of Program. The reports will include the following sections:

- Executive Summary
- Background or Introduction
- Methodology
- Process Information
- Impact Evaluation
- Recommendations
- Appendices (including a bibliography and reference list, clean copies of interview guides and survey instruments, and documentation of any electronic databases)

The evaluation team will provide a draft report to PacifiCorp and will incorporate all comments into the final report.

Final

# Idaho Low Income Weatherization Program: Analysis in Support of Tariff Revision

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# I. Program Description

The current Low Income Weatherization Program has been in place for over ten years. It is available to Utah Power customers with incomes at or below 150% of federal poverty guidelines that have installed electric heating systems. Services are provided at no cost to participants because partnering agencies are able to leverage Utah Power funding with federal and state funds they receive. Utah Power offers rebates directly to the Eastern Idaho Special Services Agency and the SouthEastern Idaho Community Action Agency ("Agencies") that administer the Program. The average annual number of completions during the period 2000 through 2004 is 23.

Utah Power in consultation with their two partnering non-profit agencies is proposing revisions to the current program (Schedule 21). There are four goals to this effort.

1. To increase Utah Power customer participation numbers.

2. To provide incentives for the installation of additional cost effective measures.

3. To offer rebates on measures that reduce electricity consumption in homes regardless of heating source.

4. To reimburse agencies for services up to two times per home, one time per measure. This allows the installation of new technologies and/or measures that previously were not considered cost effective.

The agencies provided expected participation rates for the revised program based on their historic weatherization program experience. Estimates are presented in Table I.1.

**Table I.1: Expected Annual Participation Rates**

| | |
|---|---|
| Electric Base Load Program Participants | 170 |
| Electrically Heated Homes | 70 |

***Proposed Rebates***: The following summarizes Utah Power's proposed reimbursement available to the Agencies for the installation of approved measures and reimbursement on administrative costs:

A rebate averaging up to $1,500 per home annually (April 1 through March 31) will be provided towards the cost of installed qualifying Major and Supplemental Measures. The following measure categories will be eligible for rebates:

- Weatherization Measures in Electrically Heated Homes
- Compact Fluorescent Light Bulbs (CFLs)
- Refrigerator Replacements
- Water Saving Measures in Homes with Electric Hot Water Heaters

**Weatherization**

Major Measures with a Savings to Investment Ratio (SIR) of 1.0 or greater are required (based on results of the State of Idaho Weatherization Energy Analysis) on homes with an electric heating system that is operable and permanently installed with the capacity to heat at least 51% of the dwelling. If physical barriers exist that prohibit the installation of a measure, the measure is not required. A list of qualifying measures follows. Greater R-values than listed below may be installed as long as audit results show it to be cost effective:

- Insulation up to R-48 for ceilings with less than R-30 in place.
- Floor insulation over unconditioned spaces up to R-30
- Insulation (not urea-formaldehyde) up to R-26 for walls without insulation installed
- Class 40 replacement windows

Supplemental Measures qualify for a rebate when they are determined to be cost effective.

Funding is available on the following Supplemental Measures installed in electrically heated homes:

- Attic ventilation when installed with ceiling insulation
- Ground cover and water pipe insulation when installed with floor insulation
- Forced air electric space heating duct testing, insulation, and sealing in unconditioned spaces
- Weather stripping and/or caulking including blower door assisted air sealing and duct sealing
- Thermal doors
- Timed thermostats on centrally controlled multi-room heating/cooling systems

Funding is available on the following supplemental measures installed in all homes:

- Compact fluorescent light bulbs – limit 6 Energy Star certified bulbs per home placed in fixtures that are on 2 hours or more per day.

- Refrigerators identified in the Weatherization Assistance Program Technical Assistance Center (WAPTAC) database as having mean annual usage of 900 kWh or greater may be replaced with an Energy Star model with estimated annual consumption of 500 kWh or less. Replaced refrigerators must be removed and recycled in accordance with EPA guidelines.
- Pipe insulation, energy-efficient showerheads, and aerators for homes with an electric water heater.

Administrative Cost Reimbursement will be provided at 15% of Utah Power's reimbursement for Major and Supplemental Measures with a minimum of $150 on homes with at least one major measure installed and $50 on homes without the installation of a major measure, not to exceed the following per building (Table I.2).

**Table I.2: Program Administration**

| Dwelling Units/Building | Maximum Payment |
|---|---|
| Minimum Payment - $150 w/major measure, $50 without major measure | |
| 1 to 4 | $350 |
| 5 to 10 | $800 |
| 11 to 15 | $1,200 |
| 16 to 20 | $1,400 |
| 21 to 25 | $1,600 |
| 26 to 30 | $1,800 |
| 31+ | $2,100 |

Table I.3 displays the assumptions used in the Program design and in conducting cost-effectiveness analysis. The U.S. DOE estimates the average cost per home throughout the nation is $2,744 (based on the 2005 DOE Weatherization Guideline). The average total cost of homes completed through the Utah Power program in 2004 was $1,678. Expected savings are based on an Oakridge National Laboratory study of weatherization programs. These savings include the Major Measures and Supplemental Measures with the exception of CFLs, and refrigerator replacements, which are separately estimated below. We used a 30-year economic life for the weatherization component of the Program. Overall weatherization measures were assumed to have a 30-year economic life.

**Table I.3: Weatherization Assumptions**

| Inputs | Data Source | Estimate | Outputs | Calculation |
|---|---|---|---|---|
| Number of Homes Annually | Agencies | 70 | Total Annual Savings (kWh) | 150,710 |
| National Average Total Cost | U.S. DOE | $2,744 | Total Utah Power Annual Contribution to Admin Cost | $15,750 |
| Average Total Savings (kWh) * | ORNL /CON-488 02/2003 | 2,153 | Total Utah Power Annual Rebate | $105,000 |
| Average Admin Cost | Utah Power | $225 | Total Annual Utah Power Cost | $120,750 |
| Average Rebate per Home | Utah Power | $1,500 | Total Annual Cost | $192,080 |

* Includes Major Measures and Supplemental Measures except as noted below.

## Compact Fluorescent Light Bulbs (CFL)

Utah Power will pay 50% of the bulb cost for up to eight ENERGY STAR®-certified CFLs per home, to be placed in lighting fixtures that are in use for two or more hours/day. Table I.4 displays the assumptions used in the CFL portion of the Program and in conducting cost-effectiveness analysis.

Estimates of CFL cost were derived from several other recent programs. The average wattage of replaced bulbs, installed bulb wattage, and expected number of hours of use were derived from PacifiCorp's evaluation of its CFL program in Utah. The total number of CFLs to be installed is determined by multiplying the expected participation level from Table I.1 (170 households) by eight. The program requirements will limit installations of CFLs to locations with at least two hours of use per day. With a minimum of two hours per day, we assumed an overall average use time of three hours per day across the installed CFLs. Average energy savings as a result of CFL replacement is calculated as the difference in wattage between the average incandescent light bulb (70 Watts) and the replacement CFL (20 Watts), multiplied by hours of use per day (3 hours) and days per year (365). This product is then converted to kWh by dividing by 1,000. The economic life of a CFL light bulb (9 years) is determined by assuming 10,000 hours of burn time divided by the annual hours of use (10,000/(3*365)). Agency administrative payments are limited to 15% of the Utah Power estimated contribution of $1,700.

**Table I.4: CFL Assumptions**

| Inputs | Data Source | Estimate | Outputs | Calculation |
|---|---|---|---|---|
| No. CFLs per Home | Program | 8 | Total Annual No. CFLs | 1,360 |
| Average Cost per CFL | Various | $2.50 | Avg. CFL Savings (kWh) | 54.8 |
| Average Existing Wattage | Utah Eval. | 70 | Total Annual Savings (kWh) | 74,460 |
| Average New Wattage | Utah Eval | 20 | Total Utah Power Annual Contribution to Admin Cost | $255 |
| | | | Total Utah Power Rebate | $1,700 |
| Average No Hours per Day | Utah Eval. | 3 | Total Annual Utah Power Cost | $1,955 |
| | | | Total Annual Program Cost | $3,655 |
| Rebate as % of CFL Cost | Utah Power | 50% | Economic Life (Years) | 9 |

## Refrigerators

Refrigerators can be replaced where existing models are listed in the WAPTAC database as having annual mean usage of 900 kWh or greater. Replacement refrigerators will be ENERGY STAR-certified models with annual consumption levels of 500 kWh or less. Replaced refrigerators will be removed and recycled according to Environmental Protection Agency (EPA) guidelines.[1]

Table I.5 displays the assumptions used in the refrigerator replacement portion of the Program and in conducting cost-effectiveness analysis. The consumption data are based on metered units from a similar program run in Utah during 2003. We assumed a 19-year economic life for a new refrigerator. Utah Power's total annual cost is set at 50% of the cost of replaced refrigerators. As mentioned above, the administration fee is limited to 15% of Utah Power contribution.

1 Existing refrigerators consuming over 900 kWh annually can be cost-effectively replaced. For detailed information concerning EPA Guidelines, please refer to Appendix A.

**Table I.5: Refrigerators Assumption**

| Inputs | Data Source | Estimate | Outputs | Estimate |
|---|---|---|---|---|
| Number of Refrigerators Tested | Agencies | 153 | No. Refrigerators Replaced | 68 |
| Proportion of Tested Replaced | Utah Pgm | 44% | Avg Annual Savings (kWh) | 1,510 |
| Avg Cost per New Unit | Agencies | $600 | Total Annual Savings (kWh) | 101,653 |
| Avg Cost Per Tested Unit | Agencies | * | Total Annual Equip Cost | $40,800 |
| Avg Consumption of Existing Unit (kWh) | Utah Pgm | 1,944 | Total Annual Testing Cost | * |
| Avg Consumption of New Unit (kWh) | Utah Pgm | 434 | Total Utah Power Contribution to Admin Cost | $3,060 |
| Rebate as % of Unit Cost | Utah Power | 50% | Total Utah Power Rebate | $20,400 |
| Economic Life (Years) | | 19 | Total Annual Utah Power Cost | $23,460 |
| | | | Total Annual Cost | $43,860 |

* The WAPTAC database will be used in lieu of testing[2].

## Hot Water Measures

Table I.6 displays the assumptions used in the design of the hot water portion of the Program, and in conducting cost-effectiveness analysis. The segment of clients likely to have gas heat with electric hot water was estimated at 10% (approximately 17 households). The program will install low-flow showerheads, kitchen and bathroom aerators and pipe wraps for these customers. Energy savings estimates were obtained from the evaluation of the 2002 California Low Income Energy Efficiency program[3]. As in the components above, Utah Power's contribution to administration cost will be limited to 15% of the total rebate amount for measures installed.

**Table I.6: Hot Water Measure Assumptions**

| Inputs | Data Source | Estimate | Outputs | Calculation |
|---|---|---|---|---|
| Percent of Participants with gas heat and electric hot water | Agencies | 10% | Annual Participants | 17 |
| Showerhead savings (kWh) | 2002 CA LIEE | 230 | Total Annual Savings (kWh) | 6,749 |
| Aerators (kWh) | 2002 CA LIEE | 75 | Total Annual Utah Power Contribution to Admin Cost | $97 |
| Pipe Wrap | 2004 CA DEER | 92 | Total Annual Utah Power Rebate | $323 |
| Measure Cost | Iowa LI Pgm | $38 | Total Annual Utah Power Cost | $420 |
| Rebate as % of Unit Cost | Utah Power | 50% | Total Annual Program Cost | $ 743 |
| | | | Economic Life (Years) | 9 |

[2] Energy use data for over 41,000 refrigerators, refrigerator-freezers, and freezers has been compiled by D&R International, Ltd., for DOE from the Directory of Certified Refrigerators, Freezers, and Refrigerator Freezers published by the California Energy Commission (CEC) from 1979 to 1992. See http://www.waptac.org/sp.asp?id=70.

[3] *Impact Evaluation of the 2002 California Low Income Energy Efficiency Program*, West Hill Energy and Computing, Inc. October 11, 2004

## Other Program Costs

Table I.7 displays the estimated Utah Power program management and administrative costs as well as the estimated cost of a third party evaluator. Table I.8 summarizes overall expected annual Program costs and savings.

**Table I.7: Other Program Costs**

| | |
|---|---|
| Utah Power Labor* | $10,000 |
| Evaluation | $10,000 |

*Includes program management, rebate processing and inspections.
** Evaluation costs are estimated to be $20,000, with evaluations occurring every two years.

**Table I.8: Combined Annual Program Costs and Savings**

| | Utah Power | Total | KWh |
|---|---|---|---|
| Weatherization | $120,750 | $192,080 | 150,710 |
| CFLs | $1,955 | $3,655 | 74,460 |
| Refrigerators | $23,460 | $43,860 | 102,680 |
| Hot Water | $420 | $743 | 6,749 |
| Other | $20,000 | $20,000 | |
| ***Total*** | **$166,585** | **$260,338** | **334,599** |

# II. Cost Effectiveness

Cost-effectiveness tests were run for the Program as designed using the following Standard tests:

- ***Total Resource Cost (TRC)***: This test examines the program benefits and costs from the Company and its customers' combined perspective. On the benefit side, it includes reduction in supply costs. On the cost side, it includes costs incurred by both Utah Power and the other funders. We also include a TRC test that includes a 10% conservation adder (PTRC).
- ***Utah Power (Utility Cost Test; UCT)***: From the Company's perspective, the benefits are in the form of avoided supply and line-loss costs. The costs include administration, evaluation, and rebate costs associated with the program.
- ***Ratepayers***: All ratepayers (participants and non-participants) may experience an increase in rates to recover lost revenue. This test (entitled Ratepayer Impact Measure, RIM) includes all the Company's program costs as well as first-year lost revenues. On the benefits side, it includes all avoided energy and capacity costs.

The participant test is included but no benefit cost ratio is calculated due to zero participant costs. Cost-effectiveness assumptions are summarized in Table II.1.

**Table II.1: Program Cost-Effectiveness Assumptions**

| Item | Assumptions |
|---|---|
| Energy Savings | Savings by measure |
| Retail Rate | Average 2004 Residential Retail Rate |
| Discount Rate | The US Treasury Long Term Composite bond rate of 4.60% posted on August 10, 2005 was used for the TRC. Utah Power's estimated cost of capital of 7.18% was used for the other tests. |
| Line Loss | 10.23% from the 2004 Utah Power line loss study |
| Measure Life | Each measure has its own expected life. |
| Avoided Costs | Primary source is the 2005 Integrated Resource Plan 65% load factor decrement. We also used the June 31, 2005, official Company forward price curve as a secondary data source. |
| Measure Cost | Each measure has its own expected cost. |
| Incentive Amount | Varies by element. See previous sections. |

## Results

The cost effectiveness of the Idaho Low Income Weatherization Program was calculated using Quantec's Demand Impact and Cost Effectiveness (DICE)

model. The model distributes the estimated annual kWh savings across the year based on hourly residential load shapes for each measure. Each of these hourly savings values is multiplied by the associated hourly avoided-costs from PacifiCorp's market price forecasts. These products are all discounted back to the present. This approach accurately captures the hourly differences in the value of a kWh during the year.

Cost effectiveness was calculated based on avoided costs estimated through the August 2005 IRP decrement approach using a 65% load factor and on the Company's official market price forecasts base case for Palo-Verde Hub, dated June 31, 2005.

The proposed Program design passes the utility cost effectiveness tests from the UCT perspective under both the forward price curve scenario and under the IRP decrement[4]. The program passes the TRC under the forward price curve scenario and narrowly fails the TRC under the IRP 65% load factor decrement scenario. Neither scenario reflects the additional benefits associated with low-income weatherization to both the utility and the participant. These additional benefits include decreases in collections and arrearages, improved comfort, improved health, fewer work and school absences, less frequent moves and more money to spend on other necessities.

**Table II.2: IRP Decrement (65% Load Factor)**

| All Measures | | | | AC: 65% Load Factor | |
|---|---|---|---|---|---|
| | Levelized $/kWh | Costs | Benefits | Net Benefit | Ratio |
| Total Resource Cost Test (PTRC) + Conservation Adder | 0.0552 | $260,338 | $243,705 | -$16,633 | 0.936 |
| Total Resource Cost Test (TRC) No Adder | 0.0552 | $260,338 | $221,550 | -$38,788 | 0.851 |
| Utility Cost Test (UCT) | 0.0353 | $166,585 | $177,086 | $10,501 | 1.063 |
| Rate Impact Test (RIM) | | $325,395 | $177,086 | -$148,309 | 0.544 |
| Participant Cost Test (PCT) | | $0 | $189,322 | $189,322 | n/a |
| Lifecycle Revenue Impacts ($/kWh) | | | | $0.0000039059 | |

**Table II.3: June 31, 2005 Base Case Forward Prices**

| All Measures | | | | AC: Base Case | |
|---|---|---|---|---|---|
| | Levelized $/kWh | Costs | Benefits | Net Benefit | Ratio |
| Total Resource Cost Test (PTRC) + Conservation Adder | 0.0552 | $260,338 | $349,279 | $88,941 | 1.342 |
| Total Resource Cost Test (TRC) No Adder | 0.0552 | $260,338 | $317,527 | $57,189 | 1.220 |
| Utility Cost Test (UCT) | 0.0353 | $166,585 | $245,576 | $78,991 | 1.474 |
| Rate Impact Test (RIM) | | $325,395 | $245,576 | -$79,819 | 0.755 |
| Participant Cost Test (PCT) | | $0 | $189,322 | $189,322 | n/a |
| Lifecycle Revenue Impacts ($/kWh) | | | | $0.0000021021 | |

[4] The Utility Cost Test is often considered the appropriate test for low-income weatherization programs since non-utility costs are federally funded.

# III. Evaluation Plan

The goals of the evaluation are to:

1. Estimate actual energy (kWh) and demand (kW) savings
2. Analyze Program cost effectiveness

The Company has committed to a process and impact evaluation at the end of the second program year.

## Impact Evaluation

The impact evaluation will include collecting key data, selecting a random sample of participants, estimating energy savings, and assessing cost effectiveness. The impact evaluation approach will vary by type of measure installed.

### Weatherization/Shell

This is not expected to be a large part of the Program. Energy impacts will be assessed through billing analysis, and demand impacts will be assessed using residential load shapes from secondary sources.

### Compact Fluorescent Light bulbs

The analysis will begin with the Program database for the number of CFLs installed, initial and final wattage, and hours of use whenever available.

Program database will be used to verify number of CFLs installed, hours of use, whether the replaced bulbs were in working condition, and number of bulbs removed. It is recommended that this effort be enhanced with a survey of about 100 participants to verify the information in the program database. However, this may also lead to increasing overhead costs to prohibitive levels given the size of this program.

The data collected will be used to estimate the energy (kWh) savings. The evaluator will then use secondary lighting hourly use data to estimate the Program demand (kW) impacts. Actual savings will be verified with billing analysis as described below.

### Refrigerators

The evaluator will utilize the metered data collected from the replaced refrigerators for estimating the energy and demand impacts. If conducted,

customer surveys will be used to verify the presence of new refrigerators. Actual savings will be verified with billing analysis as described below.

**Savings Analysis**

Traditionally, "quasi experimental" research design is the most appropriate method for conducting impact evaluations of demand-side management programs. The approach consists of comparing the change in pre- to post-program energy consumption between the participants and a "comparison" group of customers who, though eligible, did not participate. By accounting for non-program-related factors that can affect energy use from the pre- to the post-program periods, the approach can provide estimates of "net" program impacts.

***Census Billing Analysis***. A billing analysis will be conducted on all participants that pass the screen for sufficient billing history. These data will be compared to a group of low-income customers that did not participate in the Program.

Princeton Scorekeeping Method[5] (PRISM), an established weather-normalizing tool, will be used to calculate each individual customer's annual energy consumption under average weather conditions. Utilizing historical weather data and billing records, PRISM adjusts for the impact of weather variations upon usage during both the pre and post periods. The result is weather-normalized and annualized data that allow for the meaningful interpretation of the true impact of the Program upon energy consumption. The evaluator will use difference-of-means tests to analyze disparities between the participants and non-participant billing data.

The evaluator will also analyze the differences between pre and post PRISM-produced set temperatures for assessment of take back.

***Savings by Agency and Measure Type***. Utilizing the estimates from the billing analysis and detailed statistical models, the evaluator will stratify savings by agency and measure. This will provide valuable insight into the Program's operation and overall economic performance. This analysis will provide descriptive statistics on the frequency of installations for specific measures and groups of interrelated measures. It will also provide estimates of savings for groups of measures and can be compared to deemed savings to assess possible discrepancies. Additionally, these data will be stratified by

---

5 In order to produce the most accurate results, PRISM models each participant's pre and post periods separately, generating an individual normalized consumption record for each period. Employing several stages, PRISM utilizes an iterative process to determine the appropriate model (Heating-Only or Heating & Cooling) that best fits the data based on the usage characteristics exhibited by the participant.

agency to provide additional insight into best practices and areas of improvement.

***Quantify Non-Energy Benefits***. If surveys are conducted, the evaluator will estimate non-energy benefits, where applicable.

**Conduct Cost-Effectiveness Analysis**

The evaluator will conduct a cost-effectiveness analysis using traditional tools. The analysis will include the standard perspectives (i.e., utility, ratepayers, participants, and society) and, as much as possible, non-energy and environmental impacts (e.g., carbon dioxide reduction and reduction in forced mobility). The benefits to Utah Power include the reduction in energy consumption and the Company's avoided costs.

Program costs include administration, delivery, and actual payments made to participants. Benefit/cost ratios will be computed from the various perspectives.

## Management & Reporting

The evaluator will deliver a draft and final report of findings. The final report will reflect all the comments made by stakeholders. It will provide a complete description of the relevant evaluation objectives and how they were achieved. The final report is to contain the following elements:

- Executive Summary
- Description of the Program, its goals, and objectives
- Statement of the evaluation goals and objectives
- Discussion of methodologies
- Implementation procedures and assumptions for each method
- Data-collection procedures and methods
- Sample design and sample attrition
- Results and their interpretation (demonstrated clearly with charts and tables)

## Timeline

A process evaluation of the Program should be conducted approximately one year after Program implementation to assure that the Program is operating as planned. An impact evaluation should be conducted two years after Program implementation to allow sufficient post-implementation billing data to be available.

# Appendix A. EPA Guidelines

## Safe Disposal Requirements

Under Environmental Protection Agency (EPA) rules, equipment that is typically dismantled on site before disposal (e.g., retail food refrigeration, central residential air conditioning, chillers, and industrial process refrigeration) has to have the refrigerant recovered in accordance with EPA's requirements for servicing. However, equipment that typically enters the waste stream with the charge intact (e.g., motor vehicle air conditioners, household refrigerators and freezers, and room air conditioners) is subject to special safe disposal requirements.

Under these requirements, the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) is responsible for ensuring that refrigerant is recovered from equipment before the final disposal of the equipment. However, persons "upstream" can remove the refrigerant and provide documentation of its removal to the final person if this is more cost effective. If the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) accepts appliances that no longer hold a refrigerant charge, that person is responsible for maintaining a signed statement from whom the appliance is being accepted. The signed statement must include the name and address of the person who recovered the refrigerant, the date that the refrigerant was recovered, or a copy of a contract stating that the refrigerant will be removed prior to delivery. EPA does not mandate a sticker as a form of verification that the refrigerant has been removed prior to disposal of the appliance. Such stickers do not relieve the final disposer of their responsibility to recover any remaining refrigerant in the appliance, unless the sticker contains a signed statement that includes the name and address of the person who recovered the refrigerant and the date on which was recovered.

The equipment used to recover refrigerant from appliances prior to their final disposal must meet the same performance standards as equipment used prior to servicing, but it does not need to be tested by a laboratory. This means that self-built equipment is allowed as long as it meets the performance requirements. For MVACs and MVAC-like appliances, the performance requirement is 102 mm of mercury vacuum; for small appliances, the recovery equipment performance requirements are 90% efficiency when the appliance compressor is operational and 80% efficiency when the appliance compressor is not operational.

Technician certification is not required for individuals removing refrigerant from appliances in the waste stream.

## Section 608 of the Clean Air Act of 1990

### SEC. 608. NATIONAL RECYCLING AND EMISSION REDUCTION PROGRAM.

(a) In General -

(1) The Administrator shall, by not later than January 1, 1992, promulgate regulations establishing standards and requirements regarding the use and disposal of class I substances during the service, repair, or disposal of appliances and industrial process refrigeration. Such standards and requirements shall become effective not later than July 1, 1992.

(2) The Administrator shall, within 4 years after the enactment of the Clean Air Act Amendments of 1990, promulgate regulations establishing standards and requirements regarding use and disposal of class I and II substances not covered by paragraph (1), including the use and disposal of class II substances during service, repair, or disposal of appliances and industrial process refrigeration. Such standards and requirements shall become effective not later than 12 months after promulgation of the regulations.

(3) The regulations under this subsection shall include requirements that-

(A) reduce the use and emission of such substances to the lowest achievable level, and

(B) maximize the recapture and recycling of such substances.

Such regulations may include requirements to use alternative substances (including substances which are not class I or class II substances) or to minimize use of class I or class II substances, or to promote the use of safe alternatives pursuant to section 612 or any combination of the foregoing.

(b) Safe Disposal.- The regulations under subsection (a) shall establish standards and requirements for the safe disposal of class I and II substances. Such regulations shall include each of the following-

(1) Requirements that class I or class II substances contained in bulk in appliances, machines or other goods shall be removed from each such appliance, machine or other good prior to the disposal of such items or their delivery for recycling.

(2) Requirements that any appliance, machine or other good containing a class I or class II substance in bulk shall not be manufactured, sold, or distributed in interstate commerce or offered for sale or distribution in interstate commerce unless it is equipped with a servicing aperture or an equally effective design feature which will facilitate the recapture of such substance during service and repair or disposal of such item.

(3) Requirements that any product in which a class I or class II substance is incorporated so as to constitute an inherent element of such product shall be disposed of in manner that reduces, to the maximum extent practicable, the release of such substance into the environment. If the Administrator determines that the application of this paragraph to any product would result in producing only insignificant environmental benefits, the Administrator shall include in such regulations an exception for such product.

(c) Prohibitions. -

(1) Effective July 1, 1992, it shall be unlawful for any person, in the course of maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration, to knowingly vent or otherwise knowingly release or dispose of any class I or class II substance used as a refrigerant in such appliance (or industrial process refrigeration) in a manner which permits such substance to enter the environment. De minimis releases associated with good faith attempts to recapture and recycle or safely dispose of any such substance shall not be subject to the prohibition set forth in the preceding sentence.

(2) Effective 5 years after the enactment of the Clean Air Act Amendments of 1990, paragraph (1) shall also apply to the venting, release, or disposal of any substitute substance for a class I or class II substance by any person maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration which contains and uses as a refrigerant any such substance, unless the Administrator determines that venting, releasing, or disposing of such substance does not pose a threat to the environment. For purposes of this paragraph, the term "appliance" includes any device which contains and uses as a refrigerant a substitute substance and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.

# ATTACHMENT 5

(Market characterizations for the FinAnswer Express, Energy FinAnswer and Irrigation Efficiency programs.)

*Submitted To:*

PACIFICORP

# FinAnswer® Express Market Potential Assessment

for

# PacifiCorp's Idaho Service Territory

*Submitted By:*

Nexant

**September 17, 2004**
**(Updated August 22, 2005)**

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# Executive Summary

In an effort to realize available energy savings opportunities associated with high efficiency motor, light commercial HVAC, and lighting equipment within PacifiCorp's Idaho service territory, potential energy efficiency program options have been evaluated. Specially, this report summarizes the results Nexant, Inc. has completed in estimating the available savings potential and associated costs with introducing PacifiCorp's FinAnswer® Express program into this market. Findings presented here were derived from a variety of sources, including:

- The results of interviews and surveys recently conducted with key market players within PacifiCorp's service territories;
- A review of current market data and trends;
- The performance of the FinAnswer Express program in other PacifiCorp service territories, and;
- Nexant's experience in implementing similar Demand Side Management (DSM) programs around the country.

As a result of this work, Nexant recommends that if PacifiCorp's current FinAnswer Express Program is introduced Idaho, that the following changes be made to the program delivery mechanism:

- Prescriptive incentives for variable frequency drives (VFDs) installed on HVAC system fans and chilled water pumps $\leq$ 100 hp be added.
- Incentives for red LED traffic signals be discontinued in recognition that this measure has been accepted as current practice in the marketplace.
- Minimum efficiency requirements for packaged and split-system unitary equipment <65,000 Btu/h be increased to 15 SEER/12.5 EER.
- The 25,000 CFM size limitation on evaporative equipment be removed.

Table i summarizes the estimated incentives, customer costs, and savings impacts associated with implementing the FinAnswer Express program in Idaho with the aforementioned modifications.

## Table i. Potential FinAnswer Express program impacts in Idaho.[1]

| Year | Incentives | Net Customer Incremental Costs[2] | Net Annual Energy Savings (kWh)[3] | Net Peak Demand Savings (kW)[4] |
|---|---|---|---|---|
| ***Motors*** | | | | |
| Year 1 | $1,632 | $998 | 5,023 | 1 |
| Year 2 | $2,601 | $14,537 | 7,904 | 2 |
| ***Unitary HVAC*** | | | | |
| Year 1 | $ 1,700 | $ 3,264 | 979 | 2 |
| Year 2 | $ 3,450 | $ 6,624 | 1,987 | 5 |
| ***Evaporative*** | | | | |
| Year 1 | $ 294 | $ (3,680) | 1,127 | 6 |
| Year 2 | $ 605 | $ (7,581) | 2,322 | 12 |
| ***VFDs*** | | | | |
| Year 1 | $12,800 | $31,027 | 115,680 | 0 |
| Year 2 | $19,200 | $46,541 | 173,520 | 0 |
| ***Lighting*** | | | | |
| Year 1 | $ 28,314 | $93,952 | 210,185 | 38 |
| Year 2 | $ 56,441 | $187,287 | 418,987 | 76 |
| ***Total*** | | | | |
| Year 1 | $44,740 | $125,561 | 332,994 | 47 |
| Year 2 | $82,297 | $247,408 | 604,720 | 95 |

[1] Estimates are for a full year program period.

[2] Customer costs represent the net values inclusive of free-ridership estimates, but do not include the impacts of available incentives.

[3] Energy savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005).

[4] Demand savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005), and a coincident demand factor of 0.74, 0.87, and 0.70 for motors, HVAC (unitary and evaporative) and lighting equipment, respectively (PG&E 2001).

# Section 1 Introduction

This report summarizes work completed by Nexant, Inc. in conducting a market assessment of the savings potential associated with introducing PacifiCorp's FinAnswer Express program into the Idaho service territory. The FinAnswer Express program provides prescriptive incentives for the purchase and installation of qualifying high efficiency motors, HVAC, and lighting equipment. This program structure targets smaller, less complex energy efficiency projects and equipment replacement opportunities in the market.

Estimated savings and cost data presented in this report were determined by building upon the market assessment activities conducted in 2003 in support of the original design of the FinAnswer Express program for PacifiCorp's Utah and Washington service territories. As part of those initial activities, thirteen motor manufacturer representatives, twenty-five HVAC manufacturer representatives and large mechanical contractors, and sixteen lighting contractors and system designers were interviewed by or submitted completed surveys to Nexant. This feedback was supplemented by analyses of existing market trends, performance of the FinAnswer Express program in Utah and Washington, and similar other programs around the country.

The balance of this report is structured as follows:

- Section 2 provides an overview of the current markets within Idaho. Estimates of the annual sales volume and the percentage of high efficiency equipment installations are provided, as are estimates of the savings potential and incremental customer costs associated with qualifying high efficiency equipment;
- Section 3 presents an overview of other utility incentive programs targeting premium efficiency motors, HVAC, and lighting equipment;
- Section 4 includes Nexant's recommended modification to the current FinAnswer Express Program before introducing it to the Idaho market;
- Section 5 summarizes the potential costs and savings associated with implementing the FinAnswer Express program in the Idaho market;
- Section 6 lists key reference materials used to develop this report, and;
- Section 7 contains several appendices of supplemental information.

Based on the survey responses and market research efforts conducted by Nexant, the following is an overview of the current motor, light commercial HVAC, and lighting equipment markets and sales trends in Idaho. General information on the potential savings and incremental costs associated with high efficiency equipment is also provided.

## 2.1 MOTORS

### 2.1.1 Market Snapshot

Electric motor-driven systems consume more than a quarter of all electricity sold in the United States, making up the largest single category of electric end-use.

#### *2.1.1.1 Equipment manufacturers and representatives*

Eight major manufacturers account for the majority of commercial motors sold into the Idaho market. Leeson and Baldor appear to be dominant players, while secondary players include GE, Teco-Westinghouse, US Motors, AO Smith, Lincoln, and Siemens.

Manufacturer representatives and distributors typically push motors to the market. These distribution channels may be represented by manufacturer-employed representatives working for companies such as Leeson or Teco-Westinghouse, or through independently owned firms like S&G Electric or Kaman Industrial Technologies.

Most of the contacted parties did not have software products available that would allow them to estimate the annual operating costs and potential savings available with high efficiency equipment for their customers.

#### *2.1.1.2 Sales process*

Based on feedback from some of the survey participants, only about 10% of new motors sold will become inventory within a customer's facility while the remainders are placed into service within a short period after the sale. Electric motor sales are typically driven by one of three factors: equipment failure, planned replacement, or new construction. Table 1 summarizes the survey respondents' feedback across these categories.

**Table 1. Electric motor sales drivers.**

| Reason for Equipment Sale | Percentage |
|---|---|
| Equipment Failure | 56% |
| Planned Replacement | 16% |
| New Construction | 22% |
| Other | 6% |
| **Total** | **100%** |

When new motors are purchased, survey respondents indicate that the key decision maker in the process is generally the building owner or the facility manager. Table 2 summarizes these responses.

**Table 2. Key decision maker in electric motor sales.**

| Key Decision Maker | Percentage |
|---|---|
| Building Owner | 55% |
| A&E Firm | 31% |
| Contractor | 10% |
| Other | 4% |
| **Total** | **100%** |

#### *2.1.1.3 Equipment stocking practice and seasonal sales trends*

Survey respondents indicate that the majority of electric motors sales are filled utilizing the manufacturers' inventory, although a small number of standard and premium efficiency units are kept in local inventory for failed equipment replacements. Table 3 summarizes the survey respondents' inventory practices.

**Table 3. Electric motor stocking practices.**

| Size Category | Percentage Sold from Local Inventory (%) | Percentage Sold from Manufacturer Inventory (%) |
|---|---|---|
| 1 - 5 hp | 23% | 77% |
| 6 - 20 hp | 23% | 77% |
| 21 – 50 hp | 22% | 78% |
| 51 – 100 hp | 20% | 80% |
| 101 – 200 hp | 14% | 86% |

Finally, seasonality does not seem to play a role in the sales volume of electric motors. This is especially true for motors purchased due to failed equipment. It seems reasonable to expect some seasonality due to new construction purchases, however the survey responses received provided insufficient data to draw any conclusions.

### 2.1.2 Annual Sales Volume in Idaho

Due to the variety of distribution channels for electric motors and the unwillingness of some survey respondents to disclose sales data, a top-down approach was used to estimate the annual sales volume of electric motors in Idaho.

Table 4 presents the estimated sales within the state based upon a pro-rated comparison of the ratio of Idaho's real Gross State Product versus the U.S. real Gross Domestic Product applied to the 2001 Census Bureau's report on Motors and Generators. This estimate takes into account imports and exports as reported by the Census Bureau. The portion of sales within PacifiCorp's

service territory, estimated by applying a fixed ratio of PacifiCorp's commercial customers to the state total, is also provided (EIA 1994-2002).

**Table 4. Electric motor sales in Idaho (2001).**

| Size Category | Estimated Total Units Sold | Estimated Units Sold in PacifiCorp's ID Service Territory |
|---|---|---|
| 1 - 5 hp | 4,021 | 275 |
| 6 - 20 hp | 2,065 | 141 |
| 21 – 50 hp | 605 | 41 |
| 51 – 100 hp | 203 | 14 |
| 101 – 200 hp | 100 | 7 |
| **Total** | 6,994 | 478 |

### 2.1.3 Current Sales of Premium Efficiency Motors

The market for electric motors meeting NEMA's Premium Efficiency standards is robust and expanding, accounting for approximately 15% of national motor sales for units in the 1 to 200 hp size range. Survey respondents, although varied, seemed to confirm the validity of the national trend. Table 5 is based on the sales volumes shown in Section 2.1.2 and the assumption that 15% of total motor sales are Premium Efficient motors.

**Table 5. Premium efficiency motor sales in PacifiCorp's Idaho service territory (2001).**

| Size Category | Premium Efficiency Sales |
|---|---|
| 1 - 5 hp | 41 |
| 6 - 20 hp | 21 |
| 21 – 50 hp | 6 |
| 51 – 100 hp | 2 |
| 101 – 200 hp | 1 |
| **Total** | 72 |

### 2.1.4 Incremental Energy and Demand Savings Potential

Many factors combine to determine the energy and demand savings potential for premium efficiency motors, although the most salient ones include operating hours, load factor, and the change in efficiency.

Based upon results from ESource and Nexant's experience, predicted gross energy and demand savings were derived based on the following equations (ESource 2003):

$$kW_Savings = (0.746 \times HP \times Load_Factor) \times \left( \frac{1}{EPAct_eff} - \frac{1}{EPAct_eff + delta_eff} \right)$$

$$kWh_Savings = kW_Savings \times Hours$$

Where *hp* is the motor size and *Hours* are the average operating hours based on ESource reported average hours of industrial motors, adjusted to reflect the estimated mix of commercial and industrial motor applications within the state (Esource 2003, EIA 1994-2002). *Load_Factor* is based on numerous sources, including ESource, that all indicate an average of 50% for lower hp motors increasing to an average 70% load for larger motors. *delta_eff* is derived based on incremental efficiency gains over EPAct as reported by ESource. Key assumptions and resulting net savings estimates for premium efficiency motors from 1 to 200 hp are summarized in Table 6.

**Table 6. Motor savings calculation parameters and values.[1]**

| HP | Hours | Load Factor | EPAct eff | delta eff | Energy Savings (kWh/motor) | Demand Savings (kW/motor) |
|---|---|---|---|---|---|---|
| 1 | 2721 | 50% | 80.1% | 6.7% | 93 | 0.03 |
| 1.5 | 2721 | 50% | 83.8% | 4.6% | 91 | 0.02 |
| 2 | 2721 | 50% | 84.7% | 3.9% | 101 | 0.03 |
| 3 | 2721 | 50% | 86.3% | 3.6% | 137 | 0.04 |
| 5 | 2721 | 50% | 87.2% | 3.0% | 184 | 0.05 |
| 7.5 | 3207 | 50% | 88.7% | 3.2% | 335 | 0.08 |
| 10 | 3207 | 50% | 89.5% | 3.1% | 426 | 0.10 |
| 15 | 3207 | 50% | 90.4% | 2.3% | 473 | 0.11 |
| 20 | 3207 | 50% | 90.6% | 2.5% | 690 | 0.16 |
| 25 | 3624 | 60% | 91.6% | 2.2% | 1,012 | 0.21 |
| 30 | 3624 | 60% | 91.8% | 2.4% | 1,280 | 0.26 |
| 40 | 3624 | 60% | 92.6% | 2.0% | 1,400 | 0.29 |
| 50 | 3624 | 60% | 92.8% | 2.2% | 1,914 | 0.39 |
| 60 | 4663 | 50% | 93.4% | 1.7% | 1,954 | 0.31 |
| 75 | 4663 | 50% | 93.6% | 1.6% | 2,250 | 0.36 |
| 100 | 4663 | 50% | 93.9% | 1.6% | 2,979 | 0.47 |
| 125 | 4971 | 70% | 94.2% | 1.6% | 5,408 | 0.81 |
| 150 | 4971 | 70% | 94.6% | 1.4% | 5,627 | 0.84 |
| 200 | 4971 | 70% | 94.8% | 1.3% | 7,107 | 1.06 |

[1] Savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005) and a coincident demand factor of 0.74 (PG&E 2001).

Full-load motor speed may also impact motor savings. The full-load speed of EPAct and premium efficiency motors can vary as much as 4% within a given efficiency classification. In addition, the range of full-load speeds will be slightly higher for premium efficiency motors then for their less efficient counterparts. Although the variance within a range can be as much as 4%, the difference between the ranges (between EPAct and premium efficiency) is much less. This is due to the fact that the ranges overlap. The potential increase in speed may have a negative impact on energy use and demand if the end use is a constant speed centrifugal load, although it

can be minimized or eliminated with proper motor selection. For this reason, the issue of motor speed changes was not considered in the savings calculations.

### 2.1.5 Estimates of Incremental Customer Costs

Incremental customer costs are cited by numerous references as having little correlation to horsepower and efficiency. It is suspected that this is due to varying manufacturers discounts and various market conditions that may influence discounts and pricing on a monthly basis. For the analysis presented in this report, Nexant used average price premiums derived from MotorMaster and presented in ESource (ESource 2003). The average gross price premiums are shown in Table 7 and do not reflect the impacts of free-ridership or utility incentives.

**Table 7. Gross customer price premiums derived from MotorMaster.**

| Motor hp | Open Drip Proof | | | Totally Enclosed Fan Cooled | | | Average |
|---|---|---|---|---|---|---|---|
| | 3600 rpm | 1800 rpm | 1200 rpm | 3600 rpm | 1800 rpm | 1200 rpm | |
| 1 | -- | $ 36 | $ 20 | $ 24 | $ 32 | $ 104 | $ 43 |
| 1.5 | $ 20 | $ 22 | $ 18 | $ 61 | $ 78 | $ 86 | $ 48 |
| 2 | $ 25 | $ 46 | $ 16 | $ 70 | $ 83 | $ 16 | $ 43 |
| 3 | $ 24 | $ 16 | $ 48 | $ 50 | $ 36 | $ 146 | $ 53 |
| 5 | $ 24 | $ 22 | $ 64 | $ 81 | $ 45 | $ 121 | $ 60 |
| 7.5 | $ 73 | $ 47 | $ 83 | $ 137 | $ 62 | $ (47) | $ 59 |
| 10 | $ 71 | $ 37 | $ 99 | $ 82 | $ 83 | $ 192 | $ 94 |
| 15 | $ 85 | $ 30 | $ 144 | $ 118 | $ 103 | $ 242 | $ 120 |
| 20 | $ 80 | $ 106 | $ 175 | $ 164 | $ (19) | $ 265 | $ 129 |
| 25 | $ 127 | $ 130 | $ 175 | $ 130 | $ 205 | $ 285 | $ 175 |
| 30 | $ 122 | $ 111 | $ 93 | $ 263 | $ 194 | $ 190 | $ 162 |
| 40 | $ 160 | $ 186 | $ 344 | $ 417 | $ 447 | $ 512 | $ 344 |
| 50 | $ 114 | $ 524 | $ 311 | $ 378 | $ 345 | $ 355 | $ 338 |
| 60 | $ 224 | $ 116 | $ 426 | $ 567 | $ 234 | $ 196 | $ 294 |
| 75 | $ 119 | $ 60 | $ 489 | $ 540 | $ 31 | $ 434 | $ 279 |
| 100 | $ 201 | $ 281 | $ 496 | $ 397 | $ 112 | $ 1,300 | $ 465 |
| 125 | $ 421 | $ 216 | $ 190 | $ 281 | $ 1,000 | $ 1,321 | $ 572 |
| 150 | $ 502 | $ 608 | $ 289 | $ 374 | $ 570 | $ 645 | $ 498 |
| 200 | $ 794 | $ 564 | $ 1,065 | $ 1,171 | $ 541 | $ 1,632 | $ 961 |

## 2.2 LIGHT COMMERCIAL HVAC EQUIPMENT

### 2.2.1 Market Snapshot

#### *2.2.1.1 Equipment manufacturers and representatives*

Nationally, eight major manufacturers account for nearly all commercial unitary cooling equipment production. Carrier, Lennox and Trane equipment appear to dominate the Idaho market. Likewise for evaporative cooling equipment, there are approximately a half-dozen major manufacturers nationally, with Champion and Phoenix products leading the Idaho market.

Manufacturer representatives and distributors typically push commercial cooling equipment to the market. These distribution channels may be represented by manufacturer-employed workers such as Lennox, or through independently owned firms like Carrier-Intermountain.

All major manufacturers have software products available that can be used to inform customers of the annual operating costs and potential savings available with high efficiency equipment. In general, respondents to the surveys were familiar with and capable of using these tools or other commercially available software packages, but rarely did so in practice due to the limited sales of high efficiency equipment.

Supplemental information regarding packaged-terminal air conditioners and heat pumps (PTAC and PTHP) is provided in Appendix E of this report.

#### 2.2.1.2 Sales Process

The sale of light commercial HVAC equipment is typically driven by one of three factors: equipment failure, planned replacement, or new construction. Table 8 summarizes the survey respondents' breakdown between these categories.

**Table 8. Commercial HVAC equipment sales drivers.**

| Reason for Equipment Sale | Percentage |
|---|---|
| Equipment Failure | 25% |
| Planned Replacement | 18% |
| New Construction | 57% |
| Other | 0% |
| **Total** | **100%** |

When new commercial cooling equipment is purchased, survey respondents indicate that the key decision maker in the process the contractor. Table 9 summarizes these responses.

**Table 9. Key decision maker in HVAC equipment sales.**

| Key Decision Maker | Percentage |
|---|---|
| Building Owner | 17% |
| A&E Firm | 14% |
| Contractor | 69% |
| Other | 0% |
| **Total** | **100%** |

#### 2.2.1.3 Commercial HVAC equipment stocking practice and seasonal sales trends

Survey respondents indicate that a majority of both small and large unitary equipment is sold from manufacturer inventory, although a small number of standard efficiency units are kept in local inventory for failed equipment replacements. For unitary equipment over 5 tons, no respondent indicated that high efficiency models are stocked locally. Table 10 summarizes the survey respondents' inventory practices.

**Table 10. Commercial unitary equipment stocking practices.**

| Size Category | Percentage Sold from Local Inventory (%) | Percentage Sold from Manufacturer Inventory (%) |
|---|---|---|
| ≤ 65,000 Btu/h | <10% | >90% |
| > 65,000 Btu/h & ≤ 135,000 Btu/h | 15% | 85% |
| > 135,000 Btu/h & ≤ 240,000 Btu/h | <10% | >90% |
| > 240,000 Btu/h | 21% | 79% |

Finally, unlike the residential cooling equipment market, the commercial market is less seasonally driven, although summer months still account for a significant portion of equipment sales. Reported sales information by quarter and type is presented in Table 11.

**Table 11. Commercial HVAC cooling equipment sales timing patterns.**

| Date of Sale | Equipment Failure (%) | Planned Replacement (%) | New Construction (%) |
|---|---|---|---|
| 1st Quarter (Jan-Mar) | 13% | 20% | 19% |
| 2nd Quarter (Apr-Jun) | 33% | 40% | 31% |
| 3rd Quarter (Jul-Sep) | 44% | 10% | 26% |
| 4th Quarter (Oct-Dec) | 10% | 30% | 24% |
| **Total** | **100%** | **100%** | **100%** |

### 2.2.2 Annual Commercial HVAC Sales Volume in Idaho

Due to the variety of distribution channels for light commercial HVAC equipment and the unwillingness of some survey respondents to disclose sales data, a top-down approach has been used to estimate the annual sales volume of HVAC equipment in Idaho.

Results from the 1999 Commercial Building Energy Consumption Survey (DOE/EIA 2002), or CBECS, were used to estimate the penetration of unitary and evaporative cooling equipment in the commercial market sector. Reported values for the Mountain Census Division were used and linearly adjusted for Idaho based on state populations. An overview of the HVAC equipment used to provide cooling in Idaho's commercial buildings is presented in Figure 1.

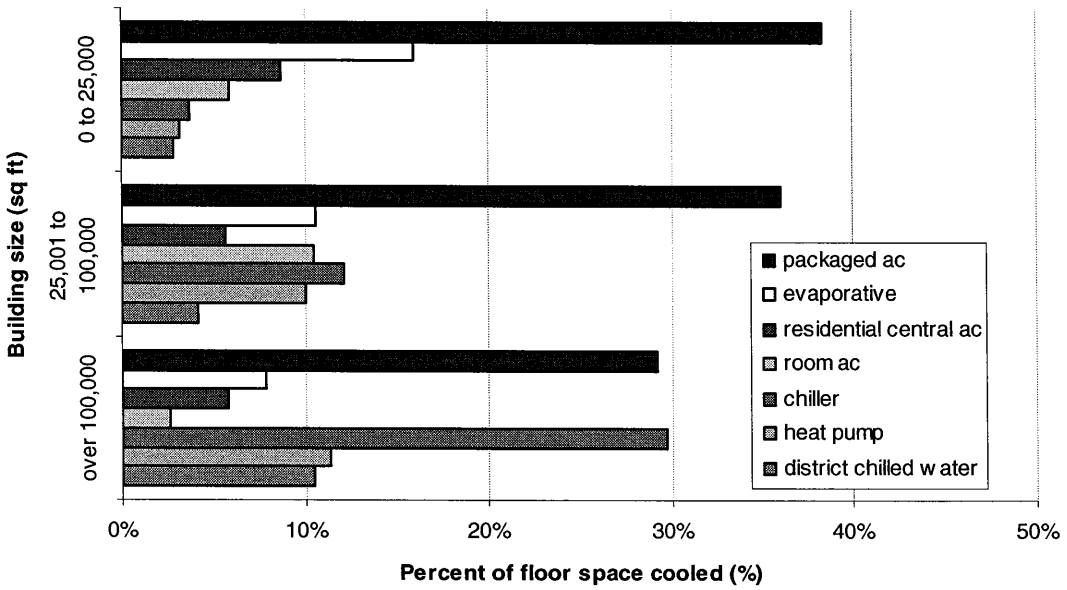


**Figure 1. Commercial cooling equipment types by floor space in Idaho.**

For the purpose of estimating annual sales of light commercial HVAC equipment, the CBECS classifications of residential central AC equipment, packaged AC equipment, and heat pumps were categorized as unitary equipment. Evaporative equipment was evaluated separately. Table 12 summarizes the estimated annual sales volumes of light commercial HVAC equipment in PacifiCorp's Idaho service territory.

**Table 12. Estimated annual sales of light commercial HVAC equipment in ID service territory.**

| Year | Replaced Unitary Equipment (tons) | New Unitary Equipment (tons) | Total Unitary Sales (tons) | Replaced Evaporative Equipment (1,000 CFM) | New Evaporative Equipment (1,000 CFM) | Total Evaporative Equipment (1,000 CFM) |
|---|---|---|---|---|---|---|
| 2004 | 1,452 | 1,081 | 2,532 | 634 | 472 | 1,106 |
| 2005 | 1,495 | 1,113 | 2,608 | 653 | 486 | 1,139 |
| 2006 | 1,540 | 1,146 | 2,686 | 673 | 501 | 1,173 |
| 2007 | 1,586 | 1,181 | 2,767 | 693 | 516 | 1,209 |

A number of key assumptions were built into the estimated sales volume values shown in Table 12. They include:

- An average equipment lifetime of 15 years (ASHRAE 2003);
- A conservative 3% growth rate in new commercial customers (EIA 1994-2002), and;
- A steady evaporative cooling equipment market.

Based on the information reported by contacted parties, these estimates of annual sales volume appear to be reasonable.

### 2.2.3 Current Sales of Commercial High Efficiency HVAC Equipment

Based on interviews with key light commercial HVAC equipment manufacturer representatives and distributors, sales of unitary equipment with efficiency levels that meet or exceed the Consortium for Energy Efficiency's (CEE) Tier 2 levels, are very limited (< 5%). Sales of unitary equipment that meet ASHRAE 90.1-1999 requirements (same as CEE's Tier 1) are slightly higher (10%-20%), but still limited. Respondents cited two key reasons:

- The commercial unitary equipment market is extremely competitive and driven by first costs. Contractors especially are unwilling to pay a premium for high efficiency equipment and place themselves at a disadvantage when responding to competitive bids.
- Building owners, contractors, and A&E firms are unfamiliar with the true costs of standard efficiency equipment as compared to high efficiency options and prefer to stick to the status quo when selecting commercial cooling equipment.

### 2.2.4 Incremental Energy and Demand Savings Potential

Due to the wide variety of commercial cooling equipment available and the manner in which it is used, Nexant has developed savings estimates that are expected to be representative of both high efficiency unitary and evaporative units in a typical commercial application

Current commercial building codes in Idaho are based on ASHRAE Standard 90.1-1999. Savings estimates provided here assume new high efficiency HVAC equipment that just meets current program eligibility requirements, which are the same as the Consortium for Energy Efficiency's (CEE) Tier 2 efficiency levels.[1] These savings estimates are shown in Table 13 and were used to estimate the potential program savings impacts in Section 5 of this report.

[1] Effective January 23, 2006, the federal minimum efficiency for split and packaged unitary equipment < 65,000 Btu/hr will increase to 13 SEER. As stated in Section 4, minimum efficiency requirements of 15 SEER/12.5 EER are recommended for this size category of HVAC equipment.

**Table 13. Representative commercial cooling equipment energy savings estimates for Idaho.** [1]

| Equipment Type | Net Annual Energy Savings (kWh) | Net Peak Demand Savings (W) |
|---|---|---|
| **Unitary** [2] | 29/ton | 57/ton |
| **Evaporative** [3] | 0.077/CFM | 0.39/CFM |

[1] Savings calculated for a commercial office building in Pocatello, Idaho with operation M-F from 7:00 a.m. to 7:00 p.m. Indoor set point of 75 °F with dry-bulb economizer. This location used as most representative of the PacifiCorp ID service territory where unitary equipment performance data was available.

[2] Savings estimates are representative of equipment from 5 to 20 tons in size. Savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005) and a coincident demand factor of 0.87 (PG&E 2001).

[3] Savings estimates are valid for evaporative equipment in comparison to a unitary system that meets the appropriate baseline efficiency requirement. Savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 for evaporative equipment (Express Efficiency Program Offering, DEER 2005), and a coincident demand factor of 0.87 (PG&E 2001).

In support of the recommendations to offer incentives for VFDs installed on HVAC system fans and ≤100 hp provided in Section 4 of this report, the estimated net annual energy savings at the meter for this measure is 723 kWh/yr/hp (PG&E 2005). The corresponding savings estimate for VFDs installed on chilled water pumps ≤ 100 hp is 565 kWh/yr/hp. These savings estimate includes a net-to-gross estimate of 0.96. There are no estimated demand savings associated with this measure.

### 2.2.5 Estimates of Incremental Customer Costs

Based on independent published reports and survey results, the estimated average incremental customer cost for unitary equipment that meets program minimum requirements is $75-100 per ton, based on the size and type of equipment. This price increase represents approximately a 15% premium in customer cost for high efficiency equipment. Estimated incremental costs for various sizes of high efficiency HVAC equipment are listed in Table 14 (CEE, 2003b; Center for Energy and Environment, 1999; survey respondents).

**Table 14. Estimated incremental HVAC equipment costs.** [1]

| HVAC Equipment Size (tons) | Incremental Cost ($/ton) |
|---|---|
| <5 | $ 180.00 |
| 7.5 | $ 72.63 |
| 10 | $ 85.75 |
| 12.5 | $ 100.00 |
| 15 | $ 73.47 |
| 20 | $ 84.65 |

[1] Gross incremental costs between current HVAC equipment sales in Idaho and qualifying HVAC equipment. Prices do not reflect impacts of free-ridership or utility incentives.

When compared to standard efficiency unitary equipment, commercial evaporative cooling equipment is typically less expensive, on the order of 50% to 70% of corresponding unitary equipment costs.

The estimated gross customer incremental cost for VFDs installed on HVAC system fans ≤ 100 hp is $202/hp, while the corresponding value for VFD retrofits on chilled water pumping systems is $382/hp (PG&E 2005).

## 2.3 LIGHTING EQUIPMENT

### 2.3.1 Market Snapshot

#### *2.3.1.1 Equipment manufacturers and representatives*

The lighting industry is fairly established and consistent throughout the country. The majority of lighting equipment is manufactured by a handful of companies such as GE, Philips, Sylvania, Advance, and Howard Industries. Lighting equipment is readily available on a national level and no one player was found to dominate the Idaho market. Electrical supply houses and equipment wholesalers typically push commercial lighting equipment to the market through installation contractors.

There are a number of commercially available software packages available to help estimate the annual operating costs and potential savings available with high efficiency lighting equipment. By far the most commonly reported tools used by lighting professionals (70%+), however, were custom in-house developed spreadsheets and savings algorithms.

#### *2.3.1.2 Sales process*

The sale of lighting equipment is typically driven by a variety of factors. Table 15 summarizes the key reasons identified by survey respondents.

**Table 15. Lighting equipment sales drivers.**

| Reason for Equipment Sale | Percentage |
|---|---|
| Equipment Failure | 9% |
| Planned System Upgrade | 19% |
| Unsolicited Proposal | 30% |
| Tenant Improvement (TI) | 14% |
| New Construction | 27% |
| **Total** | **100%** |

When new or replacement lighting equipment is purchased, survey respondents indicate that the key decision maker in the process is driven by the building owner, although the lighting designer and contractor do play a critical role as well. Table 16 summarizes these responses.

**Table 16. Key decision maker in lighting equipment sales.**

| Key Decision Maker | Percentage |
|---|---|
| Building Owner | 54% |
| A&E Firm/Lighting Designer | 23% |
| Contractor | 19% |
| Maintenance | 4% |
| **Total** | **100%** |

### 2.3.2 Annual Sales Volume in Idaho

Due to the volume of distribution channels for lighting equipment and cost associated with surveying all lighting companies, a top-down approach has been used to estimate the annual sales volume of lighting equipment in Idaho.

Results from the 1999 CBECS (DOE/EIA 2002), EIA reported sales data (EIA 1994-2002), and the ESource Lighting Atlas (ESource 1997) were used to estimate the annual sales volume of lighting equipment in the commercial market sector in Idaho. Table 17 summarizes the estimated annual sales volumes of lighting equipment in PacifiCorp's Idaho service territory.

**Table 17. Estimated annual sales of lighting equipment in Idaho service territory.**

| Year | Retrofits ($1,000s) | New Construction ($1,000s) | Total Sales ($1,000s) |
|---|---|---|---|
| **2004** | $ 3,938 | $ 2,932 | $ 6,870 |
| **2005** | $ 4,057 | $ 3,019 | $ 7,076 |
| **2006** | $ 4,178 | $ 3,110 | $ 7,288 |
| **2007** | $ 4,304 | $ 3,203 | $ 7,507 |

A number of assumptions were built into the estimated sales volume values shown in Table 17, including:

- An average equipment lifetime of 15 years, and;
- A conservative 3% growth rate in new commercial customers (EIA 1994-2002).

Based on the information reported by contacted parties, these estimates of annual sales volume appear to be reasonable.

### 2.3.3 Current Sales of High Efficiency Lighting

Based on survey responses, current sales of high efficiency lighting equipment constitute a respectable percentage of total sales. Reported sales patterns by major lighting equipment category are shown in Table 18.

**Table 18. Reported distribution of lighting equipment sales.**

| Linear Fluorescent (%) | | High Intensity Discharge (%) | | Other (%) | |
|---|---|---|---|---|---|
| T12 | 8% | Mercury Vapor | 7% | Incandescent | 13% |
| T8 | 74% | High Pressure Sodium | 13% | Halogen | 37% |
| "Enhanced" T8 | 10% | Metal Halide | 21% | Screw-in CFL | 11% |
| T5 (incl. High Bay) | 8% | Pulse Start MH | 59% | Hardwired CFL | 40% |
| **Total** | **100%** | **Total** | **100%** | **Total** | **100%** |

### 2.3.4 Incremental Energy and Demand Savings Potential

Appendix D contains a listing of the estimated incremental energy and demand savings potential for specific lighting fixture retrofits or upgrades for both retrofit and new construction measures. Across the entire non-residential market sector, the estimated gross average energy and coincident peak demand savings potential from high efficiency lighting equipment are 1.8 kWh/sqft-yr and 0.3 W/sqft respectively.

### 2.3.5 Estimates of Incremental Customer Costs

Appendix D contains a listing of the estimated incremental customer costs for specific lighting fixture retrofits or upgrades. Across the entire non-residential market sector, the estimated average gross incremental customer cost is $0.82/sqft.

Nexant completed a review of similar DSM programs targeting premium efficiency motors, HVAC equipment, and lighting equipment to characterize successful program traits implemented by other utilities. These programs were reviewed in greater detail to assess program implementation details including:

- Program participation and application requirements;
- Eligible project types;
- The incentive delivery mechanism;
- The extent of any supporting Trade Ally infrastructure, and;
- How program savings are determined.

Results of this benchmarking effort are described below.

## 3.1 MOTOR DSM PROGRAMS

Six premium efficiency electric motor incentive programs were investigated in detail. The programs reviewed included:

- *Industrial Efficiency Incentive Program.* Idaho Power's energy efficiency program available to commercial and industrial customers in Idaho Power's service territory. Incentives are available for retrofit applications if authorized prior to installation. Incentives are reserved for one calendar year.
- *Idaho Premium Efficiency Motors Program.* Avista's energy efficiency program is available to commercial and industrial customers in their service territory who wish to install premium efficiency motors in new and retrofit applications. Incentives are only available if pre-authorized and are payable via customer check or utility bill credit.
- *Energy Conservation Loan Program.* Idaho's Department of Water Resources provides low-interest loans to install energy conservation measures with payback periods of less than 15 years. Eligible measures for non-residential users energy-efficient lighting, HVAC improvements, and retrofitting pumps and motors.
- *MotorUp.* A premium efficiency motor initiative directed by 20 electric utilities across 7 states and administered by a third party. Incentives are available for retrofit or new-construction and for installation or for stock.
- *Upstream Motors & Air Conditioning Program.* California's statewide prescriptive incentive program directed by the California Public Utilities Commission and administered by the four IOUs in the state. Incentives are available for retrofit projects and motors must be installed within the program year.
- *Nevada Sure Bet.* Sierra Pacific Resource's energy efficiency program available to customers of their two subsidiary IOUs in the state of Nevada. Incentives are available for retrofit or new-construction and motors must be installed within the program year.

The three programs in Idaho allow premium efficiency motors as qualifying measures. Idaho Power's Industrial Efficiency Incentive Program is a comprehensive program that pays incentives for motors based upon the lesser of project cost or energy savings. Avista's Idaho Premium Efficiency Motors Program provides prescriptive incentives for premium efficiency motors in new and retrofit applications through a pre-purchase incentive agreement. Incentives vary depending on whether the motor operates continuously. The Idaho Department of Water Resources offers loans for energy efficient upgrades where the energy cost savings exceeds 10% of the project cost. The loan application process is flexible, allowing the applicant to choose how to portray the technical feasibility of the project.

The three out of state programs shared some common traits, including:

- Qualifying motors are 1 – 200 horsepower NEMA A & B, 3-phase, integral horsepower;
- Use of a stipulated 75% motor load factor for savings calculations;
- A post-purchase customer application process requiring the following:
  - Customer information (name, address, building type, utility account number, etc.);
  - Equipment information (make, model, size, efficiency, date of purchase, etc.);
  - Dealer information;
  - Customer information, and;
  - Detailed equipment invoice.

Table 19 provides a summary of the incentive levels, eligible market sectors, incentive payment process, and trade ally support services for each of the programs.

## Table 19. Other utility motor incentive program design parameters.

| Program | Organization | Incentive Levels | Eligible Project Types | Application Procedure | Incentive Payment Process | Trade Ally Support |
|---|---|---|---|---|---|---|
| Idaho Premium Efficiency Motors Program | Avista Corporation | $10 - $660 per motor based on hp (continuous operation) $10-$390 per motor based upon hp (non-continuous operation) No dealer incentives | Retrofit and New Construction | Pre-notification required. | Customer Check or Credit against Utility bill | None |
| Industrial Efficiency Incentive Program | Idaho Power | Customer incentive is based on the lesser of energy savings, 50% of project cost, or the one year simple payback amount. | Retrofit | Pre-notification is required and rebates are reserved for one calendar year. | Customer Check | Program 800 number |
| Energy Conservation Loan Program | Idaho Department of Water Resources | $1,000-$100,000 loan at 4% interest rate | Retrofit and limited new construction measures | Pre-Approval is required | Loan | None |
| MotorUp | Various Utilities in seven North Eastern states | $45 - $700 per motor based on hp and type Dealer incentives of $25/application were discontinued for 2003 | Retrofit and New Construction | The application may be submitted after the equipment is installed. Pre-approval from the individual utilities may be required. | Customer Check | Monthly Newsletter, Marketing, Marketing Materials, MotorMaster, Motor Management Training |
| Upstream Motors & Air Conditioning Program | PG&E, SoCal Edison, SoCal Gas, SDG&E | *Dealer Incentives* $25 - $880 per motor based on hp *Customer Incentives* $10 - $380 per motor based on hp | Retrofit | Application is submitted by distributor online with invoice. Customer may submit for incentive online. | Distributor & Customer Checks | Distributor-based program where participating vendors sign agreement, online equipment database, and electronic submittal process. Distributors are the key market players. Account representatives and general office personnel support the informational needs of the vendor public |
| Nevada Sure Bet | Nevada Power Company & Sierra Pacific Power Company | $10 - $350 per motor based on hp No dealer incentives | Retrofit and New Construction | Pre-notification required for prescriptive programs over $10,000 and custom projects over $7500 in incentives. | Customer Check [1] | Program 800 number and quarterly seminars |

[1] Customers can elect to have the incentive sent to a third party as designated on the application form.

In general, program savings for the programs listed in Table 19 were calculated rather than measured. The calculated approaches to program savings are as follows:

- *Idaho Premium Efficiency Motors Program.* Avista's program calculates savings for each motor in the program. The program calculations stipulate an EPAct baseline motor efficiency, a NEMA Premium efficiency replacement motor, a stipulated motor load factor, and stipulated annual run-hours depending whether the motor operates continuously or non-continuously.
- *MotorUp:* The MotorUp program calculates savings for each motor in the program. The program calculations stipulate an EPAct baseline motor efficiency, a NEMA Premium efficiency replacement motor, a fixed 75% motor load factor, and a variable annual run-hours as reported on the incentive application (program has a 2,000 hour minimum).
- *Upstream Motors & Air Conditioning Program and Nevada Sure Bet:* Both program's designs utilized the same methodology for calculating program savings. As with MotorUp, savings are calculated for each motor in the program. The calculations assume a baseline motor efficiency as follows:
  - < 20 hp: Baseline is assumed to be EPAct efficiency, and;
  - ≥ 20hp: Baseline is assumed to be EPAct efficiency less 2.0% (assumed to be rewound).

  The baseline motor efficiency is stipulated as NEMA Premium standards, motor load is stipulated at 75%, and annual run hours are fixed at 4,700. In addition, program demand savings are calculated using a coincident diversity factor of 74%.

## 3.2 HVAC DSM PROGRAMS

Idaho has three programs that provide incentives for HVAC related upgrades:

- *Industrial Efficiency Incentive Program.* Idaho Power's energy efficiency program available to commercial and industrial customers in Idaho Power's service territory. Incentives are available for retrofit and new construction applications if authorized prior to installation. Incentives are reserved for one calendar year.
- *Washington & Idaho Energy Efficiency Incentives.* Avista's energy efficiency program available its commercial and industrial customers. Incentives are available for retrofit and new construction applications if authorized prior to installation. Incentives are capped at 50% of the project cost.
- *Air Care Plus Program.* Avista pays for diagnosing and tuning existing commercial rooftop HVAC systems up to 15 tons in size. The program covers the cost of the service, but there are no incentives for capital improvements or replacement with new equipment.

Four additional out of state high efficiency HVAC incentive programs were investigated in detail. The programs reviewed included:

- *Upstream Motors & Air Conditioning Program / Express Efficiency.* California's statewide prescriptive incentive program directed by the California Public Utilities Commission and administered by the four IOUs in the state. In 2004 split and packaged air conditioning equipment were pulled from the Express Efficiency Program and directed through the 2004 Upstream Motors & Air Conditioning Program. Incentives for package terminal air conditioners and heat pumps can be accessed through the Express Efficiency Program.
- *Nevada Sure Bet.* Sierra Pacific Resource's energy efficiency program available to customers of their two subsidiary IOUs in the state of Nevada.
- *Cool Choice.* The commercial HVAC energy efficiency initiative developed by the Northeast Energy Efficiency Partnership (NEEP) and administered across thirteen utility service territories in Massachusetts, New Jersey, Rhode Island, and Vermont.
- *$mart Equipment Choices.* Commercial HVAC incentive program offered by the New York State Energy Research and Development Authority (NYSERDA).

These four programs shared some common traits, including:

- Use of the Consortium for Energy Efficiency's (CEE) Tier 2 standards as minimum equipment efficiency requirements;
- A post-purchase customer application process requiring the following:
  - Customer information (name, address, building type, utility account number, etc.);
  - Equipment information (make, model, size, efficiency, serial number, etc.);
  - Dealer information;
  - Customer information, and;
  - Equipment invoice.
- No equipment sizing requirements, and;
- No dealer or distributor incentives.

Determination of estimated savings impacts for each of the programs were very similar as well, relying on calculated rather than measured values. Demand savings were estimated using the difference in nameplate efficiencies between the installed unit and the minimum efficiency allowed by local code. Estimates of annual energy savings were calculated by multiplying the estimated demand savings by the assumed equivalent full load cooling hours. The Cool Choice program applied a de-rating factor of 0.9 to the energy savings calculation. The effects of various building types and part-load equipment efficiencies were not directly addressed by any program when estimating savings impacts. Adjustments for peak coincident use, transmission line losses, and the effects of free-ridership were typically applied to propagate calculated savings at the customer meter back to the generating plant.

Finally, Table 20 and Table 21 provide a summary of the incentive levels, eligible project types, incentive payment process, and trade ally support services for each of the programs.

**Table 20. HVAC DSM program incentive levels.[1]**

| Equipment Type and Size | Express Efficiency/Upstream HVAC Program[2] | | Nevada Sure Bet | Cool Choice | $mart Equipment Choices[3] |
|---|---|---|---|---|---|
| PTAC & PTHP | *Customer* | *Dealer* | | | |
| 7,000 Btu/hr or less | $100/unit | -- | N/A | N/A | $45/ton |
| > 7,000 to 9,500 | $100/unit | -- | N/A | N/A | $45/ton |
| > 9,500 to 15,000 | $100/unit | -- | N/A | N/A | $45/ton |
| > 15,000 | $100/unit | -- | N/A | N/A | $45/ton |
| Air Source AC & HP | | | | | |
| ≤ 65,000 | $80-140[4]/unit | $205-541[5]/unit | $25/ton + ($\eta_{new} - \eta_{base}$) * | $92/ton | $40/ton |
| > 65,000 to 135,000 | $75.00/unit | $79.00/unit | $30/ton | $73/ton | $40/ton |
| > 135,000 to 240,000 | $75.00/unit | $79.00/unit | $40/ton + ($\eta_{new} - \eta_{base}$) * | $79/ton | $40/ton |
| > 240,000 | $75.00/unit | $79.00/unit | $30/ton | $79/ton | N/A |
| Water Source AC & HP | | | $40/ton + ($\eta_{new} - \eta_{base}$) * | | |
| ≤ 65,000 | N/A | N/A | $30/ton | $81/ton | $140/ton |
| > 65,000 to 135,000 | N/A | N/A | $40/ton + ($\eta_{new} - \eta_{base}$) * | $81/ton | $127/ton |
| > 135,000 to 240,000 | $113/unit | $79/unit | $30/ton | $81/ton | $96/ton |
| > 240,000 | N/A | N/A | | $81/ton | N/A |
| | | | $25/ton + ($\eta_{new} - \eta_{base}$) * $80/ton | | |
| | | | $25/ton + ($\eta_{new} - \eta_{base}$) * $80/ton | | |
| | | | $25/ton + ($\eta_{new} - \eta_{base}$) * $80/ton | | |
| | | | $25/ton + ($\eta_{new} - \eta_{base}$) * $80/ton | | |

1 Unless otherwise noted, minimum efficiency requirements are consistent with CEE's Tier 2 levels.

2 Minimum PTAC and PTHP EER values are given by: 10.0 – (0.16 X Capacity in Btu/hr)/1000. Minimum capacity of 7,000 Btu/hr and maximum capacity of 15,000 Btu/hr to calculate minimum efficiency.

3 Minimum PTAC and PTHP EER values are as follows: 7,000 Btu/hr and less – 11.7 EER/3.3 COP; 7,000 to 9,500 – 11.3 EER/3.2 COP; 9,500 to 15,000 – 10.7 EER/3.1 COP; 15,000 and more – 9.6 EER/3.0 COP

4 Incentive varies by SEER and EER level.

5 Incentive varies depending on whether the equipment is split or packaged and efficiency level.

## Table 21. HVAC incentive program design parameters.

| Program | Organization | Eligible Project Types | Application Procedure | Payment Process | Trade Ally Services |
|---|---|---|---|---|---|
| Industrial Efficiency Incentive Program | Idaho Power | Customer incentive is based on the lesser of energy savings, 50% of project cost, or the one year simple payback amount. | Retrofit and New Construction. | Customer Check | None |
| Washington & Idaho Energy Efficiency Incentives | Avista Corporation | $0.04-$0.08 per annual kWh or 50% of total project cost | Retrofit and New Construction. | Customer Check | None |
| Express Efficiency | PG&E, SoCal Edison, SoCal Gas, SDG&E | Retrofit [1] | Rebates are reserved prior to equipment installation. The application is submitted after installation. | Customer Check [2] | Vendor guidelines and agreement Online equipment database |
| Upstream Motors & Air Conditioning Program | PG&E, SoCal Edison, SoCal Gas, SDG&E | *Dealer Incentives* Per unit incentive (see Table 20) *Customer Incentives* Per unit incentive (see Table 20) | Application is submitted by distributor online with invoice. Customer may submit for incentive online. | Distributor & Customer Checks | Vendor guidelines and agreement Online equipment database |
| Nevada Sure Bet | Nevada Power Company & Sierra Pacific Power Company | Retrofit and New Construction | Pre-notification required for prescriptive projects over $10,000 and custom projects over $7500 in incentives. | Customer Check [2] | Quarterly vendor seminars Online vendor listing |
| Cool Choice | Various Utilities in five North Eastern states | Retrofit and New Construction | Pre-notification required for projects over $5000 in incentives. | Customer Check or Bill Credit [2] | Online vendor listing |
| $mart Equipment Choices | NYSERDA | Retrofit [1] | The application is submitted after installation. | Customer Check | None [3] |

[1] Incentives for new construction projects are addressed by a separate DSM program offering.

[2] Customers can elect to have the incentive sent to a third party as designated on the application form.

[3] Several HVAC distributor and contractor services, including education and training, are provided through another program offering.

## 3.3 LIGHTING EQUIPMENT INCENTIVE PROGRAMS

Countless lighting equipment incentive programs exist around the country, which reflects both the potential for available savings in lighting equipment and the proven and reliable nature of high efficiency lighting technologies. Four high efficiency lighting equipment incentive programs were investigated in detail. The programs reviewed included:

- *Idaho Prescriptive Lighting Program.* Avista's prescriptive lighting program for commercial and industrial customers in their Idaho service territory. Incentives are available when pre-authorized for a prescribed amount that varies between $5 and $20 per fixture. Incentives can be paid via a check to the customer or a credit against the utility bill.
- *Express Efficiency.* California's statewide prescriptive incentive program directed by the California Public Utilities Commission and administered by the four IOUs in the state.
- *Nevada Sure Bet.* Sierra Pacific Resource's energy efficiency program available to customers of their two subsidiary IOUs in the state of Nevada.
- *Custom Efficiency.* Xcel Energy's C&I DSM program offering within their Colorado service territory.

All four programs shared some common traits, including:

- Use of the Energy Policy Act of 1992 standards for fluorescent lamps and National Appliance Energy Conservation Act standards of 1990 for ballasts in establishing equipment baselines;
- A post-purchase customer application process requiring the following:
  - Customer information (name, address, building type, utility account number, etc.);
  - Equipment information (fixture types and counts);
  - Customer signature, and;
  - Equipment invoice (except Custom Efficiency).
- No dealer or distributor incentives.

Determination of estimated savings impacts for each of the programs were very similar as well, relying on calculated rather than measured values. Demand savings were estimated using the difference in estimated fixture wattages. Estimates of annual energy savings were calculated by multiplying the estimated demand savings by estimated annual operation hours, varying by space type. Adjustments for peak coincident demand savings, transmission line losses, and the effects of free-ridership were typically applied to propagate calculated savings at the customer meter back to the generating plant.

Incentive levels for the Express Efficiency and Nevada Sure Bet Programs vary on a $/fixture basis. Nevada Sure Bet and the Idaho Prescriptive Lighting Program incentive levels are shown

in Table 22. Custom Efficiency incentives are paid on a $/kW saved basis and vary due to the nature of the program, but average approximately $0.07 per kWh/yr saved.

**Table 22. Nevada Sure Bet and Idaho Prescriptive Lighting Program lighting incentive levels.**

| Equipment Type | Idaho Pres. Lighting Program Incentive/Unit | Sure Bet Incentive/Unit |
|---|---|---|
| *Replace/Upgrade T-12 MB fixtures with T8/T5 electronic ballast (per lamp)* | | |
| ***4-Foot Fixtures*** | | |
| 4-lamp to 4-lamp | $10.00 | $15.00 |
| 4-lamp to 3-lamp | $12.00 | $16.50 |
| 4-lamp to 2-lamp | $15.00 | $18.00 |
| ***3-Foot Fixtures*** | | |
| 3-lamp to 3-lamp | $10.00 | $8.25 |
| 3-lamp to 2-lamp | $12.00 | $9.25 |
| ***2-Foot Fixtures*** | | |
| 2-lamp to 2-lamp | $5.00 | $4.00 |
| ***8-Foot Fixtures*** | | |
| 4-lamp | $20.00 | $30.00 |
| 2-lamp | $15.00 | $15.00 |
| ***Compact Fluorescent*** | | |
| *Screw-in CFLs* | | |
| 5-13 watts | $5.00 | $1.50 |
| 14-26 watts | $5.00 | $2.00 |
| >= 27 watts | $5.00 | $2.25 |
| *Hardwired CFLs* | | |
| 5-13 watts | $5.00 | $9.00 |
| 14-26 watts | $5.00 | $11.00 |
| 27-65 watts | $5.00 | $12.00 |
| 66-90 watts | $5.00 | $18.00 |
| > 90 watts | $5.00 | $22.00 |
| ***Exit Signs*** | | |
| Incandescent Sign to new LED Exit Sign | $20.00 | $12.50 |
| ***Occupancy Sensors (per sensor)*** | | |
| Wall Box | not specified | $8.00 |

# Section 4 Recommendations

Based on the current FinAnswer Express program design, Nexant recommends three minor modifications before introducing the program within PacifiCorp's Idaho service territory.

1. To test the market acceptance and savings potential, Nexant recommends that prescriptive incentives for VFDs installed on HVAC system fans and chilled water pumps $\leq$ 100 hp be added to the program. For this new measure type, an incentive level of $80/hp is recommended.

2. Incentives for red LED traffic signals be discontinued in recognition that this measure has been accepted as current practice in the marketplace.

3. Minimum efficiency requirements for packaged and split-system unitary equipment <65,000 Btu/h be increased to 15 SEER/12.5 EER to reflect the upcoming change in federal minimum efficiency standards.

4. The 25,000 CFM size limitation on evaporative equipment be removed.

Below are preliminary estimates of the incremental incentive costs and savings that could be realized if the FinAnswer Express Program is implemented in Idaho.

## 5.1 PREMIUM EFFICIENCY MOTORS

Table 23 shows the estimated program impacts for premium efficiency motors for the first two years of the program. Estimated impacts are based on the estimates in Section 2 tempered with results from the 2004 FinAnswer Express Program. The savings reflect a 3% annual shift in sales volume from EPAct motors to NEMA Premium Efficiency motors and recommended incentives in the first year and a 5 % increase in the second. Assumptions regarding the energy and demand calculations are discussed in Section 2.1.4.

**Table 23. Estimated increased net motor costs and savings impacts in Idaho.** [1]

| Year | Program Participation | Incentives | Net Customer Incremental Costs [2] | Net Annual Energy Savings (kWh) [3] | Net Peak Demand Savings (kW) [4] |
|---|---|---|---|---|---|
| Year 1 | 15 motors | $1,632 | $998 | 5,023 | 1 |
| Year 2 | 24 motors | $2,601 | $14,537 | 7,904 | 2 |

[1] Estimates are for a full year program period.

[2] Customer costs represent the net values inclusive of free-ridership estimates, but do not include the impacts of available incentives.

[3] Energy savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005).

[4] Demand savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005), and a coincident demand factor of 0.74 (PG&E 2001).

## 5.2 HIGH EFFICIENCY LIGHT COMMERCIAL HVAC EQUIPMENT

Table 24 shows the estimated program impacts for light commercial HVAC equipment for Years 1 and 2 in PacifiCorp's Idaho service territory. Table 25 lists some of the key assumptions used in developing these savings estimates, while individual equipment savings estimates were taken from Section 2.2.4.

**Table 24. Estimated increased net HVAC costs and savings impacts in Idaho.[1]**

| Year | Increased High-Efficiency Sales | Incentives | Net Customer Incremental Costs[2] | Net Annual Energy Savings (kWh)[3] | Net Peak Demand Savings (kW)[4] |
|---|---|---|---|---|---|
| ***Unitary*** | | | | | |
| Year 1 | 34 tons | $ 1,700 | $ 3,264 | 979 | 2 |
| Year 2 | 69 tons | $ 3,450 | $ 6,624 | 1,987 | 5 |
| ***Evaporative*** | | | | | |
| Year 1 | 14,678 CFM | $ 294 | $ (3,680) | 1,127 | 6 |
| Year 2 | 30,237 CFM | $ 605 | $ (7,581) | 2,322 | 12 |
| ***VFDs*** | | | | | |
| Year 1 | 160 hp | $12,800 | $31,027 | 115,680 | 0 |
| Year 2 | 240 hp | $19,200 | $46,541 | 173,520 | 0 |
| ***Total*** | | | | | |
| Year 1 | -- | $ 14,794 | $ 30,611 | 117,786 | 8 |
| Year 2 | -- | $ 23,255 | $ 45,584 | 177,829 | 17 |

[1] Estimates are for a full year program period.

[2] Customer costs represent the net values inclusive of free-ridership estimates, but do not include the impacts of available incentives.

[3] Energy savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005).

[4] Demand savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005), and a coincident demand factor of 0.87 (PG&E 2001).

**Table 25. HVAC equipment evaluation parameters.**

| Parameter | Unitary | Evaporative |
|---|---|---|
| Customer Incentive | $50/ton | $ 0.02/CFM |
| Customer Incremental Cost | $100/ton | $ (0.26)/CFM |
| Peak Coincident Use Factor | 0.87 | 0.87 |
| Net-to-Gross Savings Ratio | 0.96 | 0.96 |

## 5.3 LIGHTING EQUIPMENT

Table 26 shows the estimated program impacts for high efficiency lighting for Years 1 and 2. Estimated impacts are based on Idaho electrical sales and FinAnswer Express lighting project trends for PacifiCorp's Utah and Washington territory for 2001-2004.

**Table 26. Estimated increased net lighting costs and savings impacts in Idaho.[1]**

| Year | Increased High Efficiency Sales ($1000's) | Incentives | Net Customer Incremental Costs[2] | Net Annual Energy Savings (kWh)[3] | Net Peak Demand Savings (kW)[4] |
|---|---|---|---|---|---|
| Year 1 | $ 457 | $ 28,314 | $93,952 | 210,185 | 38 |
| Year 2 | $ 1,985 | $ 56,441 | $187,287 | 418,987 | 76 |

[1] Estimates are for a full year program period.

[2] Customer costs represent the net values inclusive of free-ridership estimates, but do not include the impacts of available incentives.

[3] Energy savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005).

[4] Demand savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.96 (Express Efficiency Program Offering, DEER 2005), and a coincident demand factor of 0.70 (PG&E 2001).

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# Section 7 Appendices

Presented in the following four appendices is information and supplemental materials supporting this report. Specifically:

- *Appendix A – Motor Survey Results.* Summarizes the survey results from motor professionals.
- *Appendix B – HVAC Survey Results.* Summarizes the survey results from HVAC professionals.
- *Appendix C – Lighting Survey Results.* Summarizes the survey results from lighting professionals.
- *Appendix D – Lighting Equipment Costs and Savings.* Identifies the estimated savings, customer costs, and recommended incentive levels for prescriptive lighting equipment retrofits and upgrades.
- *Appendix E – PTAC/PTHP Equipment.* Presents updated savings and customer cost data associated with a revised minimum efficiency requirement for PTAC and PTHP equipment.

# Appendix A – Motor Survey Results

Listed below are the aggregated responses to the survey conducted for electric motors.

1. Company type (choose all that apply).

   Percent of Respondents Reporting Role (multiple roles)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **67%** | **Manufacturer Rep.** | **33%** | **Distributor** | **44%** | **Repair/Service** | **0%** | **Other** |
| 17% | Independent | 100% | Independent | | | | |
| 83% | Mfr Employed | 0% | Mfr owned | | | | |

2. Approximately what percent of your business is derived strictly from motor sales?

   Average: 54%  Range: 8% to 100%

3. What is your service territory within Idaho?  89% Statewide; 11% Central Idaho

4. What motor manufacturers/brands do you represent?

Percent of respondents carrying manufacturers/brands:

| | |
|---|---|
| Leeson: | **56%** |
| Baldor: | **44%** |
| WEG: | **33%** |
| General Electric: | **33%** |
| Reliance: | **33%** |
| Siemens: | **22%** |
| Lincoln: | **22%** |
| US Motors: | **22%** |
| AO Smith: | **22%** |
| Brooks / Compton: | **11%** |
| Lafert: | **11%** |
| Emerson: | **11%** |
| Fasco: | **11%** |

5. Please list any analysis or software tools you use as part of the sales process to estimate operating costs (energy, O&M) or potential savings associated with premium efficiency motor.

Percent of respondents reporting use of tools: (3 of 9 respondents did not reply)

| | |
|---|---|
| Payback Analysis Charts: | **22%** |
| Baldor Save Plus: | **11%** |
| Motor Master: | **11%** |
| Other / Various: | **22%** |
| None: | **11%** |

6. Do you identify opportunities and calculate energy savings for VFD retrofits.

   Percent of respondents reporting: **Yes 56%** **No: 44%**

7. Do you offer services to identify opportunities for motor right-sizing? Is so, please explain.

   Percent of respondents reporting: **Yes 78%** **No: 22%**

   Altitude, temperature, SF, HP, PF, Torque, and efficiency are considered

8. Do you have the capability to take 3-phase power measurements of existing motors.

   Percent of respondents reporting: **Yes 78%** **No: 22%**

9. Please summarize your annual sales volume of motors (if possible, motors used in commercial applications).

| Size Category | Average % of units that meet or exceed NEMA PE Standard |
|---|---|
| 1 - 5 hp | **16%** |
| 6 - 20 hp | **16%** |
| 21 – 50 hp | **23%** |
| 51 – 100 hp | **23%** |
| 101 – 200 hp | **22%** |

10. Please characterize the driving factors for premium efficiency motor sales.

| Reason for Equipment Sale | Average Percentage |
|---|---|
| Equipment Failure | 57.2 % |
| Planned Replacement | 15.4 % |
| New Construction | 21.4 % |
| Other | 6.0 % |
| **Total** | **100%** |

11. Please identify the key decision maker in premium efficiency motor purchases.

| Key Decision Maker | Percentage |
|---|---|
| Building Owner | 57.7 % |
| A&E Firm | 28.2 % |
| Contractor | 10.2 % |
| Other | 3.8 % |
| **Total** | **100%** |

12. In your opinion, what are the key decision making criteria most customers employ to select their new motor?

Percent of respondents reporting: (1 of 9 respondents did not reply)

| | |
|---|---|
| Price: | **89%** |
| Manufacturer / Brand: | **33%** |
| Quality / Reliability: | **33%** |
| Time /Availability: | **22%** |
| Specifications: | **11%** |
| Service: | **11%** |

13. Please summarize the typical stocking practice for premium efficiency motors.

| Size Category | Average Percentage Sold from Local Inventory (%) | Percentage Sold from Manufacturer Inventory (%) |
|---|---|---|
| 1 - 5 hp | 23% | 77% |
| 6 - 20 hp | 22% | 78% |
| 21 – 50 hp | 22% | 78% |
| 51 – 100 hp | 20% | 80% |
| 101 – 200 hp | 14% | 86% |

14. Please characterize the typical sales patterns for premium efficiency motors.

(Response not summarized)

| Date of Sale | Equipment Failure (%) | Planned Replacement (%) | New Construction (%) | Other (%) |
|---|---|---|---|---|
| 1st Quarter (Jan-Mar)<br>2nd Quarter (Apr-Jun)<br>3rd Quarter (Jul-Sep)<br>4th Quarter (Oct-Dec) | | | | |
| Total | 100% | 100% | 100% | 100% |

15. Please rank the following market barriers to increased sales of premium efficiency motors from 1 to 11 (1 equals largest barrier, 11 equals smallest barrier).

| Average Rank Score | Barrier |
|---|---|
| **1.8** | First Cost |
| **3.0** | Lack of Owner Familiarity with High Efficiency Equipment |
| **4.0** | Lack of A&E and Contractor Familiarity with High Efficiency Equipment |
| **4.3** | Status Quo |
| **6.8** | Service Problems |
| **3.2** | Low Incentives |
| **4.6** | Long Paybacks |
| **6.6** | Limited Equipment Options |
| Single citation given (rank=2) | Other reason given: "ability to quickly process incentive" |

16. Please rank the following resources in terms of ability to increase sales of premium efficiency motors from 1 to 10 (1 equals most valuable resource, 10 equals least valuable resource).

| Average Rank Score | Resource |
|---|---|
| 3.5 | Educational materials targeting end-use customers |
| 4.3 | Educational materials targeting contractors and other market players |
| 5.4 | Utility program marketing collateral |
| 4.5 | Utility-provided savings calculation tool |
| 4.2 | Streamlined application paperwork process |
| 4.4 | Prescriptive incentive levels for appropriate equipment types/sizes/efficiencies |
| 2.9 | Utility Incentives for the end-user |
| 4.2 | Utility Incentives for the Equipment dealer/manufacturer representative |
| Single citation given (rank =4) | Other (please specify) "joint marketing partnership w/ PacifiCorp" – (rank =4) |

17. If you feel utility incentives are a key component to increasing sales of high efficiency premium efficiency motor, please indicate the minimum level necessary to impart a noticeable change (i.e. 10 – 15% increase) in the market place.

| | |
|---|---|
| **3.0 yrs** | Average minimum simple payback for customer (range 1 to 5 years from 67% of respondents) |
| **36 %** | Average minimum percentage of incremental customer cost (10 % to 90 % as specified from 56% of respondents) |

18. In your opinion, are customers generally aware of the motor incentives offered by Utah Power? **100% of respondents answered No**

19. For customers who are **made*** aware of the Utah Power motor incentive program, why do some choose not to participate?

Percent of respondents reporting: (1 of 9 respondents did not reply)

| | | |
|---|---|---|
| Up front cost: | **44%** | |
| Lack of education / don't recognize benefits: | | **33%** |
| Not worth trouble / paperwork: | **22%** | |
| Time to Complete process: | **11%** | |

* see response to question 18: respondents assumed to have made customers aware of program

20. In your opinion, what could be done to increase the percentage of premium efficiency motors sold into the Utah Power market?

**Opinions Given:**

a. Educate owners regarding benefits, actual energy cost of operating motors and paybacks.
b. Enhance marketing of incentive program / involve the manufacturers
c. Provide direct rebates
d. Increase incentives
e. Streamline process
f. PP to form partnerships with full service companies to reach customers at decision point of motor replacement

# Appendix B – HVAC Equipment Survey Results

Listed below are the aggregated responses to the survey conducted on light commercial HVAC equipment.

1. Company type (multiple responses allowed)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | **Manufacturer Rep.** | 4 | **Distributor** | | **Repair/Service** | | **Other** |
| 1 | Independent | 3 | Independent | | | | |
| 2 | Mfr. employed | 1 | Mfr. owned | | | | |

2. Analysis or software tools used as part of the sales process to estimate operating costs (energy, O&M) or potential savings associated with commercial cooling equipment. (number of responses)

   3 Manufacturer software package/savings calculator
   2 Commercially available software package/savings calculator
   0 Custom made software package/savings calculator
   0 None

3. Reported annual sales volume of commercial cooling equipment.

| Size Category | Evaporative (# units) | Unitary (# units) | Unitary % of sales that exceed listed efficiency levels | |
|---|---|---|---|---|
| ≤ 65,000 Btu/h | 90 | 1,300 | 13 SEER | <5% |
| > 65,000 Btu/h & ≤ 135,000 Btu/h | 100 | 550 | 11.0 EER & 11.4 IPLV | <5% |
| > 135,000 Btu/h & ≤ 240,000 Btu/h | 20 | 265 | 10.8 EER & 11.2 IPLV | <5% |
| > 240,000 Btu/h | 90 | 310 | 10.0 EER & 10.4 IPLV | <5% |

4. Driving factors for commercial cooling equipment sales.

| Reason for Equipment Sale | Sales Percentage |
|---|---|
| Equipment Failure | *25* |
| Planned Replacement | *18* |
| New Construction | *57* |
| Other | *0* |
| Total | 100% |

5. Key decision maker in commercial cooling equipment purchases.

| Key Decision Maker | Sales Percentage |
|---|---|
| Building Owner | *17* |
| A&E Firm | *14* |
| Contractor | *69* |
| Other | *0* |
| Total | 100% |

6. Key decision making criteria when purchasing new commercial cooling equipment. (number of responses)

*4* Contractor price

*2* Value for building owner

*2* Durability

*1* EER

7. Typical stocking practice for commercial cooling equipment.

| Size Category | Percentage Sold from Local Inventory (%) | Percentage Sold from Manufacturer Inventory (%) |
|---|---|---|
| ≤ 65,000 Btu/h | *9* | *91* |
| > 65,000 Btu/h & ≤ 135,000 Btu/h | *15* | *85* |
| > 135,000 Btu/h & ≤ 240,000 Btu/h | *9* | *91* |
| > 240,000 Btu/h | *21* | *79* |

8. Typical sales patterns for commercial cooling equipment.

| Date of Sale | Equipment Failure (%) | Planned Replacement (%) | New Construction (%) | Other (%) |
|---|---|---|---|---|
| 1st Quarter (Jan-Mar) | *13* | *20* | *19* | |
| 2nd Quarter (Apr-Jun) | *33* | *40* | *31* | |
| 3rd Quarter (Jul-Sep) | *44* | *10* | *26* | |
| 4th Quarter (Oct-Dec) | *41* | *30* | *24* | |
| Total | 100% | 100% | 100% | |

9. End-use customer incremental costs.

| Size Category | Minimum Efficiency Levels | Incremental Cost ($/ton) | % Premium vs. Standard Efficiency |
|---|---|---|---|
| ≤ 65,000 Btu/h | *13 SEER* | *$ 83* | *15%* |
| > 65,000 Btu/h & ≤ 135,000 Btu/h | *11.0 EER & 11.4 IPLV* | *$ 66* | *20%* |
| > 135,000 Btu/h & ≤ 240,000 Btu/h | *10.8 EER & 11.2 IPLV* | *$ 63* | *20%* |
| > 240,000 Btu/h | *10.0 EER & 10.4 IPLV* | *$ 50* | *20%* |

10. Market barriers to increased sales of high efficiency commercial cooling equipment from 1 to 11 (1 equals largest barrier, 11 equals smallest barrier).

| Median Rank | Barrier |
|---|---|
| 3.0 | First Cost |
| 4.2 | Lack of Owner Familiarity with High Efficiency Equipment |
| 5.2 | Lack of A&E and Contractor Familiarity with High Efficiency Equipment |
| 4.4 | Status Quo |
| 8.2 | Service Problems |
| 2.6 | Low Incentives |
| 2.8 | Long Paybacks |
| 3.2 | Limited Cooling Hours |
| 8.4 | Limited Equipment Options |

11. Please rank the following resources in terms of ability to increase sales of high efficiency commercial cooling equipment from 1 to 10 (1 equals most valuable resource, 10 equals least valuable resource).

| Median Rank | Resource |
|---|---|
| 6.0 | Educational materials targeting end-use customers |
| 6.0 | Educational materials targeting contractors and other market players |
| 4.8 | Utility program marketing collateral |
| 5.4 | Utility-provided savings calculation tool |
| 4.0 | Streamlined application paperwork process |
| 2.4 | Prescriptive incentive levels for appropriate equipment types/sizes/efficiencies |
| 2.2 | Utility Incentives |
| 5.2 | Equipment dealer/manufacturer representative incentives |

12. Minimum equipment incentive level necessary to impart a noticeable change in the sale of high efficiency cooling equipment (i.e. 10 – 15% increase) in the market place.

| | |
|---|---|
| 3.25 | Minimum simple payback for customer (yrs) |
| 40 | Minimum percentage of incremental customer cost (%) |

13. Are commercial customers generally aware of the cooling equipment incentives offered by PacifiCorp (number of responses)

| | |
|---|---|
| *0* | Yes |
| *4* | No |

14. What could be done to increase the percentage of high efficiency commercial cooling equipment sold in the market? (number of responses)

| | |
|---|---|
| *2* | Provide educational materials on the benefits of high efficiency cooling equipment |
| *4* | Provide utility incentives |
| *2* | Increased awareness of incentive program |
| *1* | Earlier and easier access to rebates |

# Appendix C – Lighting Equipment Survey Results

Listed below are the aggregated responses to the survey conducted on lighting equipment.

1. Company type (multiple responses allowed)

| | | | | | |
|---|---|---|---|---|---|
| 2 | Distributor | 3 | System Design | 0 | Other |
| 2 | Direct Sales | 9 | Contractor | | |

2. Please estimate the gross sales of commercial and industrial lighting projects your company was involved with in Idaho during the past 12 months.

| Project Type | Direct Sales ($) | System Design ($) | Installation ($) |
|---|---|---|---|
| Retrofit/Tenant Improvement | *1,515,000* | *18,555,000* | *2,520,000* |
| New Construction | *424,000* | *17,525,000* | *3,095,000* |
| Total | *1,939,000* | *36,080,000* | *5,615,000* |

3. Please characterize the driving factors for commercial and industrial lighting equipment sales. (sales weighted response)

| Reason for Equipment Sale | Percentage |
|---|---|
| Equipment Failure | *9%* |
| Planned System Upgrade | *19%* |
| Unsolicited Proposal | *30%* |
| Tenant Improvement (TI) | *14%* |
| New Construction | *27%* |
| Total | *100%* |

4. Please identify the key decision maker in lighting equipment purchases. (sales weighted response)

| Key Decision Maker | Percentage |
|---|---|
| Building Owner | *54%* |
| A&E Firm/Lighting Designer | *23%* |
| Contractor | *19%* |
| Maintenance | *4%* |
| Total | *100%* |

5. In your opinion, what are the key decision making criteria when purchasing new lighting equipment? (Top 6 responses in descending order)
   *First Cost*
   *Aesthetics*
   *Energy Savings*
   *Warranty/Quality*
   *Return on Investment*
   *Payback*

6. Please estimate the allocation of your lighting equipment sales across the following three general categories. (sales weighted response)

| Linear Fluorescent (%) | | High Intensity Discharge (%) | | Other (%) | |
|---|---|---|---|---|---|
| T12 | *8%* | Mercury Vapor | 7% | Incandescent | 13% |
| T8 | *74%* | High Pressure Sodium | 13% | Halogen | 37% |
| "Enhanced" T8 | *10%* | Metal Halide | 21% | Screw-in CFL | 11% |
| T5 (incl. High Bay) | *8%* | Pulse Start MH | 59% | Hardwired CFL | 40% |
| Total | *100%* | Total | *100%* | Total | *100%* |

7. Please list any analysis or software tools you use as part of the sales process to estimate potential O&M or energy cost savings associated with the installation of high efficiency lighting equipment.
   *70% use custom developed Microsoft Excel Spreadsheets*
   *12% do not use any software tools*
   *18% use a variety of commercially available software packages*

8. Please estimate what percentage of lighting projects are currently participating in one of Utah Power's efficiency programs and receiving incentives. (sales weighted response)

| Percent Participating in Current Utility Programs (%) | Project Type |
|---|---|
| *46%* | Retrofit/Tenant improvement |
| *10%* | New construction |

9. For projects that are *not* participating in one of Utah Power's current programs, please indicate why (check all that apply). (sales weighted response)

| | Reason for Not Participating |
|---|---|
| 1 | Unaware of utility incentive programs |
| 5 | Difficult application process |
| 3 | Limited availability of utility-eligible lighting technologies |
| 2 | Absence of incentives for lighting-only projects in new construction |
| 4 | Inadequate incentives |
| 6 | Fear of possible delay in project completion |
| 7 | Installation of ineligible equipment |
| 8 | Lack of capital _____ |

10. Please rank the following market barriers to increased sales of high efficiency lighting equipment from 1 to 10 (1 equals largest barrier, 10 equals smallest barrier). (sales weighted response)

| Rank | Barrier |
|---|---|
| 1 | First cost |
| 7 | Market uncertainty |
| 3 | Lack of owner familiarity with high efficiency equipment |
| 9 | Lack of A&E and contractor familiarity with high efficiency equipment |
| 4 | Status quo |
| 5 | Low utility incentives |
| 2 | Long paybacks |
| 6 | Limited savings opportunities |
| 8 | Aesthetics |

11. Please rank the following resources in terms of ability to increase sales of high efficiency lighting equipment from 1 to 11 (1 equals most valuable resource, 11 equals least valuable resource).

| Rank | Resource |
|---|---|
| *1* | Educational materials targeting end-use customers |
| *4* | Educational materials targeting designers, contractors and other market players |
| *5* | Utility incentive program marketing collateral (i.e. case studies, program brochures, etc.) |
| *10* | Utility-provided savings calculation tool |
| *8* | Technical seminars and training for lighting dealers and distributors |
| *7* | Additional utility and co-operative marketing efforts |
| *3* | Streamlined application process |
| *9* | Uniform incentive application process for retrofit and new construction projects |
| *2* | Customer incentives |
| *6* | Lighting equipment dealer/distributor incentives |

12. If you feel utility incentives are a key component to increasing sales of high efficiency lighting equipment, please indicate the minimum level necessary to impart a noticeable change in consumer behavior.

| | |
|---|---|
| *2.5* | Minimum simple payback for customer (yrs) |
| | and/or |
| *39%* | Minimum percentage of incremental customer cost (%) |

13. Which of the following two incentive mechanism do you prefer: 1) A program that provides prescriptive incentive levels for a fixed assortment of high efficiency equipment, supplemented with a custom track (where incentives are a function of the realized savings) for fixture types not identified, or 2) one that prescribes all fixture wattages and run hours and pays incentives on a $/kWh saved basis?
*1 – 25%*
*2 – 75%*

14. For the first incentive mechanism described above, please indicate which of the following abbreviated general incentive table formats you prefer:

a. *66%*

**Table 1 - Lighting Energy Efficiency Measures**

| Category | Replace | With | Lamp Installation Incentive | Delamping Incentive |
|---|---|---|---|---|
| Interior Fluorescent Fixture Upgrade to standard T8 lamps and electronic ballasts (EB) | Existing T12 lamp(s) | 4' T8 Lamp (s) | $ X/lamp | $ X/lamp |
| | | 8' T8 Lamp (s) | $ X/lamp | $ X/lamp |
| | | 8' T8/HO/VHO Lamp(s) | $ X/lamp | $ X/lamp |

*b.* *33%*

| Table 1 - Lighting Energy Efficiency Measures | | | Customer Incentive |
|---|---|---|---|
| *Category* | *Replace* | with | |
| Interior Fluorescent Fixture Upgrade to T8 lamps and electronic ballasts (EB) | 4'-1 or 2 T12 lamp(s) + 1 magnetic ballast (MB) | 4'-1 or 2 T8 lamps+1EB | $X |
| | 4'-3 or 4 T12 lamp(s) + MB(s) | 4'– 3 or 4 T8 lamps+1EB | $X |
| | 8'-1,2,3 or 4 T12 lamps + MB(s) | 8'– 1,2,3 or 4 T8 lamps +1EB | $X |
| | 8'-1,2,3 or 4 T12/HO lamps + MB(s) | 8'– 1,2,3, or 4 T8/HO lamps +EB (maximum of 2) | $X |
| Interior Fluorescent Delamping and Fixture Upgrade (Fixture removal is not eligible) | 4'-2 T12 lamps + 1 MB | 1-T8 lamp + 1EB | $X |
| | 4'-3 T12 lamps + 2 MB | 2 or 1-T8 lamp + 1EB | $X |
| | 4'-4 T12 lamps + 2 MB | 3-T8 lamps + 1EB | $X |
| | 4'-4 T12 + 2 MB | 2 or 1-T8 lamp + 1EB | $X |

15. Utah Power is considering offering additional incentives for Premium or Enhanced T8 fixtures. Following is a proposed definition of these fixtures. Please provide any comments on the applicability of this definition, or suggestions for alternative approaches.

    *Enhanced, or Premium, T8 fixtures are defined by an initial lamp+ballast efficacy of 95 lumens per watt or greater, where the initial efficacy is calculated as follows:*

    $$\text{Initial Fixture Efficacy} = \frac{\text{Initial Lamp Lumens} * \#\text{ Lamps} * \text{Ballast Factor}}{\text{Ballast Input Watts}}$$

    *56% - No response*
    *25% - Approved of proposed definition*
    *19% - Suggested a lumen/ballast factor based definition*

16. In your opinion, what could be done to increase the percentage of high efficiency lighting equipment sold into the Utah Power market? (Top 6 responses in descending order)
    *Customer and contractor educational efforts*
    *Increase available incentives*
    *Provide financing for projects*
    *Provide additional marketing materials*
    *Nothing – market and economy driven*
    *Offer contractor incentives*

17. Please estimate the *additional* gross sales that would participate in Utah Power's incentive program each year if all of your suggested program changes listed above were incorporated.

| Project Type | Direct Sales ($) | System Design ($) | Installation ($) |
|---|---|---|---|
| Retrofit/TI | 676,000 | 275,000 | 2,110,000 |
| New Construction | 402,000 | 3,425,000 | 530,000 |
| Total | 1,078,000 | 3,700,000 | 2,640,000 |

18. Please estimate the average purchase costs incurred by the end-use customer for the following general lighting equipment. (Insufficient response rate)

| Linear Fluorescent | | CFLs | | HID | |
|---|---|---|---|---|---|
| 4' T12 lamp ($/lamp) | | Hardwired 5-13W | | PSMH < 35W | |
| 8' T12 lamp ($/lamp) | | Hardwired 14-26W | | PSMH 36-70W | |
| 4' T8 lamp ($/lamp) | | Hardwired 27-65W | | PSMH 71-100W | |
| 8' T8 lamp ($/lamp) | | Hardwired 66-90W | | PSMH 101-175W | |
| 4' "Enhanced"T8 lamp ($/lamp) | | Hardwired ≥ 90W | | PSMH 176-250W | |
| 8' "Enhanced"T8 lamp ($/lamp) | | Ave Install Cost ($/fix) | | PSMH 251-400W | |
| 4' T5 HO lamp ($/lamp) | | | | HPS ≤100W | |
| T12 3 lamp EB ($/ballast) | | | | HPS 101-250W | |
| T12 4 lamp EB ($/ballast) | | | | HPS 251-400W | |
| T8 1 lamp EB ($/ballast) | | | | Ave Install ($/fix) | |
| T8 2 lamp EB ($/ballast) | | | | | |
| T8 1 lamp "Premium" EB ($/ballast) | | | | Bi-Level Control | |
| T8 2 lamp "Premium" EB ($/ballast) | | | | Tri-Level Control | |
| T5 1 lamp EB ($/ballast) | | | | | |
| T5 2 lamp EB ($/ballast) | | | | | |
| Average Installation Cost ($/fixture) | | | | | |

# Appendix D – Lighting Equipment Costs and Savings

Presented on the following pages is information summarizing the estimated operating hours, savings, and customer costs for a variety of lighting equipment retrofits and upgrades used to verify the top-down market assessment approach described in Section 2 of this report. Savings values represent the gross savings (i.e. no net-to-gross factor) at the customer meter. Deemed savings values prepared by the Regional Technical Forum (RTF 2005) served as the primary data source. Where RTF data was not available, deemed savings used in California energy efficiency programs were used (DEER 2005, PG&E 2005). Finally, some incremental cost data for new construction lighting measures was taken from PacifiCorp's current FinAnswer Express program data.

**Lighting annual operating hours by facility type (RTF 2005, DEER 2005).**

| Facility Type | Annual Operating Hours |
|---|---|
| Office | 3700 |
| School | 2500 |
| Retail | 3900 |
| Restaurant | 5000 |
| Lodging | 4300 |
| Hospital | 4500 |
| Other Health | 3700 |
| Food Store | 6500 |
| Warehouse | 3500 |
| Industrial | 5632 |
| 24 Hour | 8736 |

# Retrofit Lighting Measure Cost and Savings Data

| Category | Replace | With | Customer cost ($/unit) | Gross demand savings (kW/unit) | Gross energy savings (kWh/yr/unit) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Office | School | Retail | Restaurant | Lodging | Hospital | Other Health | Food Store | Warehouse | Industrial | 24-Hour | Traffic Signal |
| Fluorescent Fixture Upgrade to Standard T8 Fixtures [Standard T8 lamps and electronic ballasts (EB) with ballast factor (BF) ≤0.88] | 4'-1 or 2 T12 lamp(s) + 1 magnetic ballast (MB) | 4'- 1 or 2 T8 lamps+1EB | $32.45 | 0.010 | 37 | 25 | 39 | 50 | 43 | 45 | 37 | 65 | 35 | 56 | 87 | - |
| | 4'-3 or 4 T12 lamp(s) + MB(s) | 4' - 3 or 4 T8 lamps+1EB | $40.75 | 0.028 | 104 | 70 | 109 | 140 | 121 | 126 | 104 | 182 | 98 | 158 | 245 | - |
| | 8'-1,2,3 or 4 T12 lamps + MB(s) | 8' - 1,2,3 or 4 T8 lamps +1EB | $39.95 | 0.005 | 19 | 13 | 20 | 25 | 22 | 23 | 19 | 33 | 18 | 28 | 44 | - |
| | 8'-1,2,3 or 4 T12 HO/VHO lamps + MB(s) | 8' - 1,2,3, or 4 T8 HO/VHO lamps +EB (maximum of 2 EB) | $33.50 | 0.047 | 174 | 118 | 183 | 235 | 202 | 212 | 174 | 306 | 165 | 265 | 411 | - |
| Fluorescent Fixture Upgrade to 4' Premium T8 Fixtures [Lamps with initial lumens ≥3100 or wattage ≤30 W; electronic ballasts with BF ≤0.8] | 4' - 1 or 2 T12 lamp(s) + MB or standard T8 lamp(s) + EB | 4' - 1 or 2 Premium T8 lamp(s) + EB | $29.31 | 0.011 | 41 | 28 | 43 | 55 | 47 | 50 | 41 | 72 | 39 | 62 | 96 | - |
| | 4' - 3 or 4 T12 lamps + MB or standard T8 lamps + EB | 4' - 3 or 4 Premium T8 lamps + EB | $31.88 | 0.016 | 59 | 40 | 62 | 80 | 69 | 72 | 59 | 104 | 56 | 90 | 140 | - |
| | 8' - 1 or 2 T12 lamp(s) + energy efficient magnetic ballast (MB) | 4' – 2, 3 or 4 Premium T8 lamps + EB | $101.88 | 0.050 | 185 | 125 | 195 | 250 | 215 | 225 | 185 | 325 | 175 | 282 | 437 | - |
| Fluorescent Delamping and Standard T8 Fixture Upgrade [Standard T8 lamps and electronic ballasts (EB) with BF ≤0.88 - Fixture removal is not eligible] | 4'-2 T12 lamps + 1 MB | 4' - 1 Standard T8 lamp + 1EB | $30.25 | 0.037 | 137 | 92 | 144 | 185 | 159 | 166 | 137 | 240 | 129 | 208 | 322 | - |
| | 4'-3 T12 lamps + 2 MB | 4' - 2 or 1 Standard T8 lamp + 1EB | $34.64 | 0.046 | 171 | 116 | 181 | 232 | 199 | 209 | 171 | 301 | 162 | 261 | 405 | - |
| | 4'-4 T12 lamps + 2 MB | 4' - 2 or 1 Standard T8 lamp + 1EB | $34.64 | 0.081 | 300 | 203 | 316 | 406 | 349 | 365 | 300 | 527 | 284 | 457 | 709 | - |
| Fluorescent Delamping and Premium T8 Fixture Upgrade [Lamps with initial lumens ≥3100 or wattage ≤30 W; electronic ballasts with BF ≤0.8. Fixture removal is not eligible] | 4'-2 T12 lamps + 1 MB | 4' - 1-Premium T8 lamp + 1EB | $26.74 | 0.047 | 174 | 118 | 183 | 235 | 202 | 212 | 174 | 306 | 165 | 265 | 411 | - |
| | 4'-3 T12 lamps + 2 MB | 4' - 2 or 1-Premium T8 lamp + 1EB | $29.31 | 0.067 | 248 | 168 | 261 | 335 | 288 | 302 | 248 | 436 | 235 | 377 | 585 | - |
| | 4'-4 T12 lamps + 2 MB | 4' - 3-Premium T8 lamps + 1EB | $31.88 | 0.071 | 263 | 178 | 277 | 355 | 305 | 320 | 263 | 462 | 249 | 400 | 620 | - |
| | 4'-4 T12 lamps + 2 MB | 4' - 2 or 1-Premium T8 lamp + 1EB | $29.31 | 0.096 | 355 | 240 | 374 | 480 | 413 | 432 | 355 | 624 | 336 | 541 | 839 | - |
| Compact Fluorescent Lighting (CFL) | Incandescent | <10W (nominal) CFL hardwire fixture | $43.84 | 0.040 | 149 | 101 | 157 | 202 | 173 | 181 | 149 | 262 | 141 | 227 | 352 | - |
| | Incandescent | ³10W, < 20W (nominal) CFL hardwire fixture | $65.56 | 0.066 | 245 | 166 | 259 | 331 | 285 | 298 | 245 | 431 | 232 | 373 | 579 | - |
| | Incandescent | ³20W (nominal) CFL hardwire fixture | $65.56 | 0.066 | 245 | 166 | 259 | 331 | 285 | 298 | 245 | 431 | 232 | 373 | 579 | - |
| | Incandescent | <40W two-piece screw-in CFL | $7.28 | 0.069 | 255 | 173 | 269 | 345 | 297 | 311 | 255 | 449 | 242 | 389 | 603 | - |
| | Incandescent | Single-piece screw in CFL (all wattages) | $7.28 | 0.069 | 255 | 173 | 269 | 345 | 297 | 311 | 255 | 449 | 242 | 389 | 603 | - |

## Retrofit Lighting Measure Cost and Savings Data, Continued

| Category | Replace | With | Customer cost ($/unit) | Gross demand savings (kW/unit) | Gross energy savings (kWh/yr/unit) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Office | School | Retail | Restaurant | Lodging | Hospital | Other Health | Food Store | Warehouse | Industrial | 24-Hour | Traffic Signal |
| T5 Fluorescent Fixture Upgrade | 250 W MH, MV, or HPS | T5HO 3 lamp (nominal 4') with electronic ballast | $240.00 | 0.116 | 429 | 290 | 452 | 580 | 499 | 522 | 429 | 754 | 406 | 653 | 1,013 | - |
| | 400 W MH, MV, or HPS | High Bay T5HO 4 or 6 lamp (nominal 4') with electronic ballast | $250.00 | 0.201 | 742 | 502 | 783 | 1,003 | 863 | 903 | 742 | 1,304 | 702 | 1,130 | 1,753 | - |
| | 4'1,2, or 3 T12 lamps + magnetic ballast(s) | T5 interior fixtures – 1,2,or 3 T5 lamp (nominal 4') & 1EB | $160.00 | 0.051 | 189 | 128 | 199 | 255 | 219 | 230 | 189 | 332 | 179 | 287 | 446 | - |
| | 4' 4 T8 or T12 lamps + magnetic ballast(s) | T5 interior fixtures – 2 T5HO lamp (nominal 4') & 1EB | $160.00 | 0.027 | 100 | 68 | 105 | 135 | 116 | 122 | 100 | 176 | 94 | 152 | 236 | - |
| High Intensity Discharges (HID) Upgrades Based on lamp wattages | ≥ 40W and ≤120W incandescent or tungsten | ≥35W and ≤100 W Ceramic Metal Halide | $75.00 | 0.073 | 271 | 183 | 286 | 367 | 315 | 330 | 271 | 476 | 257 | 413 | 640 | - |
| | 400 W MH, MV, or HPS | ≥ 250W and ≤ 320 W Ceramic Metal Halide | $319.00 | 0.108 | 400 | 270 | 421 | 540 | 464 | 486 | 400 | 702 | 378 | 608 | 943 | - |
| | 750 W MH, MV, or HPS | 400W Ceramic Metal Halide | $319.00 | 0.420 | 1,554 | 1,050 | 1,638 | 2,100 | 1,806 | 1,890 | 1,554 | 2,730 | 1,470 | 2,365 | 3,669 | - |
| | >100W and ≤ 250W MH, MV, or HPS; ≤500W incandescent | >125W and ≤175W Pulse Start MH | $287.00 | 0.082 | 303 | 205 | 320 | 410 | 353 | 369 | 303 | 533 | 287 | 462 | 716 | - |
| | >250W and ≤ 400W MH, MV, or HPS | >175W and ≤320W Pulse Start MH | $287.00 | 0.167 | 618 | 418 | 651 | 835 | 718 | 752 | 618 | 1,086 | 585 | 941 | 1,459 | - |
| | > 400W MH, MV, or HPS | >320W and ≤400W Pulse Start MH | $287.00 | 0.093 | 344 | 233 | 363 | 465 | 400 | 419 | 344 | 605 | 326 | 524 | 812 | - |
| | ≥ 1000W MH, MV, or HPS | ≥750W Pulse Start Metal Halide | $287.00 | 0.262 | 969 | 655 | 1,022 | 1,310 | 1,127 | 1,179 | 969 | 1,703 | 917 | 1,476 | 2,289 | - |
| | ≥ 250 W & ≤ 400 W MH, MV, or HPS | 4' - 4 lamp High Bay T8 fixture | $137.49 | 0.139 | 514 | 348 | 542 | 695 | 598 | 626 | 514 | 904 | 487 | 783 | 1,214 | - |
| | ≥ 400 W MH, MV, or HPS | 4' - 6 lamp High Bay T8 fixture | $156.74 | 0.232 | 858 | 580 | 905 | 1,160 | 998 | 1,044 | 858 | 1,508 | 812 | 1,307 | 2,027 | - |
| | > 1000W MH, MV, or HPS | 4' - 8 lamp High Bay T8 fixture | $175.98 | 0.856 | 3,167 | 2,140 | 3,338 | 4,280 | 3,681 | 3,852 | 3,167 | 5,564 | 2,996 | 4,821 | 7,478 | - |
| Exit Signs | Incandescent or fluorescent exit signs | Light Emitting Diode (LED) or Electro luminescent (EL) Exit Sign – 1 or 2 faced | $41.00 | 0.042 | 157 | 106 | 166 | 212 | 183 | 191 | 157 | 276 | 149 | 239 | 371 | - |
| Lighting Controls | Wall switch or no control | Wall or Ceiling Mounted Occupancy Sensor (per sensor) | $141.00 | - | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | - |
| | No control | Photocell (per sensor) | $10.00 | - | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | - |
| | No control | Time clock (per control) | $100.00 | - | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | - |
| Traffic light upgrades | Incandescent | LED Green Ball | $225.00 | 0.123 | - | - | - | - | - | - | - | - | - | - | - | 494 |
| | Incandescent | LED Yellow and Green Ball | $450.00 | 0.123 | - | - | - | - | - | - | - | - | - | - | - | 269 |
| | Incandescent | LED Green Arrow (12" or 8") | $225.00 | 0.123 | - | - | - | - | - | - | - | - | - | - | - | 224 |
| | Incandescent | LED Don't Walk | $110.00 | 0.106 | - | - | - | - | - | - | - | - | - | - | - | 851 |
| | Incandescent | LED Cross Walk | $110.00 | 0.106 | - | - | - | - | - | - | - | - | - | - | - | 77 |

# New Construction Lighting Measure Cost and Savings Data

| Category | Replace | With | Customer cost ($/unit) | Gross demand savings (kW/unit) | Gross energy savings (kWh/yr/unit) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Office | School | Retail | Restaurant | Lodging | Hospital | Other Health | Food Store | Warehouse | Industrial | 24-Hour | Traffic Signal |
| Fluorescent Fixture Upgrade to Standard T8 Fixtures [Standard T8 lamps and electronic ballasts (EB) with ballast factor (BF) ≤0.88] | 4'-1 or 2 T12 lamp(s) + 1 magnetic ballast (MB) | 4'- 1 or 2 T8 lamps+1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 4'-3 or 4 T12 lamp(s) + MB(s) | 4' - 3 or 4 T8 lamps+1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 8'-1,2,3 or 4 T12 lamps + MB(s) | 8' - 1,2,3 or 4 T8 lamps +1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 8'-1,2,3 or 4 T12 HO/VHO lamps + MB(s) | 8' - 1,2,3, or 4 T8 HO/VHO lamps +EB (maximum of 2 EB) | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorescent Fixture Upgrade to 4' Premium T8 Fixtures [Lamps with initial lumens ≥3100 or wattage ≤30 W; electronic ballasts with BF ≤0.8] | 4' - 1 or 2 T12 lamp(s) + MB or standard T8 lamp(s) + EB | 4' - 1 or 2 Premium T8 lamp(s) + EB | $8.00 | 0.011 | 41 | 28 | 43 | 55 | 47 | 50 | 41 | 72 | 39 | 62 | 96 | - |
| | 4' - 3 or 4 T12 lamps + MB or standard T8 lamps + EB | 4' - 3 or 4 Premium T8 lamps + EB | $9.00 | 0.016 | 59 | 40 | 62 | 80 | 69 | 72 | 59 | 104 | 56 | 90 | 140 | - |
| | 8' - 1 or 2 T12 lamp(s) + energy efficient magnetic ballast (MB) | 4' – 2, 3 or 4 Premium T8 lamps + EB | $9.00 | 0.050 | 185 | 125 | 195 | 250 | 215 | 225 | 185 | 325 | 175 | 282 | 437 | - |
| Fluorescent Delamping and Standard T8 Fixture Upgrade [Standard T8 lamps and electronic ballasts (EB) with BF ≤0.88 - Fixture removal is not eligible] | 4'-2 T12 lamps + 1 MB | 4' - 1 Standard T8 lamp + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 4'-3 T12 lamps + 2 MB | 4' - 2 or 1 Standard T8 lamp + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 4'-4 T12 lamps + 2 MB | 4' - 2 or 1 Standard T8 lamp + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Fluorescent Delamping and Premium T8 Fixture Upgrade [Lamps with initial lumens ≥3100 or wattage ≤30 W; electronic ballasts with BF ≤0.8. Fixture removal is not eligible] | 4'-2 T12 lamps + 1 MB | 4' - 1-Premium T8 lamp + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 4'-3 T12 lamps + 2 MB | 4' - 2 or 1-Premium T8 lamp + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 4'-4 T12 lamps + 2 MB | 4' - 3-Premium T8 lamps + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | 4'-4 T12 lamps + 2 MB | 4' - 2 or 1-Premium T8 lamp + 1EB | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Compact Fluorescent Lighting (CFL) | Incandescent | <10W (nominal) CFL hardwire fixture | $20.00 | 0.040 | 149 | 101 | 157 | 202 | 173 | 181 | 149 | 262 | 141 | 227 | 352 | - |
| | Incandescent | ³10W, < 20W (nominal) CFL hardwire fixture | $25.00 | 0.066 | 245 | 166 | 259 | 331 | 285 | 298 | 245 | 431 | 232 | 373 | 579 | - |
| | Incandescent | ³20W (nominal) CFL hardwire fixture | $25.00 | 0.066 | 245 | 166 | 259 | 331 | 285 | 298 | 245 | 431 | 232 | 373 | 579 | - |
| | Incandescent | <40W two-piece screw-in CFL | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | Incandescent | Single-piece screw in CFL (all wattages) | | | - | - | - | - | - | - | - | - | - | - | - | - |

## New Construction Lighting Measure Cost and Savings Data, Continued

| Category | Replace | With | Customer cost ($/unit) | Gross demand savings (kW/unit) | Gross energy savings (kWh/yr/unit) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Office | School | Retail | Restaurant | Lodging | Hospital | Other Health | Food Store | Warehouse | Industrial | 24-Hour | Traffic Signal |
| T5 Fluorescent Fixture Upgrade | 250 W MH, MV, or HPS | T5HO 3 lamp (nominal 4') with electronic ballast | $50.00 | 0.116 | 429 | 290 | 452 | 580 | 499 | 522 | 429 | 754 | 406 | 653 | 1,013 | - |
| | 400 W MH, MV, or HPS | High Bay T5HO 4 or 6 lamp (nominal 4') with electronic ballast | $60.00 | 0.201 | 742 | 502 | 783 | 1,003 | 863 | 903 | 742 | 1,304 | 702 | 1,130 | 1,753 | - |
| | 4'1,2, or 3 T12 lamps + magnetic ballast(s) | T5 interior fixtures – 1,2,or 3 T5 lamp (nominal 4') & 1EB | $20.00 | 0.051 | 189 | 128 | 199 | 255 | 219 | 230 | 189 | 332 | 179 | 287 | 446 | - |
| | 4' 4 T8 or T12 lamps + magnetic ballast(s) | T5 interior fixtures – 2 T5HO lamp (nominal 4') & 1EB | $20.00 | 0.025 | 92 | 63 | 97 | 125 | 108 | 113 | 92 | 163 | 87 | 141 | 218 | - |
| High Intensity Discharges (HID) Upgrades Based on lamp wattages | ≥ 40W and ≤120W incandescent or tungsten | ≥35W and ≤100 W Ceramic Metal Halide | $75.00 | 0.073 | 271 | 183 | 286 | 367 | 315 | 330 | 271 | 476 | 257 | 413 | 640 | - |
| | 400 W MH, MV, or HPS | ≥ 250W and ≤ 320 W Ceramic Metal Halide | $128.00 | 0.108 | 400 | 270 | 421 | 540 | 464 | 486 | 400 | 702 | 378 | 608 | 943 | - |
| | 750 W MH, MV, or HPS | 400W Ceramic Metal Halide | $128.00 | 0.420 | 1,554 | 1,050 | 1,638 | 2,100 | 1,806 | 1,890 | 1,554 | 2,730 | 1,470 | 2,365 | 3,669 | - |
| | >100W and ≤ 250W MH, MV, or HPS; ≤500W incandescent | >125W and ≤175W Pulse Start MH | $30.00 | 0.087 | 322 | 218 | 339 | 435 | 374 | 392 | 322 | 566 | 305 | 490 | 760 | - |
| | >250W and ≤ 400W MH, MV, or HPS | >175W and ≤320W Pulse Start MH | $30.00 | 0.170 | 629 | 425 | 663 | 850 | 731 | 765 | 629 | 1,105 | 595 | 957 | 1,485 | - |
| | > 400W MH, MV, or HPS | >320W and ≤400W Pulse Start MH | $30.00 | 0.093 | 344 | 233 | 363 | 465 | 400 | 419 | 344 | 605 | 326 | 524 | 812 | - |
| | ≥ 1000W MH, MV, or HPS | ≥750W Pulse Start Metal Halide | $30.00 | 0.262 | 969 | 655 | 1,022 | 1,310 | 1,127 | 1,179 | 969 | 1,703 | 917 | 1,476 | 2,289 | - |
| | ≥ 250 W & ≤ 400 W MH, MV, or HPS | 4' - 4 lamp High Bay T8 fixture | $40.00 | 0.144 | 533 | 360 | 562 | 720 | 619 | 648 | 533 | 936 | 504 | 811 | 1,258 | - |
| | ≥ 400 W MH, MV, or HPS | 4' - 6 lamp High Bay T8 fixture | $50.00 | 0.232 | 858 | 580 | 905 | 1,160 | 998 | 1,044 | 858 | 1,508 | 812 | 1,307 | 2,027 | - |
| | > 1000W MH, MV, or HPS | 4' - 8 lamp High Bay T8 fixture | $80.00 | 0.856 | 3,167 | 2,140 | 3,338 | 4,280 | 3,681 | 3,852 | 3,167 | 5,564 | 2,996 | 4,821 | 7,478 | - |
| Exit Signs | Incandescent or fluorescent exit signs | Light Emitting Diode (LED) or Electro luminescent (EL) Exit Sign – 1 or 2 faced | | | - | - | - | - | - | - | - | - | - | - | - | - |
| Lighting Controls | Wall switch or no control | Wall or Ceiling Mounted Occupancy Sensor (per sensor) | $141.00 | - | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | 789 | - |
| | No control | Photocell (per sensor) | $10.00 | - | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | 106 | - |
| | No control | Time clock (per control) | $100.00 | - | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | - |
| Traffic light upgrades | Incandescent | LED Green Ball | $225.00 | 0.123 | - | - | - | - | - | - | - | - | - | - | - | 494 |
| | Incandescent | LED Yellow and Green Ball | $450.00 | 0.123 | - | - | - | - | - | - | - | - | - | - | - | 269 |
| | Incandescent | LED Green Arrow (12" or 8") | $225.00 | 0.123 | - | - | - | - | - | - | - | - | - | - | - | 224 |
| | Incandescent | LED Don't Walk | $110.00 | 0.106 | - | - | - | - | - | - | - | - | - | - | - | 851 |
| | Incandescent | LED Cross Walk | $110.00 | 0.106 | - | - | - | - | - | - | - | - | - | - | - | 77 |

# Appendix E – PTAC/PTHP Equipment

For consistency with updates suggested for commercial unitary equipment, Nexant reviewed Packaged Terminal Air Conditioner and Heat Pump (PTAC and PTHP, respectively) equipment. Based on this review, recommended changes to minimum efficiency levels and customer incentives for PacifiCorp's DSM programs are presented here. Also included are updated estimates of customer's incremental costs and available savings associated with high efficiency PTAC and PTHP units. No significant impact on program incentives or realized savings are expected, and as such, results presented here are not incorporated in the savings and cost projections provided in the main body of this report.

## Equipment Efficiency Levels

Suggested minimum equipment efficiency levels for PTAC and PTHP equipment are presented in the following table. Minimum cooling EER values are based on a 7.5% increase over the ASHRAE 90.1-1999 PTAC minimum values for new construction. Minimum heating COP values are based on a 7.5% increase over the ASHRAE 90.1-1999 PTHP minimum values for new construction.

**Recommended minimum equipment efficiency levels.**

| Equipment Size | Minimum Cooling EER (PTAC & PTHP) | Minimum Heating COP (PTHP) |
|---|---|---|
| <8,000 Btu/h | 11.8 | 3.3 |
| ≥8,000 and <10,500 Btu/h | 11.4 | 3.2 |
| ≥10,500 and <13,500 Btu/h | 10.7 | 3.1 |
| ≥13,500 Btu/h | 10.0 | 3.0 |

## Equipment Savings

Estimated energy and demand savings for qualifying PTAC and PTHP equipment are presented inthe following table. These estimates were derived from an hourly analysis of a typical hotel modeled in DOE-2. The simulation was run using weather data for Salt Lake City, Utah. Due to similar weather patterns and the small magnitude of savings, identified values are expected to be acceptable for use throughout PacifiCorp's Idaho service territory as well.

A PTAC unit with electric resistance heat that met ASHRAE 90.1-1999 minimum equipment efficiency levels for new construction was modeled as the baseline equipment. The high efficiency PTAC unit also had electric resistance heat and an EER rating 7.5% above the ASHRAE minimum for new construction. The high efficiency PTHP had the same cooling EER rating and COP rating 7.5% above the ASHRAE minimum for new construction.

**Estimated average energy and demand savings.[1]**

| Equipment Type | Net Peak Demand Savings (kW/unit) | Net Annual Energy Savings (kW/unit) |
|---|---|---|
| High efficiency PTAC | 0.04 | 47 |
| High efficiency PTHP | 0.04 | 890 |

[1] Savings reflect net impacts at the customer meter with an assumed net-to-gross ratio of 0.95 and a coincident demand factor of 0.77 (PG&E 2001).

## Customer Incremental Costs

Based on a review of PTAC and PTHP equipment from four major manufacturers, the average incremental customer cost to purchase a qualifying unit is $50 for PTAC equipment and $150 for PTHP equipment. These incremental costs are in comparison to a PTAC unit that complies with ASHRAE 90.1-1999 minimum equipment efficiency levels for new construction and do not include the impacts of utility incentives.

## Customer Incentive Levels

Nexant recommends that customer incentive levels be set at $50 per ton for all qualifying equipment.

*Submitted To:*

PACIFICORP

# Energy FinAnswer® Market Assessment

for

# PacifiCorp's Idaho Service Territory – Preliminary Findings

*Submitted By:*

Nexant

**September 17, 2004**
**(revised May 25, 2005)**

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# Executive Summary

In an effort to increase the number of comprehensive energy efficiency projects undertaken by commercial, industrial, and agricultural end-use customers within PacifiCorp's Idaho service territory, potential changes in the incentive delivery mechanism of the Energy FinAnswer® (FinAnswer) program are being evaluated. Specially, Nexant, Inc. has completed preliminary steps to assess the savings potential associated with adopting the cash incentive structure used by the FinAnswer program within PacifiCorp's Washington and Utah service territories.

These preliminary results, arrived at through a progressive three-step approach to assessing market potential from a top-down perspective, indicate that a revision in the incentive structure could result in energy savings totaling approximately 0.75% of total annual non-residential load within three years. Total non-discounted costs to PacifiCorp, including program incentives and administration costs, are expected to be $0.25/kWh of realized energy savings. Table i summarizes preliminary savings and cost estimates associated with this programmatic change.

**Table i. Estimated FinAnswer Program Performance in ID [1, 2, 3]**

| | Energy Savings (MWh/yr) | Demand Savings (peak kW) | Measure Costs ($'000) | Incentives ($'000) | Other Deferred Costs ($'000) |
|---|---|---|---|---|---|
| **Year 1** | 1,850 | 160 | $428 | $207 | $381 |
| **Year 2** | 5,560 | 490 | $1,284 | $630 | $1,143 |
| **Year 3** | 6,940 | 610 | $1,605 | $755 | $1,602 |
| **Total** | 14,350 | 1,260 | $3,317 | $1,592 | $3,126 |

1 Savings estimates are for a full year program period.

2 Measure costs represent the net values adjusted for an estimated net to gross ratio of 0.80, but do not include the impacts of available incentives (Database for Energy Efficiency Resources, All Other Non-Residential Programs category, www.rtf.nwppc.org/deer2005/).

3 Energy and demand savings reflect net impacts at the customer meter based on an estimated net to gross savings ratio of 0.80 (Database for Energy Efficiency Resources, All Other Non-Residential Programs category, www.rtf.nwppc.org/deer2005/).

Prior to proceeding with the final steps of the market assessment that will seek to update these results using a bottom-up market approach, Nexant recommends that the potential cost-effectiveness of the program be evaluated using the range of programmatic costs presented in this report. Marginal cost effectiveness results may indicate an increased level of importance on the feedback obtained by contacting vendors and customers in the local market. Conversely, favorable cost-effectiveness results may allow for a less focused market-based effort.

# Section 1 Introduction

This preliminary report summarizes work completed by Nexant, Inc. to date in conducting a market assessment of the savings potential associated with modifying the incentive structure of PacifiCorp's Energy FinAnswer (FinAnswer) program in their Idaho (ID) service territory. Specifically, the assessment has focused on the electric savings potential by adopting the FinAnswer incentive structure currently available in PacifiCorp's Washington (WA) and Utah (UT) service territories. No other changes in the program delivery model, including the availability of detailed energy studies at no cost to the customer, have been evaluated.

The WA and UT FinAnswer programs offer customers a first-year savings incentive of $0.12/kWh plus $50 per average first-year monthly on-peak kW reduction. This incentive structure has generated a higher level of program participation than the corresponding low-cost financing mechanism currently available in ID.

As illustrated below in Figure 1-1, the first three steps of these market assessment activities have been completed and are reported in this document. Each of these steps has sought to build upon the previous results and increase the accuracy of the savings estimates. Steps 4 and 5 would provide further refined market information based on a bottom-up market approach including stakeholder interviews, surveys, and scoping visits.

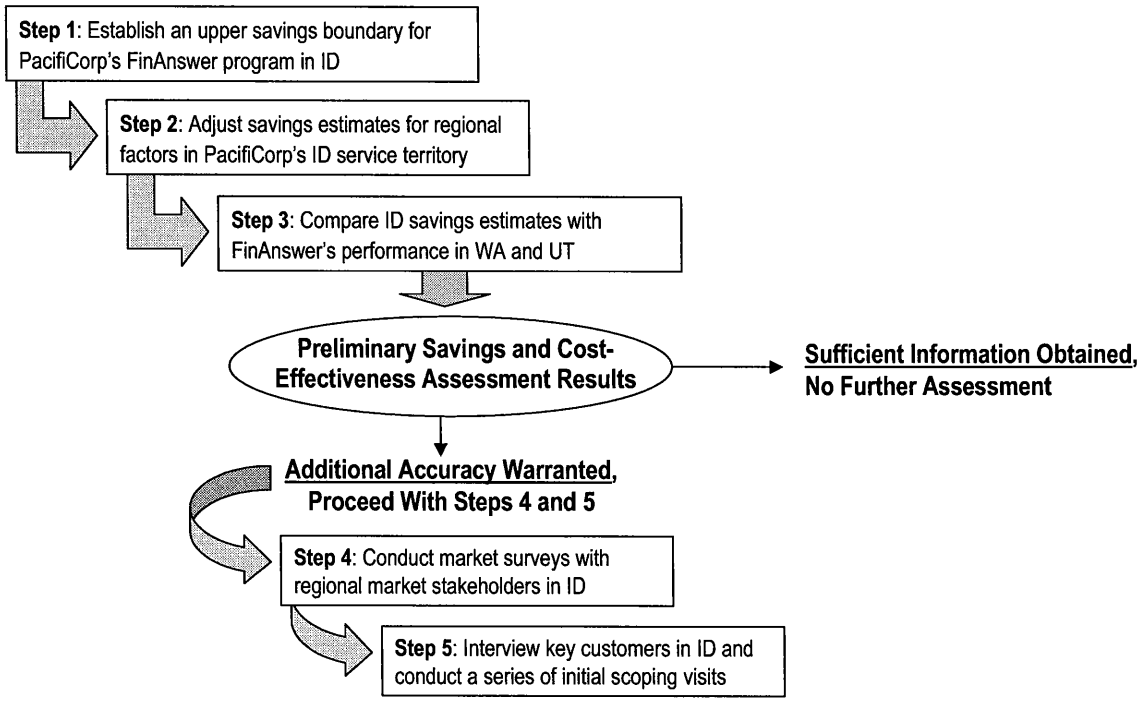



**Figure 1-1. Approach of ID FinAnswer Market Assessment**

The remainder of this document is structured as follows:

- Section 2 provides an estimate of the upper savings boundary (i.e., achievable annual MWh savings) for a revised FinAnswer program in ID;

- Section 3 incorporates regional characteristics of the ID market, as well as the experience of other relevant utilities, into a revised upper savings boundary estimate;
- Section 4 uses the performance of the FinAnswer programs in WA and UT to estimate a final preliminary savings estimate for PacifiCorp's ID service territory; and
- Section 5 outlines recommended next steps.

The FinAnswer program targets energy savings from non-residential electric customers that implement energy efficiency measures as part of retrofit or new construction projects. Total commercial and industrial (C&I) electricity consumption in PacifiCorp's ID service territory was 1,157,364 MWh for the 12-month period ending March 2003.[1] Table 2-1 lists a range of potential annual savings estimates for energy efficiency programs taken from various recent market potential studies and discussions with utility company representatives.

**Table 2-1. Summary of Recent Market Assessment Results**

| Market Assessments and Discussions with Electric Utility Representatives | Avg. Savings/Year (% of total use) | Comments |
|---|---|---|
| ACEEE review of regional U.S. energy efficiency market assessments (i) – 2004 | 1.2% | Annual economic potential for C&I and residential users |
| PG&E funded industrial energy efficiency market study (ii) - 2001 | 0.4% | Actual savings from industrial rebate program, 1995 –1999 |
| Hewlett Foundation study on the energy efficiency potential in CA (iii) – 2002 | 1.3% | Annual economic potential for C&I and residential users. |
| Electric utility, California (iv) – 2004 | 1.5% to 2% | C&I assessment but commercial end-users provide bulk of savings |
| Electric utility, Northeast U.S. (v)- 2004 | 0.5% to 1% | Reflects experience in C&I sector over the last 15-20 years |
| Electric utility, California (vi) - 2004 | 1% | Based on utility C&I program results and recent market studies. |

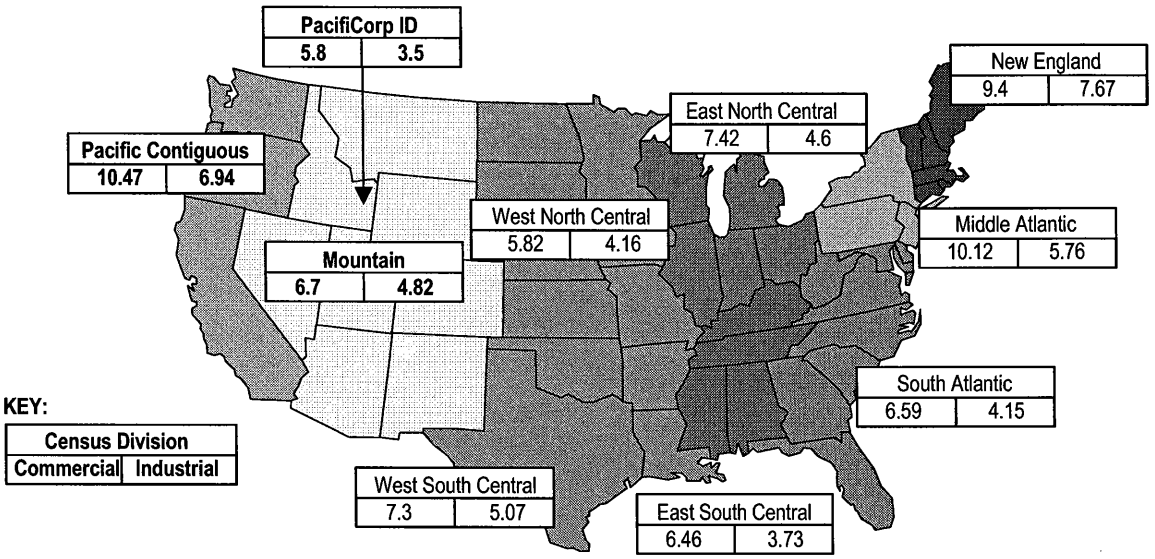
Notes: (i) *Technical, Economic, and Achievable Potential for Energy Efficiency in the U.S.*, Nadel, Shipley, and Elliott, ACEEE; (ii) *CA Industrial Energy Efficiency Market Characterization Study*, XENERGY, 2001; (iii) *California's Secret Energy Surplus*, 2002; (iv), (v), and (vi) all data based on discussions with utility representatives in September 2004.

Savings estimates listed in Table 2-1 cover studies that have been completed in over ten different states ranging from the Northeastern U.S. to the Pacific Northwest. Despite the variation of end-use sectors and geographic areas covered in Table 2-1, the savings estimates in these studies range between a relatively narrow band of 0.5% to 2% of annual consumption. Nexant conducted interviews with representatives of utilities operating energy efficiency incentive programs to confirm the validity of these market assessments. These discussions, which focused on the performance of C&I programs, confirm that savings levels between 1% and 2% of total annual C&I electricity consumption are achievable.

To establish an upper savings boundary estimate for a revised FinAnswer program in ID, an average value within these estimates of 1.5% of annual consumption was utilized. This corresponds to a savings estimate of approximately **17,400 MWh/yr** (1.5% X 1,157,364 MWh) in PacifiCorp's ID service territory.

[1] *Source:* Usage data provided by PacifiCorp in an email dated August 10, 2004. This value does not include special contracts customers since they are not eligible to participate in the FinAnswer program.

Two main factors contribute to a recommended downward adjustment of the 1.5% upper savings boundary estimate for PacifiCorp's ID market established in the previous section. First, energy prices are lower in PacifiCorp's ID service territory compared to those offered by utilities operating in near-by states, reducing the strength of economic drivers to implement energy efficiency measures. Figure 3-1 illustrates that PacifiCorp's industrial and commercial rates in ID are roughly half of comparable average electricity rates in the Pacific zone and a quarter of those offered in Mountain zone states (and well below average listed for all other U.S. geographic zones).

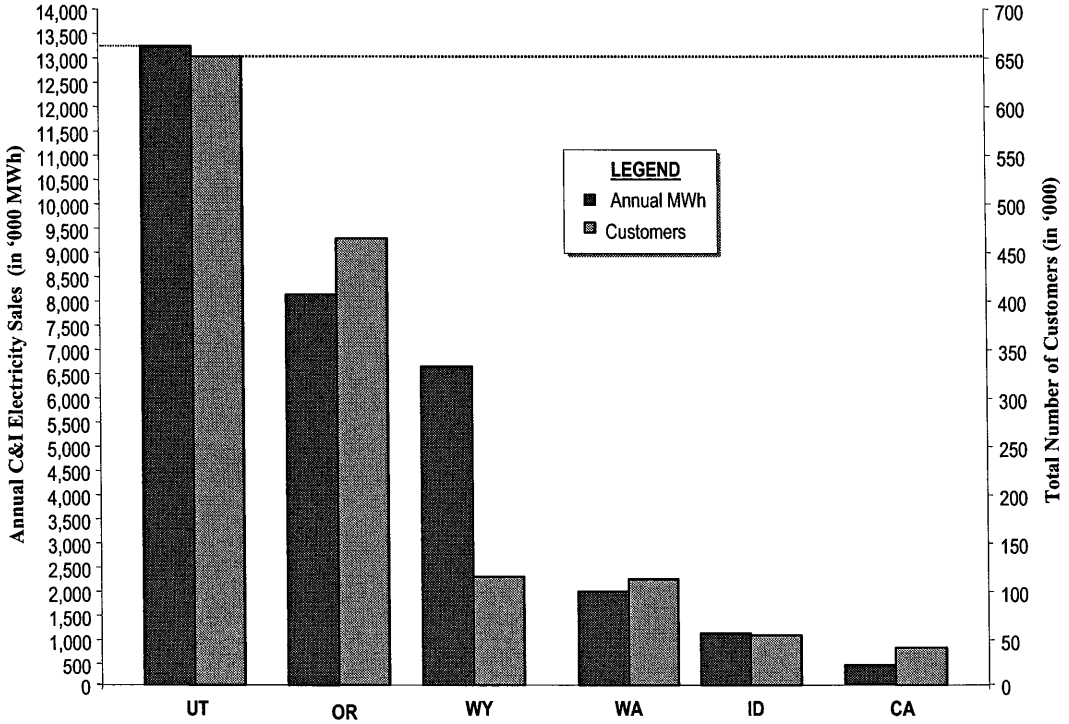



*Source: EIA average electricity prices (in cents per kWh) for 2003 for the Continental U.S.*

**Figure 3-1. PacifiCorp ID C&I Prices (cents per kWh) versus the Continental U.S**

Secondly, PacifiCorp's ID service territory has a predominantly rural demographic with no major urban centers. PacifiCorp's ID service territory is second smallest (after CA) of the six Western states that it covers, accounting for slightly over six percent of its annual electricity sales and total number of customers.[2] In general, the size and customer make-up of the ID market indicates that a more limited potential for achieving energy savings exists than in other parts of the state or country. Figure 3-2 illustrates the relative size of the ID service territory—in terms of total number of customers (residential and C&I) and annual C&I electricity sales—compared to PacifiCorp' other service territories.

[2] *PacifiCorp Form 10-K* for the fiscal year ended March 31, 2004.




*Notes: Customer data from PacifiCorp's 10-k report for the fiscal year ended March 31, 2004. MWh sales data from PacifiCorp's Table, 2003.*

**Figure 3-2. Comparison of PacifiCorp Service Territories in the Western U.S.**

To account for these lower energy prices and the overall composition of PacifiCorp's service territory in ID, the 1.5% upper savings boundary estimate was lowered to approximately 1%. In terms of potential energy savings, the application of this adjusted savings estimate translates into a savings of approximately **11,600 MWh/yr** (1% X 1,157,364 MWh) in PacifiCorp's ID service territory.

# Section 4 Extrapolation of FinAnswer Performance in WA and UT to ID

This section presents revised savings estimates and the costs associated with the implementation of a revised FinAnswer program in ID based on the results of Step 3 of the market assessment activities (see Figure 1-1). Specifically, further refinements have been made to the savings estimates from Sections 2 and 3 by extrapolating the historical performance of the FinAnswer program in WA and UT to PacifiCorp's ID market.

## 4.1 WA AND UT FINANSWER PROGRAM REVIEW

In WA and UT, the FinAnswer program has gained momentum in the marketplace, exhibited by a steady increase in annual electricity savings. Table 4-1 lists key program results for both states during the period of 2001 to 2003.

**Table 4-1. FinAnswer Program Performance in WA and UT***

| | Gross Energy Savings (MWh) | Savings as % of total C&I use | Gross Peak Demand Savings (kW) |
|---|---|---|---|
| **Washington** | | | |
| 2001 | 5,539 | 0.22% | 375 |
| 2002 | 14,303 | 0.58% | 1,140 |
| 2003 | 21,726 | 1.04% | 1,689 |
| **Utah** | | | |
| 2001 | 1,000 | 0.01% | 214 |
| 2002 | 6,638 | 0.05% | 655 |
| 2003 | 24,412 | 0.20% | 2,090 |

*Note: Based on FinAnswer program performance data for 2001 –2003 provided by PacifiCorp.

As can been seen from Table 4-1, savings in PacifiCorp's WA service territory as a percentage of total C&I load are larger than in UT by a factor of five. This is partially attributable to momentum in the WA energy efficiency marketplace prior to the launch of the FinAnswer program (where such market activity was effectively non-existent in UT). In addition, the fact that the C&I load in WA is approximately one-sixth that in UT may contribute to the variation as smaller markets can respond more quickly to utility programs (less customers, more interaction among customers and utility, etc.).

PacifiCorp's cost of achieving energy savings from FinAnswer are associated with the costs to provide the energy analysis services and implementation incentives of $0.12/kWh plus an average monthly on-peak kW reduction of $50/kW for first year savings. Cash incentives, however, are capped at 50% of the eligible energy efficiency measure cost. Based on a review of 2002 FinAnswer evaluation reports, the total average program costs for WA and UT (in $ per realized annual gross energy savings) were as follows:[3]

- Gross measure Cost: $0.23/kWh
- Incentives: $0.09/kWh
- Other Deferred Costs: $0.16/kWh.

[3] *PacifiCorp Energy FinAnswer 2002 Utah and Washington Program Evaluations*. Quantec LLC. August 2004.

In terms of direct costs to PacifiCorp, the total average estimated cost per unit of realized gross energy savings from the FinAnswer program in WA and UT is $0.25/kWh.

## 4.2 ESTIMATED SAVINGS POTENTIAL AND ASSOCIATED COSTS

As the size and customer mix of PacifiCorp's WA service territory (in comparison to UT) more closely approximates the area covered by PacifiCorp in ID, historical program activity in WA will be relied on more heavily to predict potential outcomes in ID. Specifically, the 1% savings of total annual C&I consumption in WA is considered to be a more reasonable estimate for PacifiCorp's market in ID and consistent with findings presented in Section 2 of this report. However, to reflect that the ID energy services market (i.e., presence of ESCOs and high efficiency equipment vendors), while beginning to become more active, is still less developed then within PacifiCorp's WA service territory, the gross estimate has been revised downward to 0.75%. The application of this assumed 0.75% savings estimate equates to an estimated annual reduction of approximately **8,700 MWh** (0.75% X 1,157,364 MWh) in PacifiCorp's ID service territory.

Further, the 1% annual savings level for the WA FinAnswer program was achieved over a three-year period. During this initial period, the level of annual savings increased significantly between Years 1 and 2 as the program gained more traction. A similar period (path) of savings ramp-up should be expected in ID. Figure 4-1 depicts a potential scenario in which the 0.75% annual level of estimated gross energy savings from a revised FinAnswer program in ID are realized over an initial three-year period as follows: 0.20% in Year 1, 0.60% in Year 2, and 0.75% in Year 3.

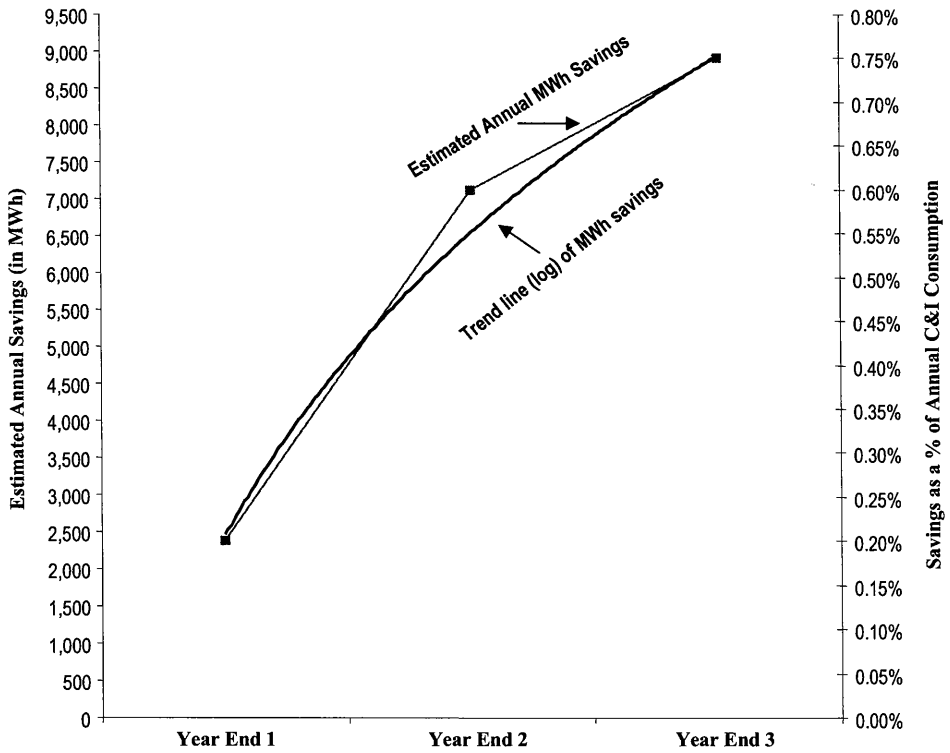



**Figure 4-1. Potential Ramp-up of Gross Annual FinAnswer Savings in ID**

Average measure, incentive, and other deferred program costs taken from the 2002 Evaluation reports of the WA and UT FinAnswer programs have been used to estimate corresponding costs in ID.[4] Table 4-2 summarizes the predicted costs and savings associated with a modified FinAnswer incentive structure in ID. Cost data contained in Table 4-2 is based on average costs for the WA and UT program. Due to the wide variation in these cost metrics between the two service territories, Tables 4-3 and 4-4 are also included to establish estimated low and high-cost boundaries corresponding to the same estimated savings assumptions.[5]

**Table 4-2. Estimated FinAnswer Program Performance in ID [1,2,3]**

| | Energy Savings (MWh/yr) | Demand Savings (peak kW) | Measure Costs ($'000) | Incentives ($'000) | Other Deferred Costs ($'000) |
|---|---|---|---|---|---|
| **Year 1** | 1,850 | 160 | $428 | $207 | $381 |
| **Year 2** | 5,560 | 490 | $1,284 | $630 | $1,143 |
| **Year 3** | 6,940 | 610 | $1,605 | $755 | $1,602 |
| **Total** | 14,350 | 1,260 | $3,317 | $1,592 | $3,126 |

1 Savings estimates are for a full year program period.

2 Measure costs represent the net values adjusted for an estimated net to gross ratio of 0.80, but do not include the impacts of available incentives (Database for Energy Efficiency Resources, All Other Non-Residential Programs category, www.rtf.nwppc.org/deer2005/).

3 Energy and demand savings reflect net impacts at the customer meter based on an estimated net to gross savings ratio of 0.80 (Database for Energy Efficiency Resources, All Other Non-Residential Programs category, www.rtf.nwppc.org/deer2005/).

**Table 4-3. Low Cost Implementation Scenario**

| | Measure Costs [1] ($'000) | Incentives ($'000) | Other Deferred Costs ($'000) |
|---|---|---|---|
| **Year 1** | $332 | $163 | $211 |
| **Year 2** | $996 | $490 | $634 |
| **Year 3** | $1,246 | $612 | $793 |
| **Subtotal** | $2,574 | $1,265 | $1,638 |

1 Measure costs represent the net values adjusted for an estimated net to gross ratio of 0.80, but do not include the impacts of available incentives (Database for Energy Efficiency Resources, All Other Non-Residential Programs category, www.rtf.nwppc.org/deer2005/).

4 Other deferred costs include training, administrative support, advertising, EEM inspections, ongoing evaluation, modeling/design/contract, and program management.

5 Tables 4-3 and 4-4 utilize the lowest or highest cost figure that is listed in the 2002 program evaluation reports for WA and UT (e.g., the low cost scenario uses the incentive cost from UT ($0.07/kWh) rather than WA ($0.11/kWh).

**Table 4-4. High Cost Implementation Scenario**

| | Measure Costs [1] ($'000) | Incentives ($'000) | Other Deferred Costs ($'000) |
|---|---|---|---|
| **Year 1** | $524 | $250 | $550 |
| **Year 2** | $1,571 | $750 | $1,651 |
| **Year 3** | $1,964 | $938 | $2,063 |
| **Subtotal** | $4,059 | $1,938 | $4,265 |

[1] Measure costs represent the net values adjusted for an estimated net to gross ratio of 0.80, but do not include the impacts of available incentives (Database for Energy Efficiency Resources, All Other Non-Residential Programs category, www.rtf.nwppc.org/deer2005/).

# Section 5 Recommendations and Next Steps

Based on the success of the FinAnswer program within PacifiCorp's UT and WA service territories, proceeding with the revision to the incentive delivery mechanism within the Idaho market appears to be justified at this stage of the market assessment. However, prior to making the determination to move forward with steps 4 and 5 of the market assessment (see Figure 1-1), Nexant recommends that PacifiCorp complete an analysis of the cost-effectiveness of the revised program. Specially, the sensitivity of the results to the low and high-cost implementation scenarios in Section 4 will help dictate the appropriate level of effort for steps 4 and 5. Marginal cost effectiveness results may indicate an increased level of importance on the feedback obtained by contacting vendors and customers in the local market. Conversely, favorable cost-effectiveness results may allow for a less focused market-based effort.

# REVIEW AND DEVELOPMENT OF UTAH POWER'S IRRIGATION PROGRAM IN IDAHO

Presented to

UTAH POWER

Submitted By:

Fazio Engineering

November 17, 2004

Revised August 31, 2005

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**REVIEW AND DEVELOPMENT OF**

**UTAH POWER'S IRRIGATION PROGRAM IN IDAHO**

August 31, 2005

## 1 EXECUTIVE SUMMARY

This report is prepared in support of a proposed irrigation efficiency program for Utah Power customers in Idaho. Pending approvals, Utah Power plans to offer their Idaho irrigation customers a comprehensive irrigation efficiency program to be offered in addition to an incentive Energy FinAnswer/ FinAnswer Express suite of programs in Idaho and the current Idaho load control program offered through Schedule 72. The main goals of this report are to:

- Summarize the demographics of Utah Power's Idaho irrigation accounts and identify key irrigation market actors.
- Review program designs already in the market and/or provide recommendations for a better alternative design from the standpoint of our Idaho irrigation accounts.
- Using the recommended assumptions, estimate program savings and costs.

Based on field observations, discussions with key market stakeholders and potential contractors who responded to the RFP, the currently proposed irrigation efficiency program four main components.

1. A nozzle exchange program targeting hand lines, wheel lines and solid set sprinkler systems. Exchange of pipe gaskets and low pressure drains are also included in this program component.
2. An on-site pump and system screening that also provides an irrigation water management consultation.
3. A pump testing and system evaluation component
4. A center pivot equipment replacement component with prescriptive incentives. Items considered for replacement include sprinkler pressure regulators, pivot low pressure drains and qualifying sprinkler packages

The following table summarizes the irrigation program results for Idaho using current assumptions.

**Summary – Potential Irrigation Energy Efficiency Impacts from a multi-year Idaho program**

| Program Item | Program Incentives | Customer Incremental Costs | Annual Savings (kWh/yr) |
|---|---|---|---|
| Nozzle Exchange | $ 62,100 | $ 55,707 | 1,086,755 |
| Gasket Exchange | $ 55,246 | $ 22,466 | 894,993 |
| Drain Exchange | $ 171,202 | $ 22,827 | 554,696 |
| Pump Screening/Irrigation Management | $ 125,200 | $ 0 | 1,875,200 |
| Pump Testing Repair/Replacement | $ 141,000 | $ 26,250 | 351,000 |
| System Redesign/Modification | $ 88,125 | $ 60,000 | 702,000 |
| Pivot Sprinkler Regulator Replacement | $ 103,914 | $ 43,297 | 1,957,047 |
| Pivot Low Pressure Drain Replacement | $ 5,380 | $ 7,061 | 492,270 |
| Replacement Sprinkler Packages | $ 122,400 | $ 397,120 | 1,467,712 |
| Dual Sprinkler Packages | $ 20,000 | $ 7,000 | 269,800 |
| Total | $894,567.00 | $641,728.00 | 9,651,473 |

*Summary Table Notes:*

*Nozzle savings adjusted by 67% combined net-to-gross and savings realization ratio. Nozzle costs not adjusted. Pump checks & water management and pivot measures were adjusted by 50% combined net-to-gross and savings realization ratio. Costs were not adjusted. Incentives include service incentives such as pump testing. In addition, cost effectiveness analysis applies a net to gross ratio of .75 on all savings and costs except those resulting from Nozzle Exchange components. Savings in the table represent savings delivered over a 2 year + period from November 2005 through December 2007.*

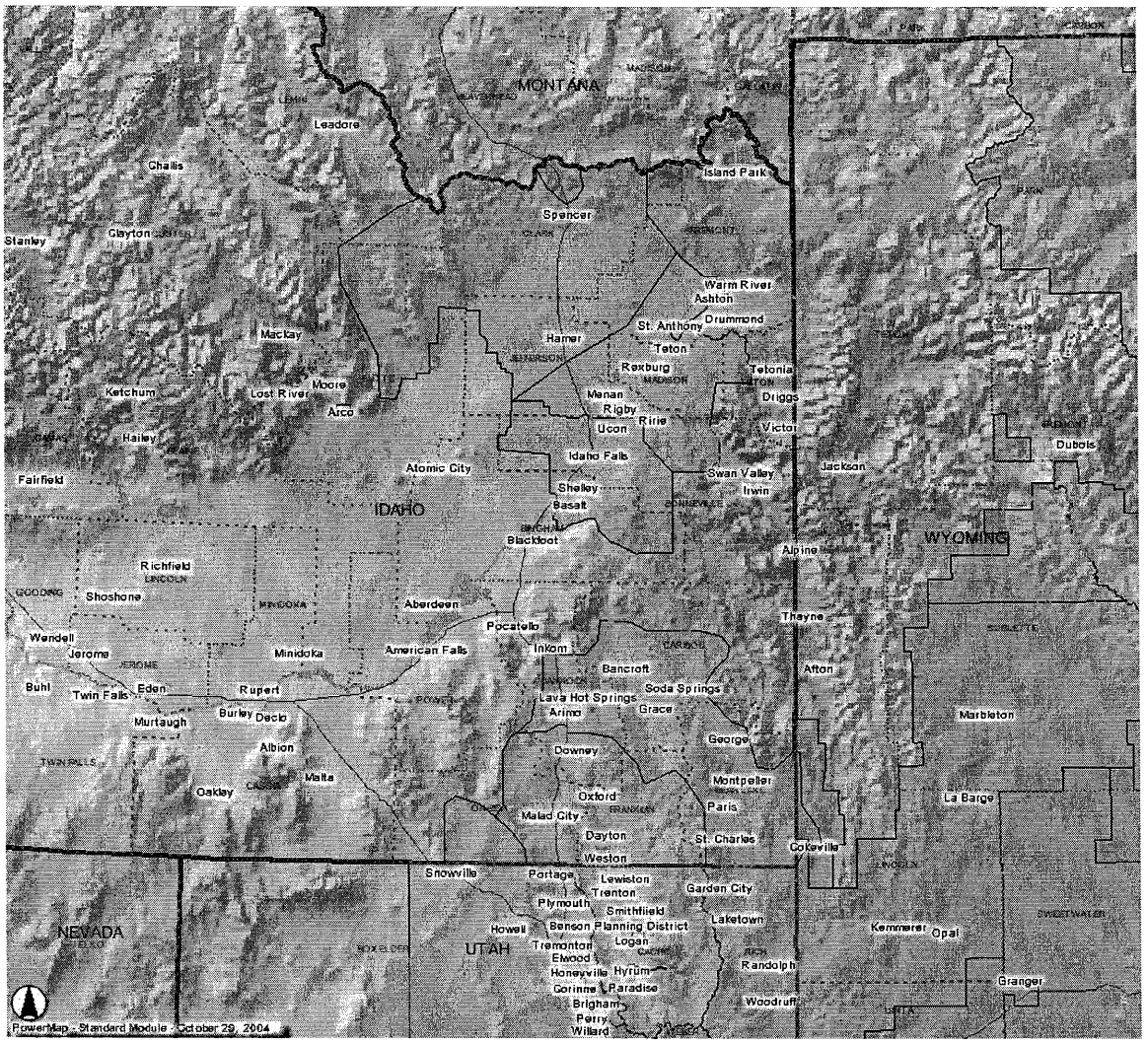
# 2 DEMOGRAPHICS OF IDAHO IRRIGATION ACCOUNTS

## 2.1 Data Collected

Utah Power provided a map of their Idaho service territory and the number of customers and total kWh/yr by rate schedule. Additionally, Utah Power provided a list of meters for irrigation accounts on rate schedule 10 in Idaho. This was used to estimate the number of irrigation services by city. This customer break down by city is included in Appendix A. As is typical with agricultural accounts, customers usually receive bills at locations other than the service address. This data was sorted by city and state with about half of locations outside Idaho grouped at the end of the list.

Figure 1 shows the service territory within Idaho.

**Figure 1: Idaho Service Territory**




Data was obtained from the 2002 Census of Agriculture for select counties in Idaho. Primary data included are the number of irrigated farms; total irrigated acres; irrigated pasture; potatoes; forage, hay and haylage; vegetable; and cattle and calves.

Initial discussions with local county agents in Franklin and Caribou counties lead to contacting the agricultural statistics group of the agricultural census in Boise. Summary of the 1998 statewide irrigation data is shown in Table 1. The latest Farm and Ranch Irrigation Survey is not yet available.

**Table 1: Statewide Irrigated Acres by Method**

| Irrigation Method | # Farms | Irrigated Acres | % of Total |
|---|---|---|---|
| Center Pivot/Linears | 1,652 | 1,043,571 | 33% |
| Side Roll | 2,507 | 575,875 | 18% |
| Hand Move | 4,482 | 501,950 | 16% |
| Solid Set | 438 | 61,746 | 2% |
| Traveler/Big Gun | 55 | 3,664 | 0% |
| Gravity | 8,994 | 991,613 | 31% |
| Drip | 208 | 1,083 | 0% |
| Totals | 18,336 | 3,179,502 | |

The data in Table 1 was used to estimate the number of irrigation systems in each county. Based on conversations with National Resource Conservation Service (NRCS) in Franklin County, many of the counties in southeast Idaho are primarily hand line and wheel lines with small amounts of ground water. Additionally, these southeast counties have short seasons growing primarily alfalfa and small grains. Counties located on the Snake River plain are primarily center pivots. Similarly, Idaho Department of Water and Power (IDWR) indicated that as much as 90% of the irrigation systems are center pivots for areas located near Idaho Falls and Rexburg.

## 2.2 Data Within Service Territory

Utah Power's service territory covers many counties in Idaho. Appendix B estimates crop acreage and irrigation method by county. In many cases only portions of a county were within Utah Power's service territory. In these cases the amount of irrigated acres was estimated as a percent of the county total. Percentages for each irrigation method within a county were taken from the census statewide data and local estimates when available. Table 2 summarizes the census data for the Idaho counties that are part of Utah Power's service territory.

**Table 2: 2002 Census of Agriculture Summary Data**

| | Total | Estimated in Service Territory |
|---|---|---|
| Irrigated Farms (#) | 5,479 | 1,069 |
| Irrigated Land, Acres | 1,350,807 | 196,978 |
| Irrigated Pasture, Acres | 160,355 | 19,875 |
| Potatoes, Acres | 205,978 | 29,933 |
| Forage, hay and haylage, Acres | 533,776 | 89,238 |
| Sugarbeets for sugar, Acres | 25,574 | - |
| Vegetables, Acres | 35 | - |
| Orchards, Acres | 101 | 30 |

Using the estimated irrigated acres per county served by Utah Power, the irrigated acres per irrigation method were estimated. The irrigation methods or systems considered were center pivots, wheel lines, hand lines, solid set, big guns, gravity and drip. Using standard acreages for each irrigation method, the number of systems was estimated for each county. Table 3 shows the estimated irrigation methods within the service territory, associated acres and number of systems.

**Table 3: Estimated Irrigation Methods Inside Service Territory**

| Method | Total Acres | Acres/Method | Total Systems |
|---|---|---|---|
| Center Pivot | 58,450 | 120 | 487 |
| Side Roll | 35,677 | 26.7 | 1,338 |
| Hand Move | 30,823 | 20 | 1,541 |
| Solid Set | 3,825 | 20 | 191 |
| Liner/Big Gun | 227 | 20 | 11 |
| Gravity | 67,980 | 120 | 566 |
| Drip | 67 | 20 | 3 |

## 2.3 Historical Energy Usage

The annual energy usage for all the Idaho irrigation customers is shown in Table 4. This data was provided by Utah Power and represents a twelve-month period ending March 2003.

**Table 4: Estimated Historical Energy Usage**

| Utah Power Idaho Rate Schedule ending March 2003. | | | | |
|---|---|---|---|---|
| | | MWh | Ave kWh | Est. Op. Hrs |
| Number of Customers | 2,236 | 606,460 | 271,225 | |
| Estimated # of Meters | 4,726 | 606,460 | 128,324 | 1,943 |

Review of the irrigation accounts (schedule 10) indicated 4,726 meters with an average operating horsepower of about 90 HP. This size of connected HP may indicate many wells and/or larger irrigation systems.

## 2.4 Key Market Players

### *2.4.1 Local Irrigation Suppliers*

| | |
|---|---|
| Sunrise Irrigation (208) 734-9444 (Twin Falls) | Irrigation Centers – Arco<br>104 W. Idaho Street<br>Arco, ID 83213-0657 208-527-3075 |
| Pioneer Equipment Co (208) 523-5455 (Idaho Falls) | Irrigation Centers – Challis<br>P.O. Box 303<br>Challis, ID 83226 208-782-0213 |
| PPS Precision Pumping/VSDs (208) 323-5300 (Boise) | Advanced Irrigation, Inc.<br>4440 S. Yellowstone<br>Idaho Falls, ID 83402 208-522-3703 |
| Golden West Irrigation & Equipment<br>291 Stanley Street<br>Idaho Falls, ID 83405 208-524-3203 | Golden West Irrigation & Equipment<br>2256 S. Hwy 191<br>Rexburg, ID 83440 208-356-9318 |
| NI West (208) 356-8250 (Rexburg) | |

### *2.4.2 Federal Contacts*

The USDA is offering the Environmental Quality Incentives Program (EQIP), Ground and Surface Water Conservation Program. This program focuses on water conservation and does not emphasize energy conservation. Although no conflicts are anticipated between a Utah Power irrigation program and the NRCS conservation program, customers, irrigation evaluators and testers need to be aware of the NRCS program.

Two contacts are: Phuoc Hoang, ID Design Engineer, vinh.hoang@id.usda.gov and Bruce Sandoval, Irrigation Engineer (Twin Falls), bruce.sandoval@id.usda.gov.

### *2.4.3 State Contacts*

Idaho Department of Water Resources (IDWR) offers a Pump Efficiency Testing Program. The Agricultural, Industrial & Municipal Team (AIM) is responsible for the program. The primary contact is Stuart Van Greuningen (208) 287-4800. According to their web site over 1,000 irrigation pump tests have been done since 1984. Additionally, the web site refers to test results showing that most of the pumps operated 15% below theoretical maximum efficiency. Based on a recent conversation with Stuart, IDWR plans to test an additional 100 pumps starting this fall and sees synergies with a possible Utah Power offering targeting irrigation customers. Stuart indicated that historically less than 5% of the participants actually make changes.

Avista Utilities offers energy efficiency incentives for Idaho customers. According to their web site, Avista appears to offer site-specific incentives and specific programs for variable frequency drives and premium efficiency motors.

Idaho Power offers an incentive program for Idaho irrigators. According to their web site, irrigators can receive up to $5,000 for improving the energy efficiency of a pump system or installing a new one. The primary Idaho Power Agriculture Representative is:

Quentin Nesbit
Idaho Power Corporate Headquarters
P.O. Box 70
Boise, ID 83707
(208) 388-2519

PacifiCorp previously prepared the following contact information tables.

### *2.4.4 County Extension Contacts:*

| County | Contact | Address | E-mail |
|---|---|---|---|
| Teton | None | 89 N. Main Courthouse, Driggs, ID 83422 | teton@uidaho.edu |
| Clark | Keith Bramwell | P.O. Box 65 Dubois, ID 83423 | clark@uidaho.edu |
| Fremont | Janice Stimpson | 49 W. 1st N, St. Anthony, ID 83445 | fremont@uidaho.edu |
| Butte | Charles Cheyney | P.O. Box 832 Arco, ID 83213 | butte@uidaho.edu |
| Madison | Gale Harding | P.O. Box 580 Rexburg, ID 83440 | madison@uidaho.edu |
| Jefferson | George Hamilton | 134 N. Clark Rm 30, Rigby, ID 83442 | jefferson@uidaho.edu |
| Bonneville | Wayne Jones | 2925 Rollandet, Idaho Falls ID 83402 | bonneville@uidaho.edu |
| Bingham | Scott Nash | 132 S. Shilling, Blackfoot, ID 83221 | bingham@uidaho.edu |
| Bear Lake | Joel Packham | P.O. Box 237, Paris, ID 83261 | bearlake@uidaho.edu |
| Franklin | Stuart Parkinson | 561 W Oneida, Preston, ID 83263 | franklin@uidaho.edu |
| Oneida | Rauhn Panting | 30 N. 1st W, Malad, ID 83252 | oneida@uidaho.edu |
| Bannock | Becky Dahl | P.O. Box 4228, Pocatello, ID 83205 | bannock@uidaho.edu |
| Caribou | Steven Harrison | 53 E. 1st St., Soda Springs, ID 83276 | caribou@uidaho.edu |

### 2.4.5 *Soil and Water Conservation Districts:*

| District Name | Contact Name | Address | Phone |
|---|---|---|---|
| West Side | Mark Hyndman | 1120 Lincoln Rd, Idaho Falls, ID 83401 | 208-522-5137 |
| Clark | Norman Tavenner | 263 E. 4th N. Rexburg, ID 83440 | 208-356-6931 |
| Madison | Susan Hymas | 263 E. 4th N. Rexburg, ID 83440 | 208-356-6931 |
| Jefferson | Mel Briggs | 3862 E. 300 N Rigby, ID 83442 | 208-745-6662 |
| Caribou | Wilder Hatch | 390 E. Hooper, Soda Springs, ID 83276 | (208) 547-2558 |
| Franklin | Steven Chatterton | 89 E. 800 N. #3, Preston, ID 83263 | 208-852-0562 |

### 2.4.6 *Water and Groundwater Districts:*

| District | Contact | Address | Phone |
|---|---|---|---|
| Bear River Water Dist. 11 | Pete Peterson | P.O. Box 349, Preston ID 83263 | 208-852-1385 |
| Water Dist. 1 | Ron Carlson | 900 N. Skyline Dr. Suite A, Idaho Falls, ID 83402 | 208-525-7171 |
| Bingham Ground Water Dist (GWD) | Craig Evans | P.O. Box 42, Pingree, ID 83262 | 208-684-9634 |
| Bonneville/Jefferson GWD | Robert Martin | 6330 West 33rd. South, Idaho Falls, ID 83402 | 208-522-0399 |
| Madison GWD | Richard Smith | No contact info. | |
| Oneida | Rauhn Panting | 30 N. 1st W, Malad, ID 83252 | oneida@uidaho.edu |
| Bannock | Becky Dahl | P.O. Box 4228, Pocatello, ID 83205 | bannock@uidaho.edu |
| Caribou | Steven Harrison | 53 E. 1st St., Soda Springs, ID 83276 | caribou@uidaho.edu |

## 3 REVIEW OF IRRIGATION PROGRAM DESIGNS

PacifiCorp has reviewed other irrigation program designs in the process to best select a design with a "best fit" for Idaho customers. Part of this process involved categorizing source of savings for irrigation systems into the following areas:

- Education – operational changes that tailor water use and system operation to the best available weather and crop conditions.
- Pump tests/repairs and replacement
- System modifications/repairs and replacement.

These sources of savings are progressively more expensive to obtain (from both a customer and utility perspective), but are more persistent as well. Review of other irrigation programs indicate high requests for low or no costs services like pump tests combined with low overall implementation rates are likely outcomes and adversely impact cost effectiveness. To counter this, many programs combine lower cost savings with higher cost approaches to help maintain cost effectiveness. This is the approach proposed here.

A program design recently proposed by the Energy Trust of Oregon for PacifiCorp's Oregon territory and analyzed for applicability to PacifiCorp's CA service territory appears to represent an effective approach to low cost savings as well as some intermediate steps to help insure implementation of the more costly savings. As such, this program design forms the framework for the proposed Idaho program. Subsequent discussions with growers and irrigation suppliers about the proposed design indicated a need to include simple pivot equipment changes into the program and the pivot equipment incentives were added for four measures.

Analysis assumptions and projected savings from estimated participation are summarized in this document with supporting details provided in an attached spreadsheet. Assumptions about program start dates and annual vs. partial year results may cause some totals to be off slightly. Overall program performance is anticipated to be similar to the overall projections. A printout of the spreadsheet is also located in Appendix C. The most current spreadsheet summarizing program savings and costs is displayed in Appendix D.

The proposed program components are:

- Nozzle Exchange Program
- Pump Screening & System Audit
- Pump Testing Program
- Center Pivot Equipment

This proposed program design appears to be comparable with other market offerings to irrigators including the Idaho Department of Water Resources pump testing program which has tested 1,000 pumps to date and plans to target another 100 starting last fall.

Avista Utilities and Idaho Power's incentive programs for irrigation customers appear to be similar to the incentives and services offered by PacifiCorp's FinAnswer Program in WA and UT which will be the same as the program filed in Idaho. .

# 4 RECOMMENDED PROGRAM DESIGN

The demographics of the Idaho irrigation accounts show a large number of sprinkler irrigators (center pivots, hand and wheel lines). Irrigation seasons and associated energy usage per system vary throughout eastern Idaho. Based on the diverse mix of irrigation methods it is recommended that the irrigation program be similar to proposed program design. The main components are summarized in this section.

When estimating the amount of energy savings and costs for each program component, the goal was to produce reasonable yet conservative estimates.

## 4.1 Nozzle Exchange

The proposed nozzle exchange part of the program will provide new standard brass sprinkler nozzles to replace worn ones. This part of the program will target irrigators with hand lines and wheel lines as well as solid set sprinklers systems. Additionally, flow control nozzles will also be part of the program.

Primary design elements for the nozzle part of the program are:

- No limits on the maximum number of nozzles.
- Flow control nozzles will also be available and allowed to replace worn standard nozzles.

- Solid set sprinklers will be allowed.
- Equipment suppliers will decide which nozzles are appropriate for participants.
- Participants will have new nozzles in hand prior to replacement and returning old ones. A limited provision will be made for irrigation customers to return nozzles after the new ones are installed.
- Center pivots sprinkler packages are covered under a separate portion of the program.
- The primary time to replace nozzles is during the irrigation off-season; i.e, November through March.

#### *4.1.1 Primary Assumptions for Nozzles in the Nozzle Exchange portion of the program*

- 4,726 potential meters from schedule 10 accounts
- 4.5% estimated annual participation rate
- 2 systems per meter (i.e. 2 wheel lines)
- 84 nozzles per system on average
- 1,504 kWh average savings per system, assumes 33 5/32" nozzles worn 1.5 sizes larger and 1,940 average operating hours
- $57.10 nozzle cost per system, assumes 80% standard brass nozzle, 10% flow control and 10 % solid set with brass nozzles
- $51.24 customer cost per system, assumes $0.61/nozzle labor
- 43 gpm (15 acre-feet/year) potential water savings per system (0.18 acre-feet per nozzle)
- 4 year measure life
- 1/3 of the nozzles are not installed or produce energy savings

The energy savings from nozzle replacement is dependant on a reduction of water flow. The estimated potential water savings is about 0.18 acre-feet per nozzle per year. Taking into account that 1/3 of the nozzles are not implemented, the average water savings is closer to 0.12 acre-feet per year for each nozzle purchased.

Irrigation accounts such as the irrigation districts were not identified and will not have any nozzles to replace. Overall projected Nozzle Exchange participation is not likely to be materially affected by these district customers.

#### *4.1.2 Primary Assumptions for Gaskets and Drains in the Nozzle Exchange portion of the program*

Later during program development and to provide more options for irrigation customers to achieve energy savings, pipe gaskets for hand lines and low pressure drains for wheel lines were included in the Nozzle Exchange.

The primary assumptions for are:

- Participation rate is approximately ¼ that of nozzles
- 1,604 kWh/year for fixing drains or gaskets per system (1.25% of average annual usage)
- 33 drain and gaskets per system
- 48.6 kWh/year potential energy savings per drain or gasket
- 0.357 acre-feet per year potential water savings per drain or gasket
- 50% will not be installed or produce energy savings

- $1.50 average cost per gasket
- $0.61 installation labor cost per gasket
- $7.50 average cost per drain
- $1 installation cost per drain

A check was done to see if the amount of energy savings calculated was reasonable. Assuming a small 1 gpm leak from a drain or gasket produces about 91 kWh in potential savings, so the original calculations of 48.6 kWh per year in potential savings are conservative.

#### *4.1.3 Implementation*

The overall program is designed to be delivered by a third party (program administrator) under contract with Utah Power. The program administrator will be responsible for identifying and enlisting the support and cooperation of existing irrigation supply stores who will inventory equipment and provide them to irrigators. The expanse of the company service territory makes it important for the program administrator to enlist as many geographically distributed irrigation supply stores as possible.

The benefits and logistics of the nozzle exchange program will be provided to irrigators through short classes or information sheets developed as part of an overall communication plan and delivered by the program administrator.

### 4.2 Pump Screening & Water Management Consultation

The pump screening portion of the program is a simple audit of a customer's irrigation system promoting irrigation management and identifying energy savings opportunities. The primary energy savings opportunities of the pump screening portion of the program include:

1. Information on irrigation management
2. Information on pump operation to minimize demand charges
3. Identifying worn sprinkler nozzles and refer to the nozzle exchange portion of the nozzle program
4. Identifying leaks from sprinklers, gaskets, hoses, drains and valves
5. Identifying inefficient pumps for the pump testing portion of the program. This will be done by measuring the wire-to-water efficiency using the utility meter, measuring pressures, lift, and estimating flow. It does not include direct measurement of voltage, amps, power factor or flow directly.
6. The preferred time to do this work is in early spring for making impacts and referrals to the nozzle and pump testing program. The work can be done when the system is operating with a growing crop.

#### *4.2.1 Primary Assumptions*

- 4,726 potential meters from schedule 10 accounts
- 4.5% estimated annual participation rate
- 2 systems per meter
- $200 to $250 per participant depending on the program year
- 3 year measure life
- 50% of participants will implement changes
- 3,200 kWh average savings per system (2.5% average meter usage)

### *4.2.2 Implementation*

The program administrator will be responsible for performing the pump screening visits. If it's cost effective, existing infrastructure including the consultants who perform pump tests for IDWR may be available for this work. Individuals or firms performing the pump screening work will have to work closely with the nozzle exchange, pump testing and pivot measure portions of the programs.

Irrigation accounts such as the irrigation districts were not identified but would benefit from a pump screen as a first step toward a pump test. The overall savings available to the program will not be materially impacted by the absence of crop related water management opportunities.

## 4.3 Pump Testing

The proposed pump testing portion of the program will be a full pump test with some audit of the irrigation system. This will include measuring pump lift, flow, electrical demand and system pressures. This service goes beyond pump screening by directly measuring voltage, amps, power factor and flow.

Based on the demographics of the Idaho customers, a pump testing program is likely to have many center pivots and wells to test.

### *4.3.1 Primary Assumptions*

- 4,726 potential meters from schedule 10 accounts
- 4.5% estimated annual participation rate + 30% of pump screenings
- $300 testing cost per pump
- 7 year measure life
- About 15 of participants will implement changes
- 23,400 kWh average savings, assumes 10% Overall Pumping Efficiency (OPE) increase.
- $3,500 average pump repair cost.
- 50% cost share

### *4.3.2 Implementation*

As with other portions of the program, this portion will be delivered by the program administrator who will be responsible for finding and securing qualified contractors to perform this work. Pump tests will be performed on pumps that have been through the screening portion of the program, so coordination between each program component is necessary.

It is assumed that pump repairs and replacements will be recommended based on energy savings and eligibility. The level of cost share depends on repair cost and energy savings.

A different utility – customer cost share may have to be designed if the customer is participating in the NRCS EQIP cost sharing program, which could be up to 75%.

It is expected that the testing large lift pump stations could be done under the pump testing portion of the program.

### *4.3.3 Deep Well Turbines*

Deep well turbines are relatively simple to test, but the measurement of water levels can be misleading sometimes. If care is taken, it is recommended that deep well turbines be included in the pump testing portion of the program. The main program challenge presented by large wells is that any changes would be expensive. Utah Power needs to be careful on making specific recommendations. Possibly, the pump testing portion of the program could leave specifics to the suppliers and owner with pump test recommendations being OPE based.

Pump tests can be done whenever the pumps are running. Testing during later summer is generally preferred because most systems are operating at that time and any changes are likely not to take place until after harvest.

## 4.4 Center Pivot Equipment

Replacement of equipment specific to center pivots was not originally part of the proposed irrigation efficiency program. The Franklin Soil Water Conservation District more recently estimated the number of center pivots using aerial photographs to be 2,876 within the Idaho service territory and pivot owners expressed an interest in having easy to access incentives for equipment replacement measures. As a result the program design was modified to include prescriptive incentives for certain center pivot equipment. Eligible equipment includes replacement of sprinkler pressure regulators and low pressure drains, replacement of worn sprinkler packages and conversion to dual sprinkler nozzle packages.

### *4.4.1 Sprinkler Pressure Regulator Replacement*

Typical pressure regulators are installed before a sprinkler to provide a relatively constant pressure at the sprinkler. When regulators fail, the sprinklers may operate at higher pressures discharging more water potentially using more energy.

#### *4.4.1.1 Primary Assumptions*

- 2,876 potential center pivots
- About 125 pivots participate in multi-year program
- 17,139 pressure regulators replaced over the program life
- 4 year measure life
- 226 kWh potential energy savings per regulator (assumes a 17/64" nozzle changes from 20 to 15 PSI operating pressure). Energy savings estimates ranged from 100 to 300 kWh depending on pumping lift assumed.
- 0.44 acre-feet per year per regulator potential water savings
- 50% of regulators will not be installed or at a location that produce energy savings
- $6.50 average cost per regulator
- $2 per regulator for installation labor by owner

#### *4.4.1.2 Implementation*

Equipment suppliers should be primarily responsible for helping customers select the proper pressure regulator taking into account the flow, operating pressure, and target output pressure desired. The program administrator will develop procedures for offering these incentives, including arranging for pre and post installation inspection of the sites where this equipment is installed. Procedures will be posted on the Company web site

and data collected from the inspections will be made available to the evaluators and to assess program effectiveness.

### *4.4.2 Low Pressure Drain Replacement*

Low pressure drains are typically located near the end of each pivot span. If the drain leaks during normal pivot operation a significant amount of water can be lost or applied unnecessarily.

*4.4.2.1 Primary Assumptions*

- 2,876 potential center pivots
- 150 pivots participate (about 5%) in a multi-year program
- 1,345 low pressure drains over the life of the program
- 4 year measure life
- 732 kWh potential energy savings per drain (assumes a 4 gpm leak for 1,940 hours). Energy savings estimates ranged from 360 to 1,000 kWh depending on pumping lift assumed.
- 1.42 acre-feet per year potential water savings per drain
- 50% of drains will not be installed or at a location that produce energy savings
- $7.25 average cost per drain
- $2 per drain for installation labor by owner

*4.4.2.2 Implementation*

Equipment suppliers should be primarily responsible for helping customers select the proper low pressure drain. The program administrator will develop procedures for offering these incentives, including arranging for pre and post installation inspection of the sites where this equipment is installed. Procedures will be posted on the Company web site and data collected from the inspections will be made available to the evaluators and to assess program effectiveness.

### *4.4.3 Qualified Sprinkler Package Replacement*

This portion of the program offers to replace the existing sprinkler package with a new more efficient one. The offer is available to those with worn sprinkler packages and those who can reduce their application rate by at least 1 gallon per minute per acre. Potential candidates include old center pivots with overhead impact sprinklers, and those with an older sprinkler package that can reduce pivot flow rate.

*4.4.3.1 Primary Assumptions*

- 2,876 potential center pivots
- 136 pivots participate (about 5%) in multi-year program
- 4 year measure life
- 21,584 kWh potential energy savings (assumes a savings of 1 gpm/acre). Energy savings estimates ranged from 10,000 to 30,000 kWh depending on pumping lift assumed.
- 50% of new sprinkler packages will not be installed with pumping conditions that provide energy savings
- $3,500 average cost per new sprinkler package, with drops and regulators
- $320 installation labor cost by owner

*4.4.3.2 Implementation*

Equipment suppliers should be primarily responsible for helping customers select the proper sprinkler packages. The program administrator will develop procedures for offering these incentives, including arranging for pre and post installation inspection of the sites where this equipment is installed. Procedures will be posted on the Company web site and data collected from the inspections will be made available to the evaluators and to assess program effectiveness.

### *4.4.4 Dual Sprinkler Packages (Normal Flow and Lower Flow)*

This change includes adding a sprinkler nozzle clip and a second nozzle at each drop tube or current sprinkler position. In essence the center pivot would have two sprinkler packages, one design for irrigating during the peak conditions and another to irrigate with during low water use periods. For example: a sprinkler package designed for 5.5 gpm/acre could be used during the spring while the plants are germinating to small plants. The 5.5 gpm package would be swapped and the second set of nozzles designed for a higher application rate (i.e. 7.5 gpm/acre) would operate through the peak growing season.

*4.4.4.1 Primary Assumptions*

- 2,876 potential center pivots
- 50 pivots participate (about 2%) in a multi-year program
- 4 year measure life
- 10,792 kWh potential energy savings (assumes 7.5 gpm/acre pivot operating ¼ of the time with the lower flow sprinkler package of 5.5 gpm/acre). Energy savings estimates ranged from 5,300 to 15,000 kWh depending on pumping lift assumed.
- 50% of new sprinkler packages will not be installed with pumping/operating conditions that produce energy savings
- $500 average cost for dual sprinkler assemblies
- $40 installation labor cost by owner

*4.4.4.2 Implementation*

Equipment suppliers should be primarily responsible for helping customers select the proper sprinkler packages. The program administrator will develop procedures for offering these incentives, including arranging for pre and post installation inspection of the sites where this equipment is installed. Procedures will be posted on the Company web site and data collected from the inspections will be made available to the evaluators and to assess program effectiveness.

## 4.5 System Re-designs and Major Replacements

System design, re-design and major replacements beyond pump repairs or replacements will receive project specific engineering and incentives. These projects are expected to be the minority of participants in the program. Incentives for pump repairs, replacements and system re-designs will be calculated according to a formula that will mirror the Energy FinAnswer incentive formula. Available incentives will be similar to the Avista and Idaho Power offers for Idaho irrigation customers.

Current program discussions assume the following for system redesigns or modifications:

- 15 participants in a multi-year program
- 7 year measure life
- 46,800 kWh/yr energy savings, twice estimated for pump repairs.
- $8,000 average cost
- 50% cost share
- $1,875 average cost for engineering

## 5 ESTIMATED PROGRAM SAVINGS AND COSTS

Table 5 shows the estimated program costs and savings for each portion of the program using the primary and updated assumptions for the Idaho irrigators. All values are for program starting in the last quarter of 2005 and ending in December 2007. In reality participation rates will vary each year depending on market awareness and acceptance. More program detail is located in Appendix D.

**Table 5: Summary of Idaho Irrigation Program**

| | Nozzles | Gaskets | Drains | Pump Screen | Pump Test | Pump Rep./ Repl. | System Changes | Pivot Spk. Regulator | Pivot Drains | Repl. Sprinkler Packages | Dual Packages |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Participation | 91,324 | 36,831 | 22,827 | 586 | 375 | 15 | 15 | 17,319 | 1,345 | 136 | 50 |
| Unit or Estimated Cost | $0.68 | $1.50 | $7.50 | | | $3,500 | $8,000 | $6.50 | $7.25 | $3,500 | $500 |
| Unit Labor Cost | $0.61 | $0.61 | $1.00 | | | | | $2.00 | $2.00 | $320 | $40 |
| Testing Cost | | | | $200-250 | $300 | $150 | $1,875 | | | | |
| Unit Savings (kWh/yr) | 11.90 | 24.30 | 24.30 | 3,200 | | 23,400 | 46,800 | 113 | 366 | 10,792 | 5,396 |
| Life (years) | 4 | 4 | 4 | 3 | 7 | 7 | 7 | 4 | 4 | 4 | 4 |
| Incentive | 100% | 100% | 100% | 100% | 100% | 50% | 50% | 92% | 55% | 25% | 80% |
| Incentive | $0.68 | $1.50 | $7.50 | | | $1,750 | $4,000 | $6.00 | $4.00 | $900 | $400 |
| Total Incentives & Testing | $62,100 | $55,246 | $171,202 | $125,200 | $112,500 | $28,500 | $88,125 | $103,914 | $5,380 | $122,400 | $20,000 |
| Customer Costs | $55,707 | $22,466 | $22,827 | $ - | $ - | $26,250 | $60,000 | $43,297 | $7,061 | $397,120 | $7,000 |
| Total Savings (kWh) | 1,086,755 | 894,993 | 554,696 | 1,875,200 | - | 351,000 | 702,000 | 1,957,047 | 492,270 | 1,467,712 | 269,800 |

Annual participants in the entire proposed irrigation program offering can easily exceed 500 participants per year. Having about 4,726 meters with approximately half this many unique customers, it would take just a few years to involve a large portion of irrigation customers. This is the rationale for an initial two plus year program proposal. Irrigation customer offerings after December 2007 may be either part of the Energy FinAnswer/ FinAnswer Express suite or included in a new irrigation program designed based on results from this program.

## Appendix A: Idaho Irrigation Accounts by City

This appendix summarizes the number of irrigation sites (schedule 10) and total horsepower demand for each city. Horsepower data was generated from 3-year average metered kW from 2001 thru 2003. The data was sorted based on billing addresses. There were 128 of the 4,726 billing addresses with cities located outside Idaho. These cities are shown at the end of Appendix A.

Idaho Irrigation Accounts by City

| Billing Address by City | No. Accounts | Total June (HP) | Total July (HP) | Total August (HP) | Total September (HP) | Average August HP per account |
|---|---|---|---|---|---|---|
| ABERDEEN ID 83210 | 1 | - | - | - | - | - |
| AMMON ID 83406 | 4 | 762 | 764 | 763 | 571 | 191 |
| ARCO ID 83213 | 6 | 138 | 76 | 103 | 78 | 17 |
| ARIMO ID 83214 | 46 | 2,229 | 2,358 | 1,704 | 291 | 37 |
| ASHTON ID 83420 | 104 | 5,008 | 4,052 | 2,587 | 1,518 | 25 |
| ASHTON ID 83420 | 1 | 53 | 53 | 27 | 17 | 27 |
| BANCROFT ID 83217 | 134 | 11,780 | 10,131 | 7,385 | 4,053 | 55 |
| BERN ID 83220 | 2 | 73 | 72 | 66 | 18 | 33 |
| BLACKFOOT ID 83221 | 35 | 2,944 | 2,294 | 2,338 | 1,901 | 67 |
| BLOOMINGTON ID 83223 | 2 | 81 | 47 | 6 | 2 | 3 |
| BOISE ID 83707 | 11 | 2,831 | 2,814 | 2,454 | 1,723 | 223 |
| BOISE ID 83713 | 2 | 116 | 62 | 109 | 49 | 54 |
| BURLEY ID 83318 | 2 | 97 | 98 | 90 | 62 | 45 |
| CHESTER ID 83421 | 3 | 206 | 205 | 167 | 93 | 56 |
| CHUBBUCK ID 83202 | 10 | 498 | 512 | 463 | 420 | 46 |
| CLIFTON ID 83228 | 28 | 1,188 | 1,141 | 1,173 | 515 | 42 |
| DAYTON ID 83232 | 33 | 948 | 890 | 859 | 513 | 26 |
| DINGLE ID 83233 | 5 | 102 | 120 | 39 | - | 8 |
| DOWNEY ID 83234 | 59 | 2,043 | 2,063 | 1,370 | 582 | 23 |
| DUBOIS ID 83423 | 8 | 317 | 322 | 242 | 378 | 30 |
| DUBOIS ID 83423 | 5 | 647 | 646 | 643 | 641 | 129 |
| DUBOIS ID 83423 | 17 | 2,557 | 2,617 | 2,626 | 1,835 | 154 |
| FELT ID 83424 | 3 | 106 | 105 | 21 | 13 | 7 |
| FIRTH ID 83236 | 114 | 6,994 | 5,854 | 6,049 | 4,729 | 53 |
| FISH HAVEN ID 83287 | 1 | 43 | 64 | 63 | 62 | 63 |
| FRANKLIN ID 83237 | 15 | 395 | 319 | 243 | 61 | 16 |
| GENEVA ID 83238 | 9 | 781 | 781 | 593 | 1 | 66 |
| GRACE ID 83241 | 180 | 10,540 | 7,824 | 6,432 | 3,430 | 36 |
| HAMER ID 83425 | 264 | 34,078 | 33,975 | 31,689 | 27,488 | 120 |
| HOLBROOK ID 83243 | 12 | 861 | 775 | 906 | 427 | 76 |
| HOWE ID 83244 | 148 | 15,627 | 14,792 | 13,981 | 11,844 | 94 |
| IDAHO FALLS ID 83401 | 132 | 13,555 | 12,690 | 9,788 | 7,444 | 74 |
| IDAHO FALLS ID 83402 | 330 | 38,104 | 33,728 | 28,630 | 24,816 | 87 |
| IDAHO FALLS ID 83403 | 50 | 17,302 | 14,586 | 14,982 | 12,354 | 300 |
| IDAHO FALLS ID 83404 | 75 | 8,939 | 7,320 | 6,867 | 5,599 | 92 |
| IDAHO FALLS ID 83405 | 44 | 8,170 | 7,434 | 6,342 | 6,261 | 144 |
| IDAHO FALLS ID 83406 | 63 | 3,960 | 3,371 | 2,831 | 1,511 | 45 |
| IONA ID 83427 | 10 | 607 | 456 | 387 | 348 | 39 |
| LAVA HOT SPRINGS ID 83246 | 18 | 559 | 553 | 429 | 224 | 24 |
| LEADORE ID 83464 | 1 | 230 | 229 | 226 | 4 | 226 |

**Appendix A: Continued**

| Billing Address by City | No. Accounts | Total June (HP) | Total July (HP) | Total August (HP) | Total September (HP) | Average August HP per account |
|---|---|---|---|---|---|---|
| LEWISVILLE ID 83431 | 48 | 4,490 | 4,211 | 3,682 | 3,176 | 77 |
| MALAD ID 83252 | 12 | 1,109 | 1,065 | 964 | 580 | 80 |
| MALAD CITY ID 83252 | 93 | 6,298 | 5,511 | 5,497 | 2,616 | 59 |
| MALAD CITY ID 83252 | 2 | 136 | 118 | 113 | 116 | 56 |
| MCCAMMON ID 83250 | 13 | 431 | 409 | 390 | 143 | 30 |
| MENAN ID 83434 | 85 | 17,962 | 16,061 | 14,358 | 10,749 | 169 |
| MONTEVIEW ID 83435 | 220 | 30,611 | 28,962 | 28,075 | 21,384 | 128 |
| MONTPELIER ID 83254 | 40 | 2,085 | 1,837 | 925 | 251 | 23 |
| MUD LAKE ID 83450 | 1 | 164 | 169 | 165 | 56 | 165 |
| NAMPA ID 83687 | 1 | 322 | 294 | 126 | 1 | 126 |
| NEWDALE ID 83436 | 120 | 24,770 | 21,683 | 15,479 | 11,515 | 129 |
| OVID ID 83254 | 7 | 112 | 90 | 15 | 3 | 2 |
| PARIS ID 83261 | 8 | 226 | 233 | 140 | 29 | 18 |
| PARKER ID 83438 | 2 | 7 | 8 | 7 | 3 | 4 |
| POCATELLO ID 83201 | 4 | 255 | 175 | 76 | 110 | 19 |
| POCATELLO ID 83204 | 3 | 421 | 311 | 353 | 91 | 118 |
| PRESTON ID 83263 | 161 | 6,378 | 5,962 | 4,623 | 1,219 | 29 |
| REXBURG ID 83440 | 400 | 68,016 | 64,644 | 55,872 | 50,776 | 140 |
| REXBURG ID 83460 | 2 | 118 | 111 | 113 | 106 | 57 |
| RIGBY ID 83442 | 169 | 22,965 | 21,165 | 15,616 | 14,166 | 92 |
| RIRIE ID 83443 | 51 | 7,106 | 6,517 | 5,231 | 3,188 | 103 |
| ROBERTS ID 83444 | 94 | 15,132 | 14,264 | 10,554 | 9,631 | 112 |
| SAINT ANTHONY ID 83445 | 260 | 31,439 | 30,264 | 25,709 | 22,455 | 99 |
| SAINT CHARLES ID 83272 | 1 | 52 | 51 | 18 | - | 18 |
| SHELLEY ID 83274 | 339 | 23,503 | 20,446 | 19,765 | 14,326 | 58 |
| SODA SPRINGS ID 83276 | 12 | 398 | 431 | 197 | 75 | 16 |
| SPENCER ID 83446 | 1 | - | - | - | - | - |
| ST CHARLES ID 83272 | 2 | 91 | 24 | - | - | - |
| STONE ID 83252 | 24 | 2,038 | 2,011 | 1,595 | 404 | 66 |
| SUGAR CITY ID 83448 | 92 | 15,514 | 14,332 | 13,625 | 11,918 | 148 |
| SWANLAKE ID 83281 | 10 | 298 | 254 | 237 | 230 | 24 |
| TERRETON ID 83450 | 169 | 25,767 | 22,487 | 21,848 | 18,023 | 129 |
| TETON ID 83451 | 77 | 3,596 | 3,219 | 2,848 | 1,195 | 37 |
| TETONIA ID 83452 | 2 | 1,627 | 1,576 | 1,545 | 1,812 | 773 |
| THATCHER ID 83283 | 5 | 153 | 142 | 94 | - | 19 |
| TWIN FALLS ID 83301 | 1 | 29 | 9 | 20 | - | 20 |
| UCON ID 83454 | 3 | 89 | 64 | 30 | 38 | 10 |
| WESTON ID 83286 | 75 | 3,245 | 3,102 | 2,904 | 1,304 | 39 |
| WESTON ID 83286 | 2 | 97 | 97 | 97 | 33 | 48 |
| **Billing Addresses Outside Idaho** | | | | | | |
| ALPINE CA 91903 | 1 | - | - | - | - | - |
| ARLINGTON TX 76013 | 1 | 39 | 25 | 26 | 38 | 26 |
| BERKELEY CA 94708 | 1 | 32 | 32 | 32 | 31 | 32 |
| BALLWIN MO 63011 | 1 | 8 | - | - | - | - |
| BORDER WY 83114 | 1 | - | - | - | - | - |

**Appendix A: Continued**

| Billing Address by City | No. Accounts | Total June (HP) | Total July (HP) | Total August (HP) | Total September (HP) | Average August HP per account |
|---|---|---|---|---|---|---|
| BOUNTIFUL UT 84010 | 1 | 80 | 80 | 79 | 80 | 79 |
| BRIGHAM CITY UT 84302 | 14 | 1,608 | 1,958 | 1,577 | 446 | 113 |
| CAVE CREEK AZ 85331 | 5 | 69 | 49 | 34 | 1 | 7 |
| COALVILLE UT 84017 | 1 | 111 | 112 | 112 | - | 112 |
| COKEVILLE WY 83114 | 1 | 105 | 105 | 71 | - | 71 |
| COVE UT 84320 | 3 | 112 | 75 | 63 | 14 | 21 |
| CUPERTINO CA 95014 | 1 | 129 | 86 | - | 85 | - |
| ELLENSBURG WA 98926 | 3 | 103 | 123 | 39 | 26 | 13 |
| FARMINGTON UT 84025 | 1 | 42 | 42 | 42 | 1 | 42 |
| FRESNO CA 93711 | 1 | 91 | 91 | 90 | 29 | 90 |
| FRUIT HEIGHTS UT 84037 | 1 | 23 | 23 | 23 | 8 | 23 |
| HARRISVILLE UT 84404 | 1 | 20 | 20 | 20 | 10 | 20 |
| HERMISTON OR 97838 | 2 | 90 | 90 | 64 | 5 | 32 |
| JACKSON WY 83001 | 1 | 22 | 23 | 23 | - | 23 |
| KAYSVILLE UT 84037 | 4 | 115 | 117 | 80 | 1 | 20 |
| KENNEWICK WA 99336 | 1 | 11 | 11 | 11 | 11 | 11 |
| LAS VEGAS NV 89102 | 8 | 782 | 803 | 551 | 301 | 69 |
| LEHI UT 84043 | 1 | 19 | 22 | 9 | 13 | 9 |
| LEWISTON UT 84320 | 3 | 2,169 | 2,234 | 1,983 | - | 661 |
| LIMA MT 59739 | 1 | 48 | 49 | 33 | 32 | 33 |
| LOGAN UT 84321 | 4 | 79 | 77 | 49 | 24 | 12 |
| LOS ALAMOS NM 87544 | 1 | 21 | 21 | 21 | - | 21 |
| LYMAN WY 82937 | 2 | 98 | 74 | 36 | 19 | 18 |
| LAYTON UT 84040 | 1 | 85 | 78 | 78 | 29 | 78 |
| MESQUITE NV 89027 | 2 | 290 | 288 | 288 | 96 | 144 |
| MILLVILLE UT 84326 | 1 | 12 | 12 | 12 | 4 | 12 |
| MONTICELLO UT 84535 | 1 | 32 | 31 | - | - | - |
| NEW ORLEANS LA 70160 | 1 | - | - | - | - | - |
| NEWTON UT 84327 | 2 | 155 | 136 | 54 | - | 27 |
| NORTH LOGAN UT 84341 | 3 | 136 | 110 | 182 | 117 | 61 |
| NORTH OGDEN UT 84414 | 1 | 47 | 48 | 48 | - | 48 |
| NORTH SALT LAKE UT 84054 | 1 | 197 | 17 | - | 13 | - |
| OGDEN UT 84405 | 1 | 83 | 77 | 73 | 30 | 73 |
| OGDEN UT 84409 | 7 | 644 | 706 | 703 | 610 | 100 |
| OLYMPIA WA 98501 | 4 | 536 | 548 | 549 | 545 | 137 |
| PHOENIX AZ 85022 | 1 | 52 | 5 | - | - | - |
| PINEDALE WY 82941 | 2 | 137 | 134 | 70 | 44 | 35 |
| RICHMOND UT 84333 | 1 | 13 | - | - | - | - |
| RIVERTON UT 84065 | 1 | 15 | 15 | 15 | 15 | 15 |
| ROSEBURG OR 97470 | 2 | 95 | 87 | 86 | 36 | 43 |
| SALT LAKE CITY UT 84109 | 2 | 121 | 85 | 36 | 85 | 18 |
| SALT LAKE CITY UT 84115 | 1 | - | - | 24 | - | 24 |
| SALT LAKE CITY UT 84121 | 1 | 32 | 32 | 32 | 11 | 32 |
| SAN GABRIEL CA 91775 | 1 | 19 | 19 | 6 | - | 6 |
| SAN JOSE CA 95132 | 1 | 277 | 281 | 139 | 139 | 139 |

**Appendix A: Continued**

| Billing Address by City | No. Accounts | Total June (HP) | Total July (HP) | Total August (HP) | Total September (HP) | Average August HP per account |
|---|---|---|---|---|---|---|
| SAN RAMON CA 94583 | 1 | 24 | 20 | 15 | 0 | 15 |
| SANDY UT 84092 | 1 | 209 | 278 | 276 | - | 276 |
| SEDALIA CO 80135 | 1 | 66 | 66 | 44 | 42 | 44 |
| SEVERNA PARK MD 21146 | 1 | 70 | 70 | 49 | 72 | 49 |
| SMITHFIELD UT 84335 | 1 | 338 | 338 | 339 | 336 | 339 |
| SMITHFIELD UT 84335 | 1 | 273 | 273 | 138 | 150 | 138 |
| SNOWVILLE UT 84336 | 4 | 544 | 539 | 467 | 114 | 117 |
| SOUTH JORDAN UT 84095 | 1 | 21 | 22 | 9 | - | 9 |
| SURPRISE AZ 85374 | 2 | 315 | 302 | 272 | 272 | 136 |
| UNION OR 97883 | 1 | 37 | 38 | 37 | 27 | 37 |
| WALNUT CREEK CA 94597 | 6 | 542 | 532 | 537 | 327 | 90 |
| WAMSUTTER WY 82336 | 1 | 36 | 36 | 13 | - | 13 |
| WENATCHEE WA 98802 | 1 | 35 | 35 | 23 | - | 23 |
| WEST JORDAN UT 84084 | 1 | 65 | 63 | 42 | 24 | 42 |
| WILLARD UT 84340 | 1 | 75 | 76 | 74 | 87 | 74 |
| Total | 4,726 | 524,173 | 480,238 | 418,379 | 327,998 | |
| | | | | | Weighted Ave. | 89 |

## Appendix B: County Demographics of Idaho Irrigation Customers

**2002 Census of Agriculture: County Summary**

| County | Bannock | Bear Lake | Bingham | Bonneville | Butte | Caribou | Clark |
|---|---|---|---|---|---|---|---|
| Irrigated Farms (#) | 644 | 271 | 979 | 690 | 145 | 198 | 32 |
| Irrigated Land, Acres | 55,177 | 43,499 | 322,801 | 141,823 | 58,258 | 67,219 | 31,085 |
| Irrigated Pasture, Acres | 8,393 | 5,645 | 24,817 | 10,167 | 10,687 | 9,330 | 3,063 |
| Potatoes, Acres | 6,324 | - | 68,767 | 29,436 | 1,161 | 6,468 | |
| Forage, hay and haylage, Acres | 30,407 | 47,844 | 72,969 | 36,510 | 35,237 | 28,854 | 16,696 |
| Sugarbeets for sugar, Acres | - | - | 25,574 | - | - | - | - |
| Vegetables, Acres | 26 | - | - | - | - | - | - |
| Orchards, Acres | 25 | - | 24 | 29 | - | - | - |
| Cattle and Calves, # | 20,892 | | 64,689 | 75,193 | 15,676 | 29,862 | 8,745 |

**Estimated Idaho Irrigation Customers From Census Data**

| County | Bannock | Bear Lake | Bingham | Bonneville | Butte | Caribou | Clark |
|---|---|---|---|---|---|---|---|
| % of Irrigation Served | 60% | 80% | 25% | 30% | 10% | 40% | 95% |
| Irrigated Farms (#) | 386 | 217 | 245 | 207 | 15 | 79 | 30 |
| Irrigated Land, Acres | 33,106 | 34,799 | 80,700 | 42,547 | 5,826 | 26,888 | 29,531 |
| Irrigated Pasture, Acres | 5,036 | 4,516 | 6,204 | 3,050 | 1,069 | 3,732 | 2,910 |
| Potatoes, Acres | 3,794 | - | 17,192 | 8,831 | 116 | 2,587 | - |
| Forage, hay and haylage, Acres | 18,244 | 38,275 | 18,242 | 10,953 | 3,524 | 11,542 | 15,861 |
| Sugarbeets for sugar, Acres | - | - | 6,394 | - | - | - | - |
| Vegetables, Acres | 16 | - | - | - | - | - | - |
| Orchards, Acres | 15 | - | 6 | 9 | - | - | - |

| **Irrigation Method** | | Bannock | Bear Lake | Bingham | Bonneville | Butte | Caribou | Clark |
|---|---|---|---|---|---|---|---|---|
| Center Pivot | | 33% | 15% | 33% | 33% | 33% | 20% | 33% |
| Side Roll | | 18% | 18% | 18% | 18% | 18% | 40% | 18% |
| Hand Move | | 16% | 15% | 16% | 16% | 16% | 30% | 16% |
| Solid Set | | 2% | 2% | 2% | 2% | 2% | 5% | 2% |
| Liner/Big Gun | | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Gravity | | 31% | 50% | 31% | 31% | 31% | 5% | 31% |
| Drip | | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| **Acres by Method** | | | | | | | | |
| Center Pivot | | 10,866 | 5,220 | 26,487 | 13,965 | 1,912 | 5,378 | 9,693 |
| Side Roll | | 5,996 | 6,303 | 14,617 | 7,706 | 1,055 | 10,755 | 5,349 |
| Hand Move | | 5,226 | 5,220 | 12,740 | 6,717 | 920 | 8,066 | 4,662 |
| Solid Set | | 643 | 676 | 1,567 | 826 | 113 | 1,344 | 573 |
| Liner/Big Gun | | 38 | 40 | 93 | 49 | 7 | 31 | 34 |
| Gravity | | 10,325 | 17,400 | 25,169 | 13,269 | 1,817 | 1,344 | 9,210 |
| Drip | | 11 | 12 | 27 | 14 | 2 | 9 | 10 |
| **# Systems** | **Ac./Each** | | | | | | | |
| Center Pivot | 120 | 91 | 43 | 221 | 116 | 16 | 45 | 81 |
| Side Roll | 26.7 | 225 | 236 | 548 | 289 | 40 | 403 | 201 |
| Hand Move | 20 | 261 | 261 | 637 | 336 | 46 | 403 | 233 |
| Solid Set | 20 | 32 | 34 | 78 | 41 | 6 | 67 | 29 |
| Liner/Big Gun | 20 | 2 | 2 | 5 | 2 | 0 | 2 | 2 |
| Gravity | 120 | 86 | 145 | 210 | 111 | 15 | 11 | 77 |
| Drip | 20 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |

## Appendix B: Continued

**2002 Census of Agriculture: County Summary** 9/13/2004

| County | Franklin | Fremont | Jefferson | Lemhi | Madison | Oneida | Teton | Total |
|---|---|---|---|---|---|---|---|---|
| Irrigated Farms (#) | 441 | 336 | 669 | 270 | 382 | 229 | 193 | 5,479 |
| Irrigated Land, Acres | 46,155 | 103,065 | 202,620 | 75,153 | 115,750 | 32,487 | 55,715 | 1,350,807 |
| Irrigated Pasture, Acres | 6,909 | 13,659 | 13,335 | 36,783 | 5,086 | 2,900 | 9,581 | 160,355 |
| Potatoes, Acres | - | 24,351 | 27,788 | | 34,617 | - | 7,066 | 205,978 |
| Forage, hay and haylage, Acres | 39,919 | 19,061 | 97,958 | 38,647 | 17,039 | 33,856 | 18,779 | 533,776 |
| Sugarbeets for sugar, Acres | - | - | - | - | - | - | - | 25,574 |
| Vegetables, Acres | | - | | | - | | 9 | 35 |
| Orchards, Acres | | - | | 23 | | - | | 101 |
| Cattle and Calves, # | 39,886 | 13,411 | 65,844 | 41,313 | 15,081 | 21,914 | 10,867 | 423,373 |

**Estimated Idaho Irrigation Customers From Census Data**

| County | Franklin | Fremont | Jefferson | Lemhi | Madison | Oneida | Teton | Total |
|---|---|---|---|---|---|---|---|---|
| % of Irrigation Served | 100% | 25% | 85% | 5% | 100% | 60% | 15% | |
| Irrigated Farms (#) | 441 | 84 | 569 | 14 | 382 | 137 | 29 | 1,069 |
| Irrigated Land, Acres | 46,155 | 25,766 | 172,227 | 3,758 | 115,750 | 19,492 | 8,357 | 196,978 |
| Irrigated Pasture, Acres | 6,909 | 3,415 | 11,335 | 1,839 | 5,086 | 1,740 | 1,437 | 19,875 |
| Potatoes, Acres | - | 6,088 | 23,620 | - | 34,617 | - | 1,060 | 29,933 |
| Forage, hay and haylage, Acres | 39,919 | 4,765 | 83,264 | 1,932 | 17,039 | 20,314 | 2,817 | 89,238 |
| Sugarbeets for sugar, Acres | - | - | - | - | - | - | - | |
| Vegetables, Acres | - | - | - | - | - | - | 1 | |
| Orchards, Acres | - | - | - | 1 | - | - | - | 30 |

| Irrigation Method | | Franklin | Fremont | Jefferson | Lemhi | Madison | Oneida | Teton | Total |
|---|---|---|---|---|---|---|---|---|---|
| Center Pivot | | 20% | 33% | 33% | 33% | 33% | 33% | 33% | |
| Side Roll | | 40% | 18% | 18% | 18% | 18% | 18% | 18% | |
| Hand Move | | 30% | 16% | 16% | 16% | 16% | 16% | 16% | |
| Solid Set | | 5% | 2% | 2% | 2% | 2% | 2% | 2% | |
| Liner/Big Gun | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| Gravity | | 5% | 31% | 31% | 31% | 31% | 31% | 31% | |
| Drip | | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| **Acres by Method** | | | | | | | | | |
| Center Pivot | | 9,231 | 8,457 | 56,528 | 1,233 | 37,991 | 6,398 | 2,743 | 58,450 |
| Side Roll | | 18,462 | 4,667 | 31,194 | 681 | 20,965 | 3,530 | 1,514 | 35,677 |
| Hand Move | | 13,847 | 4,068 | 27,190 | 593 | 18,274 | 3,077 | 1,319 | 30,823 |
| Solid Set | | 2,308 | 500 | 3,345 | 73 | 2,248 | 379 | 162 | 3,825 |
| Liner/Big Gun | | 53 | 30 | 198 | 4 | 133 | 22 | 10 | 227 |
| Gravity | | 2,308 | 8,036 | 53,714 | 1,172 | 36,100 | 6,079 | 2,606 | 67,980 |
| Drip | | 16 | 9 | 59 | 1 | 39 | 7 | 3 | 67 |
| **# Systems** | **Ac./Each** | | | | | | | | |
| Center Pivot | 120 | 77 | 70 | 471 | 10 | 317 | 53 | 23 | 487 |
| Side Roll | 26.7 | 692 | 175 | 1,170 | 26 | 786 | 132 | 57 | 1,338 |
| Hand Move | 20 | 692 | 203 | 1,359 | 30 | 914 | 154 | 66 | 1,541 |
| Solid Set | 20 | 115 | 25 | 167 | 4 | 112 | 19 | 8 | 191 |
| Liner/Big Gun | 20 | 3 | 1 | 10 | 0 | 7 | 1 | 0 | 11 |
| Gravity | 120 | 19 | 67 | 448 | 10 | 301 | 51 | 22 | 566 |
| Drip | 20 | 1 | 0 | 3 | 0 | 2 | 0 | 0 | 3 |

**Idaho Nozzle Program** 4/29/2005

**Maximum Number of Systems Available to Participate**

| | Number Nozzles per | # Systems Total | Total # Nozzles |
|---|---|---|---|
| Side Roll | 33 | 1,338 | 44,150 |
| Hand Move | 33 | 1,541 | 50,858 |
| Solid Set | 545 | 191 | 95,009 |
| Total | | 3,070 | 190,017 |

**Estimated Number of Irrigation Customers (Schedule 10)**

| | |
|---|---|
| # of Irrigation Sites | 4,726 |

| **Estimated Costs:** | | | | % of Systems |
|---|---|---|---|---|
| **Standard Brass Nozzles:** | | | | |
| Cost Per Nozzle | $ | 0.55 | Wholesale around $0.39. | |
| Labor Cost Per Nozzle | $ | 0.61 | $10/hour for 2 hours per system | |
| Number Nozzles Per System | | 33 | | |
| Nozzle Cost Per System | $ | 18.15 | | 80% |
| Labor Cost Per System | $ | 20.13 | | |
| **Flow Control Nozzles:** | | | | |
| Cost Per Nozzle | $ | 3.82 | List Price from Nelson 2002 | |
| Labor Cost Per Nozzle | $ | 0.61 | $10/hour for 2 hours per system | |
| Number Nozzles Per System | | 33 | | |
| Nozzle Cost Per System | $ | 126.06 | | 10% |
| Labor Cost Per System | $ | 20.13 | | |
| **Solid Set with Brass Nozzles** | | | | |
| Cost Per Nozzle | $ | 0.55 | Wholesale around $0.39. | |
| Labor Cost Per Nozzle | $ | 0.61 | Same as standard | |
| Number Nozzles Per System | | 545 | | |
| Nozzle Cost Per System | $ | 299.75 | | 10% |
| Labor Cost Per System | $ | 332.45 | | |

**Appendix C: Energy Savings Calculations**

## Appendix C: Continued

| Energy Trust Assumptions: | | Idaho Irrigation Accounts: Using Trust Assumptions | | Using New Assumptions | |
|---|---|---|---|---|---|
| Sites | | 4,726 | | 4,726 | |
| Participation Rate, % of Sites | 9% | 9% | | 4.5% | |
| Number of Participants | 200 | 425 | | 213 | |
| Number of Systems per Participant | 2 | 2 | | 2 | |
| Number of Systems | 400 | 851 | 27.7% of Systems | 425 | |
| Total Number of Nozzles | | | | 35,814 | |
| Average # of Nozzles Per System | | | | 84 | Ave. Cost |
| Nozzle Cost Per System | $ 20 | $ 20.00 | | $ 57.10 | $ 0.68 |
| Labor Cost Per System | $ 30 | $ 30.00 | | $ 51.36 | $ 0.61 |
| Savings per system, kWh | 1,815 | 1,815 | | 1,504 | |
| Life, Years | 3 | 3 | | 4 | |
| Potential Savings per Nozzle, kWh | | | | 17.9 | |
| % of Nozzles Installed | 67% | 67% | | 67% | |
| Annual Savings, kWh | 484,000 | 1,029,323 | | 426,370 | |
| Annual Savings Per Nozzle, kWh | | | | 11.9 | |
| Total Nozzle Cost | $ 8,000 | $ 17,014 | | $ 24,287 | |
| Total Customer Cost | | | | $ 21,846 | Assumes all nozzles installed |

| Estimated Energy Savings | | Nozzle Diam. (inches) | Avg. Press. (psi) | Flow per Sprinkler (gpm) | Demand* KW/Nozzle | System # Spk. | Op. Hours | System KW | System KWH | System Flow (GPM) | System Acre-Feet |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Worn 1 Size | 5/32 worn to 11/64 | 0.1719 | 45.0 | 5.86 | 0.191 | 33 | 1940 | 6.30 | 12,227 | 193 | 69.1 |
| Worn 2 Sizes | 5/32 worn to 3/16 | 0.1875 | 45.0 | 6.97 | 0.227 | 33 | 1940 | 7.50 | 14,546 | 230 | 82.1 |
| New Nozzle | 5/32 | 0.1563 | 50.0 | 5.12 | 0.186 | 33 | 1940 | 6.13 | 11,883 | 169 | 60.4 |
| Worn 1 Size | | | | Savings | 0.005 | | Savings | 0.18 | 344 | 24 | 9 |
| Worn 2 Sizes | | | | Savings | 0.042 | | Savings | 1.37 | 2,663 | 61 | 22 |
| | | | | | | | | Average | 1,504 | 42.6 | 15.2 |

* 60% pumping eff. assumed

## Appendix C: Continued

**Idaho Pump Screening Program**

| | Energy Trust Assumptions | Idaho Irrigation Accounts Using Trust Asssumptions | Using New Asssumptions |
|---|---|---|---|
| | For Klamath | 4,726 sites | 4,726 sites |
| Participants | 9% | 9% | 4.5% |
| Participants | 186 | 425 | 213 |
| # Systems per Participant | | | 2 |
| # Systems | | | 425 |
| Participants that change | | | 50% |
| Systems that change | | | 213 |
| Life of Measures | 3 years | 3 Years | 3 Years |
| Cost | $ 360 | $ 360 | $ 250 |
| Energy Savings | 6,000 kWh | 6,000 kWh | 3,200 kWh |
| Total Annual Savings | 1,116,000 kWh | 2,552,040 kWh | 680,544 kWh |
| Annual Incentive Cost | $ 66,960 | $ 153,122 | $ 53,168 |

**Possible Savings Opportunites**

| | | |
|---|---|---|
| Irrigation Scheduling | 5% | |
| Proper Pump Operation | 0% | Possible demand savings |
| Refer to Pump Testing | 0% | Savings under pump testing |
| Nozzle Replacement | 0% | Savings under nozzle exchange |
| Addressing Leaks/Problems | 0% | Fixing leaks: sprinklers, drains and gaskets |
| Total | 5.0% | for two systems |

| **Average Usage per Site** | # Sites | Total MWH | Average kWh | Savings % | Per System Savings kWh |
|---|---|---|---|---|---|
| Schedule 10 Accounts | 4,726 | 606,460 | 128,324 | 2.50% | 3,208 |

**Estimated Savings for Drains and Gaskets**

Original savings was estimated at 5% per system site with 2 systems.

| | | |
|---|---|---|
| From above, savings is about | 2.50% | per system for drains and gaskets |
| Dividing equally | 1.25% | for fixing drains |
| | 1.25% | for fixing gaskets |
| Estimated Savings is | 1,604 | kWh for drains |
| and | 1,604 | kWh for gaskets |
| Number of drains replaced | 33 | per system for wheel lines |
| Number of gaskets replaced | 33 | per system |
| Potential Savings per drain | 48.61 | kWh |
| Potential Savings per gasket | 48.61 | kWh |

***Check of Savings from Leaking Drains and Gaskets***

| Initial Leak GPM | Proposed Leak GPM | Operating Hours | Pump Operating PSI | Savings GPM | Savings Acre-Feet | Savings kW | Savings kWh |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 1,940 | 65 | 1 | 0.357 | 0.047 | 91 |

***Primary Assumptions:***

Pumping efficiency 60% with no pumping lift

Pump discharge pressure is constant

## Appendix C: Continued

**Idaho Pump Testing Program**

| | Energy Trust Assumptions | Idaho Irrigation Accounts Using Trust Assumptions | Idaho Irrigation Accounts Using New Assumptions |
|---|---|---|---|
| Sites | 2030 | 4,726 | 4,726 |
| Participation Rate | 4.5% | 4.5% | 1.0% |
| 50% of Irrig. Dist. & USBR pumps | 91 | 213 Sites | 47 Sites |
| + 30% of Screening | 56 | 128 | 64 |
| Total Sites | 146 | 340 | 111 |
| Cost per Test | $ 400 | $ 400 | $ 300 |
| Repair/Replacement Participation | 15% | 15% | 5% |
| Repair/Replacement Participation | 22 | 51 | 6 |
| Savings per Pump, kWh | 14,384 | 14,384 | 23,400 |
| Life, Year | 7 | 7 | 7 |
| Repair Cost | $ 1,200 | $ 1,200 | $ 3,500 |
| Incentive | 50% | 50% | 50% |
| Incentive | $ 600 | $ 600 | $ 1,750 |
| Total Incentive | $ 13,140 | $ 30,624 | $ 9,718 |
| Total Savings, kWh | 315,010 | 734,171 | 129,941 |
| Total Incentive Cost | $ 71,540 | $ 166,733 | $ 43,036 |
| Total Customer Cost | $ 13,140 | $ 30,624 | $ 9,718 |

**Estimate of Energy Savings**

| Average HP | kW | Op Hours | kWh | Pre-Test Efficiency | Proposed Efficiency | Savings kW | Savings kWh |
|---|---|---|---|---|---|---|---|
| 89 | 66.394 | 1,940 | 128,804 | 45% | 55% | 12.07 | 23,419 |

## Appendix C: Continued

**Potential Energy Savings Opportunities for Center Pivots**
**Estimated Savings and Cost**

6/16/2005

### 1 Pressure Regulator Replacement

| Ave. Sprinkler diameter | Initial Conditions Sprinkler PSI | Initial Conditions Flow GPM | Proposed Conditions Sprinkler PSI | Proposed Conditions Flow GPM | Savings GPM | Savings Acre-Feet | Operating Hours | Savings kW | Savings kWh | Estimated Purchase Cost | Estimated Install Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17/64 | 20 | 9.22 | 15 | 7.98 | 1.23 | 0.441 | 1,940 | 0.058 | 113 | $ 6.50 | $ 2.00 |
| 17/64 | 20 | 9.22 | 15 | 7.98 | 1.23 | 0.441 | 1,940 | 0.161 | 312 | | |

**Primary Assumptions:**
Pump discharge pressure 65 psi before and after.
Pumping efficiency 60% with no pumping lift
Sprinkler diameter taken at 2/3 length of 1,340' pivot with 7.5 gpm/acre package (about 143 sprinklers)
Pressure regulator designed for 25 PSI minimum input pressure and 20 PSI out.
Shaded Values: Assume 65% pumping efficiency with 300 feet of lift

### 2 Replacing Leaking, Low Pressure Drains

| Initial Flow GPM | Proposed Flow GPM | Operating Hours | Pump Operating PSI | Savings GPM | Savings Acre-Feet | Savings kW | Savings kWh | Estimated Purchase Cost | Estimated Install Cost |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 0 | 1,940 | 65 | 4 | 1.429 | 0.2 | 366 | $ 7.25 | $ 2.00 |
| 4 | 0 | 1,940 | 65 | 4 | 1.429 | 0.5 | 1,012 | $ 7.25 | $ 2.00 |

**Primary Assumptions:**
Pumping efficiency 60% with no pumping lift
Pump discharge pressure is constant, pressure adjustment made
Sprinkler package with sprinklers, regulators, drop hoses and side booms on end towers
Shaded Values: Assume 65% pumping efficiency with 300 feet of lift

## Appendix C: Continued

### 3 Replacement of Worn Sprinkler Package or Reducing Flow

| Initial GPM/Acre | Proposed GPM/Acre | Irrigated acres | Initial Flow GPM | Proposed Flow GPM | Operating Hours | Pump Operating PSI | Savings GPM | Savings kW | Savings kWh | Estimated Cost | Estimated Labor |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.5 | 7.5 | 118 | 1003 | 885 | 1,940 | 65 | 118 | 5.6 | 10,792 | $ 3,500 | $ 320 |
| 8.5 | 7.5 | 118 | 1003 | 885 | 1,940 | 65 | 118 | 15.4 | 29,866 | $ 3,500 | $ 320 |

42.16 Acre-Feet Savings

**Primary Assumptions:**
Pumping efficiency 60%
Pump discharge pressure is constant
Costs assume sprinkler package with sprinklers and regulators
Shaded Values: Assume 65% pumping efficiency with 300 feet of lift

### 4 Dual Sprinkler Packages (Two Sets of Nozzles)

| | Flow GPM/Acre | Irrigated acres | Flow GPM | Operating Hours | Pump Operating PSI | Demand kW | Usage kWh | Pumped Acre-Feet | Estimated Cost | Estimated Labor |
|---|---|---|---|---|---|---|---|---|---|---|
| Existing | 7.5 | 118 | 885 | 1,940 | 65 | 41.7 | 80,940 | 316.2 | | |
| Spring & Fall | 5.5 | 118 | 649 | 485 | 65 | 30.6 | 14,839 | 58.0 | $ 500 | $ 40 |
| Summer | 7.5 | 118 | 885 | 1,455 | 65 | 41.7 | 60,705 | 237.1 | | |
| | | | | | | Total | 75,544 | 295.1 | | |
| | | | | | | Savings | 5,396 | 21.1 | | |

**Primary Assumptions:**
Pumping efficiency 60%
Pump discharge pressure is constant
System operates 1/4 of time with lower flow sprinkler package.
Cost for new nozzles and clips, labor est. $10/hr for 4 hours
Shaded Values: Assume 65% pumping efficiency with 300 feet of lift

| | Flow GPM/Acre | Irrigated acres | Flow GPM | Operating Hours | Pump Operating PSI | Demand kW | Usage kWh | Pumped Acre-Feet | Estimated Cost | Estimated Labor |
|---|---|---|---|---|---|---|---|---|---|---|
| Existing | 7.5 | 118 | 885 | 1,940 | 65 | 115.5 | 223,992 | 316.2 | | |
| Spring & Fall | 5.5 | 118 | 649 | 485 | 65 | 84.7 | 41,065 | 58.0 | $ 2,500 | $ 160 |
| Summer | 7.5 | 118 | 885 | 1,455 | 65 | 115.5 | 167,994 | 237.1 | | |
| | | | | | | Total | 209,059 | 295.1 | | |
| | | | | | | Savings | 14,933 | 21.1 | | |

## Appendix D: Summary of Idaho Irrigation Efficiency Program

| | | | | |
|---|---|---|---|---|
| *Summary of Idaho Irrigation Efficiency Program* | | | | rev 8-31-05 |
| | | | **Savings Estimates (per unit)** | |
| | | | | **Nozzles, Gaskets and Drains** |
| | | | 11.90 | kWh/yr deemed savings per nozzle |
| | | | 24.30 | kWh/yr deemed savings per gasket |
| | | | 24.30 | kWh/yr deemed savings per drain |
| | | | 3,200.00 | kWh/yr deemed savings per irrigation management consultation |
| | | | 23,400.00 | Estimated kWh/yr savings per pump repair/replacement |
| | | | 46,800.00 | Estimated kWh/yr savings for system redesigns/modification |
| | | | | **Center Pivot Equipment** |
| | | | 113.00 | kWh/yr deemed savings per sprinkler pressure regulator |
| | | | 366.00 | kWh/yr deemed savings per low pressure drain |
| | | | 10,792.00 | kWh/yr deemed savings per replacement sprinkler package |
| | | | 5,396.00 | kWh/yr deemed savings per dual sprinkler package |
| bal 05 | 2006 | 2007 | **Estimated Program Participation** | |
| **yr1** | **yr 2** | **yr 3** | **Total** | |
| 5,372.00 | 42,976.00 | 42,976.00 | 91,324.0 | Est. Number of Nozzles |
| 1,343.00 | 17,744.00 | 17,744.00 | 36,831.0 | Est. Number of Gaskets |
| 1,343.00 | 10,742.00 | 10,742.00 | 22,827.0 | Est. Number of Drains |
| 10.00 | 320.00 | 256.00 | 586.0 | Estimated Number of Checks/Irr. Management |
| 10.00 | 207.00 | 158.00 | 375.0 | Estimated Number of Pump Tests |
| - | 8.00 | 7.00 | 15.0 | Number of pump repairs (5% of tests) |
| - | 8.00 | 7.00 | 15.0 | Est. Number of System Redesigns/Mod. |
| 1,213.00 | 8,053.00 | 8,053.00 | 17,319.0 | Est. Number of Pivot Sprinkler Pressure Regulators |
| 159.00 | 593.00 | 593.00 | 1,345.0 | Est. Number of Pivot Low Pressure Drains |
| 6.00 | 65.00 | 65.00 | 136.0 | Est. Number of Replacement Sprinkler Packages |
| 4.00 | 23.00 | 23.00 | 50.0 | Est. Number of Dual Sprinkler Packages |
| | | | **Energy Savings** | |
| **yr1** | **yr 2** | **yr 3** | **Total** | |
| 63,926.80 | 511,414.40 | 511,414.40 | 1,086,755.6 | kWh for Nozzles |
| 32,634.90 | 431,179.20 | 431,179.20 | 894,993.3 | kWh for Gaskets |
| 32,634.90 | 261,030.60 | 261,030.60 | 554,696.1 | kWh for Drains |
| 32,000.00 | 1,024,000.00 | 819,200.00 | 1,875,200.0 | kWh for Checks/Irr. Management |
| - | 187,200.00 | 163,800.00 | 351,000.0 | kWh for Pump Repairs |
| - | 374,400.00 | 327,600.00 | 702,000.0 | kWh for System Redesigns/Modifications |
| 137,069.00 | 909,989.00 | 909,989.00 | 1,957,047.0 | kWh for Pivot Sprinkler Pressure Regulators |
| 58,194.00 | 217,038.00 | 217,038.00 | 492,270.0 | kWh for Pivot Low Pressure Drains |
| 64,752.00 | 701,480.00 | 701,480.00 | 1,467,712.0 | kWh for Replacement Sprinkler Packages |
| 21,584.00 | 124,108.00 | 124,108.00 | 269,800.0 | kWh for Dual Sprinkler Packages |
| 442,795.60 | 4,741,839.20 | 4,466,839.20 | 9,651,474.0 | total kWh savings |
| 0.051 | 0.541 | 0.510 | 1.102 | total aMW savings |
| | | | | |

| | | | | |
|---|---|---|---|---|
| | | | **Program Costs (per unit)** | |
| | | | | **Nozzles, Gaskets and Drains** |
| | | | $ 0.68 | material cost per nozzle |
| | | | $ 1.50 | material cost per gasket |
| | | | $ 7.50 | material cost per drain |
| | | | $ 0.61 | labor cost per nozzle |
| | | | $ 0.61 | labor cost per gasket |
| | | | $ 1.00 | labor cost per drain |
| | | | | **Pump Check and Irrg. Mgmt. Consultation** |
| | $ 200.00 | $ 223.44 | $ 250.00 | cost of check and consultation - yr 1, year 2 blended at $223.44, year 3 @ $200 |
| | | | | **Pump Tests** |
| | | | $ 300.00 | cost of pump test |
| | | | $ 150.00 | cost of retest |
| | | | $ 1,750.00 | average pump repair/replacement incentive |
| | | | $ 3,500.00 | average pump repair/replacement cost |
| | | | | **System Redesigns/Modifications** |
| | | | $ 1,875.00 | cost of engineering analysis |
| | | | $ 4,000.00 | average incentive for system modifications |
| | | | $ 8,000.00 | average cost of system modification |
| | | | | **Center Pivot Equipment Costs** |
| | | | $ 6.50 | material cost per pressure regulator |
| | | | $ 2.00 | labor cost per pressure regulator |
| | | | $ 7.25 | material cost per drain |
| | | | $ 2.00 | labor cost per drain |
| | | | $ 3,500.00 | material cost per replacement sprinkler package |
| | | | $ 320.00 | labor cost per replacement sprinkler package |
| | | | $ 500.00 | material cost per dual sprinkler nozzles |
| | | | $ 40.00 | labor cost per dual sprinkler package |
| | | | | **Center Pivot Equipment Incentives** |
| | | | $ 6.00 | Pressure Regulators |
| | | | $ 4.00 | Low Pressure Drains |
| | | | $ 900.00 | Replacement Sprinkler Packages |
| | | | $ 400.00 | Dual Sprinkler Packages |
| | | | | |

| yr 1 | yr 2 | yr 3 | Total | PMC contract NTE program costs |
|---|---|---|---|---|
| $ 3,652.96 | $ 29,223.68 | $ 29,223.68 | $ 62,100.32 | Nozzle incentive (100% of material cost, customer provides labor to replace) |
| $ 2,014.50 | $ 26,616.00 | $ 26,616.00 | $ 55,246.50 | Gasket incentive (100% of material cost, customer provides labor to replace) |
| $ 10,072.50 | $ 80,565.00 | $ 80,565.00 | $ 171,202.50 | Drain incentive (100% of material cost, customer provides labor to replace) |
| $ 2,500.00 | $ 71,500.80 | $ 51,200.00 | $ 125,200.80 | Total Cost of Pump Checks/Irr. Consultation |
| $ 3,000.00 | $ 62,100.00 | $ 47,400.00 | $ 112,500.00 | Total Cost of Pump Tests |
| $ - | $ 1,200.00 | $ 1,050.00 | $ 2,250.00 | Total Cost of Re-tests |
| $ - | $ 14,000.00 | $ 12,250.00 | $ 26,250.00 | Total Incentives for Pump Repair/Replacement |
| $ - | $ 15,000.00 | $ 13,125.00 | $ 28,125.00 | Total Cost for System Redesigns/Modifications Analysis |
| $ - | $ 32,000.00 | $ 28,000.00 | $ 60,000.00 | Total Incentives for Redesigns/Modifications |
| $ 7,278.00 | $ 48,318.00 | $ 48,318.00 | $ 103,914.00 | Pressure Regulator Incentives |
| $ 636.00 | $ 2,372.00 | $ 2,372.00 | $ 5,380.00 | Pivot Drain Incentives |
| $ 5,400.00 | $ 58,500.00 | $ 58,500.00 | $ 122,400.00 | Replacement Sprinkler Packages Incentives |
| $ 1,600.00 | $ 9,200.00 | $ 9,200.00 | $ 20,000.00 | Dual Sprinkler Package Incentives |
| $ 28,600.00 | $ 1,680.00 | $ 1,180.00 | $ 31,460.00 | program design |
| $ 13,000.00 | $ 44,325.00 | $ 44,325.00 | $ 101,650.00 | marketing & outreach |
| $ - | $ 38,425.00 | $ 38,425.00 | $ 76,850.00 | tracking and reporting, evaluation support |
| $ 3,250.00 | $ 28,700.00 | $ 28,700.00 | $ 60,650.00 | nozzle & pivot measure program mgmt |
| $ 81,003.96 | $ 563,725.48 | $ 520,449.68 | $ 1,165,179.12 | PMC contract NTE |
| | | | | |
| | | | | |
| $ 15,000.00 | $ 15,000.00 | $ 15,000.00 | $ 45,000.00 | utility staff |
| $ 96,003.96 | $ 578,725.48 | $ 535,449.68 | $ 1,210,179.12 | utility costs paid directly by Utah Power |
| | | | | |
| $ 5,000.00 | $ 5,000.00 | $ 5,000.00 | $ 15,000.00 | Company marketing (not part of PMC contract) |
| $ 5,000.00 | $ 7,500.00 | $ 7,500.00 | $ 20,000.00 | QA (not part of PMC contract) |
| $ 3,000.00 | $ 20,000.00 | $ 20,000.00 | $ 43,000.00 | impact & process evaluation |
| $ 13,000.00 | $ 32,500.00 | $ 32,500.00 | $ 78,000.00 | |
| | | | | |
| | | | | **Incentives summary** |
| $ 15,739.96 | $ 136,404.68 | $ 136,404.68 | $ 288,549.32 | Nozzles, Gasket and Drains |
| $ - | $ 14,000.00 | $ 12,250.00 | $ 26,250.00 | Pump repairs |
| $ - | $ 32,000.00 | $ 28,000.00 | $ 60,000.00 | System Redesigns and Modifications |
| $ 7,914.00 | $ 50,690.00 | $ 50,690.00 | $ 109,294.00 | Regulators and Pivots Drains |
| $ 7,000.00 | $ 67,700.00 | $ 67,700.00 | $ 142,400.00 | Pivot Sprinkler Packages |
| $ 30,653.96 | $ 300,794.68 | $ 295,044.68 | $ 626,493.32 | Total incentives |
| | | | | |
| | | | | **Program management contractor fees (excluding nozzle incentives)** |
| $ 3,000.00 | $ 63,300.00 | $ 48,450.00 | $ 114,750.00 | Pump testing (includes retests) |
| $ 2,500.00 | $ 71,500.80 | $ 51,200.00 | $ 125,200.80 | Pump Check/Irr. Management Consultations |
| $ - | $ 15,000.00 | $ 13,125.00 | $ 28,125.00 | System Redesign/Modification Engineering Analysis |
| $ 44,850.00 | $ 113,130.00 | $ 112,630.00 | $ 270,610.00 | program management |
| $ 50,350.00 | $ 262,930.80 | $ 225,405.00 | $ 538,685.80 | total |
| | | | | |
| | | | | **Utility program management costs** |
| $ 5,000.00 | $ 5,000.00 | $ 5,000.00 | $ 15,000.00 | Marketing and web site |
| $ 8,000.00 | $ 27,500.00 | $ 27,500.00 | $ 63,000.00 | QA and evaluation |
| $ 15,000.00 | $ 15,000.00 | $ 15,000.00 | $ 45,000.00 | staff |
| $ 28,000.00 | $ 47,500.00 | $ 47,500.00 | $ 123,000.00 | total |
| | | | | |
| | | | | |
| $ 109,003.96 | $ 611,225.48 | $ 567,949.68 | $ 1,288,179.12 | Total utility cost (including incentives) |
| | | | $ 0.1335 | Total utility cost/kwh |
| | | | $ 1,169,194.37 | Total utility cost/aMW |
| | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **Customer costs (NO Net-to-Gross Ratios in effect)** |
| $ | 3,276.92 | $ | 26,215.36 | $ | 26,215.36 | $ | 55,707.64 | Labor Costs for Nozzles |
| $ | 819.23 | $ | 10,823.84 | $ | 10,823.84 | $ | 22,466.91 | Labor Costs for Gaskets |
| $ | 1,343.00 | $ | 10,742.00 | $ | 10,742.00 | $ | 22,827.00 | Labor Costs for Drains |
| $ | - | $ | 14,000.00 | $ | 12,250.00 | $ | 26,250.00 | Customer Costs for Pump Repairs |
| $ | - | $ | 32,000.00 | $ | 28,000.00 | $ | 60,000.00 | Customer Costs for System Modifications |
| $ | 3,032.50 | $ | 20,132.50 | $ | 20,132.50 | $ | 43,297.50 | Mtrl & Labor Cost for Regulator Replacement |
| $ | 834.75 | $ | 3,113.25 | $ | 3,113.25 | $ | 7,061.25 | Mtrl & Labor Cost for Pivot Drain Replacement |
| $ | 17,520.00 | $ | 189,800.00 | $ | 189,800.00 | $ | 397,120.00 | Mtrl & Labor for Sprinkler Package Replacement |
| $ | 560.00 | $ | 3,220.00 | $ | 3,220.00 | $ | 7,000.00 | Mtrl & Labor of Dual Sprinkler Package Installation |
| | | | | | | **$** | **641,730.30** | total |