Work Paper SCE13PR004

**Revision 2**

**Southern California Edison**

**Agricultural Milk Transfer Pump VSD**

# At-a-Glance Summary

|  |  |
| --- | --- |
| **Measure Codes** | PR-59192 |
| **Measure Description** | VSD on Existing Dairy Farm Milk Transfer Pump |
| **Base Case Description** | Constant Speed Dairy Farm Milk Transfer Pump |
| **Units** | Per 1,000 lbs of milk |
| **Energy Savings** | 0.466 kWh, 0.000079 kW |
| **Full Measure Cost ($/unit)** | $0.41 |
| **Incremental Measure Cost ($/unit)** | $0.41 |
| **Effective Useful Life** | Agr-VSDmilkTrnsfr: EUL 15yrs, RUL 5yrs |
| **Measure Installation Type** | Retrofit Add-on (REA) |
| **Net-to-Gross Ratio** | Agric-Default>2yrs: 0.60 |
| **Important Comments** | This work paper has a complementary Ex Ante Database data set that will be provided in a separate submission to the California Public Utilities Commission (CPUC). |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 4/17/12 | John Rossi/EMCOR Energy Services | -New template for 2013-14 program cycle. |
| 1 | 7/10/14 | Vincent Partusch/SCE | -Template Update  -Work paper updated for the reporting period, effective 7/1/14 – 12/31/14. |
| 2 | 1/29/16 | Yun Han/SCE | * New template update for 2016 program year * WP effective from 1/1/2016 thru 12/31/2016 * Removed SCE building type   + Changed Ag to MLi * No value modifications |

# Commission Staff and Cal TF Comments

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rev** | **Party** | **Submittal Date** | **Comment Date** | **Comments** | **WP Developer Response** |
|  |  |  |  |  |  |
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|  |  |  |  |  |  |

Cal TF website: <http://www.caltf.org/>

# Section 1. General Measure & Baseline Data

## 1.1 Measure Description & Background

This work paper documents the E3 Calculator inputs and assumptions for installing a variable speed drive (VSD) on an existing dairy farm milk transfer pump. The base case is an existing constant speed dairy farm pump operating without a variable speed drive.

**Base, Standard, and Measure Cases**

|  |  |
| --- | --- |
| **Case** | **Description of Typical Scenario** |
| Measure | VSD on Existing Dairy Farm Milk Transfer Pump |
| Existing Condition | Constant Speed Dairy Farm Milk Transfer Pump |
| Code/Standard | N/A |
| Industry Standard Practice | N/A |

Measures and Codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure Codes** | | | | **Measure Name** |
| SCG | SDG&E | SCE | PG&E |
|  |  | PR-59192 |  | Agricultural Milk Transfer Pump VSD |

This measure is only eligible for existing operational pumps in an Agricultural building type located within an SCE climate zone. VSD installations on backup/standby pumps do not qualify for incentives. In situations containing multiple pump configurations, savings may be claimed for each pump VSD installed so long as the milk production (in 1000 lbs. of milk) is partitioned between pumps.

## 1.2 Technical Description

Dairy farm milk transfer pumps transport milk from the milking vacuum system to the bulk milk storage tank. Energy savings are realized as a result of the reduced speed of the pump motor. The energy savings in this work paper are provided on a per “1000 lbs. of milk” produced basis.

## 1.3 Installation Types and Delivery Mechanisms

The installation type is Retrofit Add-on (REA).

**Installation Type Descriptions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Installation Type** | **Savings** | | **Life** | |
| 1st Baseline (BL) | 2nd BL | 1st BL | 2nd BL |
| Retrofit Add-on (REA) | Above Customer Existing | N/A | EUL | N/A |

The delivery method is Financial Support / Down-Stream Incentive – Deemed.

A delivery mechanism is a delivery method paired with an incentive method. Delivery mechanisms are used by programs to obtain program participation and energy savings.

**Delivery Method Descriptions**

|  |  |
| --- | --- |
| **Delivery Method** | **Description** |
| Financial Support | The program motivates customers, through financial incentives such as rebates or low interest loans, to implement energy efficient measures or projects. |

**Incentive Method Descriptions**

|  |  |
| --- | --- |
| **Incentive Method** | **Description** |
| Down-Stream Incentive | The customer installs qualifying energy efficient equipment and submits an incentive application to the utility program. Upon application approval, the utility program pays an incentive to the customer. Such an incentive may be deemed or customized. |

## 1.4 Measure Parameters

### 1.4.1 DEER Data

DEER Difference Summary

|  |  |
| --- | --- |
| **DEER Item** | **Used for Workpaper?** |
| Modified DEER methodology | No |
| Scaled DEER measure | No |
| DEER Base Case | No |
| DEER Measure Case | No |
| DEER Building Types | Yes |
| DEER Operating Hours | No |
| DEER eQUEST Prototypes | No |
| DEER Version | N/A |
| Reason for Deviation from DEER | DEER does not contain this type of measure. |
| DEER Measure IDs Used | N/A |

**Net-to-Gross Ratio**

The NTG values were obtained using the DEER READI tool. The relevant NTG values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** |
| Agric-Default>2yrs | All other EEMs with no evaluated NTGR; existing EEM in programs with same delivery mechanism for more than 2 years | Ag | Any | Any | 0.60 |

**Spillage Rate**

Spillage rates are not tracked in work papers; they are tracked in an external document which will be supplied to the Commission Staff.

**Installation Rate**

The IR values were obtained using the DEER READI tool. The relevant IR values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GSIA ID** | **Description** | **Sector** | **BldgType** | **ProgDelivID** | **GSIAValue** |
| Def-GSIA | Default GSIA values | Any | Any | Any | 1 |

**Effective and Remaining Useful Life**

The EUL and RUL values were obtained using the DEER READI tool. DEER defines the RUL as 1/3 of the EUL value. The RUL value is only applicable to the first baseline period for an RET measure with an applicable code baseline. The relevant EUL and RUL values for the measures in this work paper are in the table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** |
| Agr-VSDmilkTrnsfr | Milk Transfer Pump Variable Speed Drive | Ag | ProcDist | 15 | 5 |

### 1.4.2 Codes and Standards Analysis

There are no federal or state efficiency requirements that apply to milk transfer pumps. In addition, REA measures do not invoke code requirements.

Code Summary

|  |  |  |
| --- | --- | --- |
| **Code** | **Reference** | **Effective Dates** |
| Title 24 (2013) | N/A | July 1, 2014 |
| Title 20 (2014) | N/A | July 1, 2014 |

## 1.5 EM&V, Market Potential, and Other Studies – Base Case and Measure Case Information

### 1.5.1 EnSave CA 2004-2005 Multi Measure Farm Program for Milk Transfer Pump VSD

* 2004-2005 Program [A]

### 1.5.2 Milk Transfer VSD Worksheet

* 2007 and 2008 data from Ag EE Program [B]

### 1.5.2 CA Department of Food and Agriculture

* CA Dairy Statistics 2011, 2012

## 1.6 Data Quality and Future Data Needs

N/A

# Section 2. Calculation Methodology

Ensave’s 2004-2005 California Multi Measure Farm Program [A] provided data from previous projects where VSDs were installed on milk transfer pumps. Examination of the data indicates that the average

kWh and kW for this measure is 13,777 kWh and 2.34 kW for an average 29,572,648 pounds of milk production. Therefore, the normalized annual energy savings and demand reduction are calculated as:

Normalized Annual kWh Savings = 13,777 kWh ÷ 29,572,648 pound of milk produced

= 0.000466 kWh per pound of milk produced

= 0.466 kWh per 1000 pounds of milk produced

Normalized Annual kW Savings = 2.34 kW ÷ 29,572,648 pound of milk produced

= 0.000000079 kW per pound of milk produced

= 0.000079 kW per 1000 pounds of milk produced

The kW savings in this work paper assume that the milk transfer pumps operate during the DEER peak period.

Alternatively, if annual milk production in pounds is not available but the number of cows is known, the following assumptions can be made: According to the California 2011 Dairy Statistics[C], an average dairy farm has 1,101 cows with each cow producing 23,438 pounds of milk, on average, annually.

# Section 3. Load Shapes

The ideal load shape for net benefits estimates would represent the difference between the base case and measure case. The closest load shapes that are applicable to the measures in this work paper are listed in the table below.

Building Types and Load Shapes

|  |  |  |
| --- | --- | --- |
| **Building Type** | **Load Shape** | **E3 Alternate Building Type** |
| Manufacturing – Light Industrial | Ag & Water Pumping | Agricultural |

# Section 4. Costs

## 4.1 Base Case Cost

The base case is $0 because this measure is a discretionary modification to the customer’s existing equipment. The customer’s alternative option is to make no changes to the existing system.

## 4.2 Measure Case Cost

The costs for the milk transfer pump VSD measure are based upon actual kWh and costs from past projects in the Agricultural Energy Efficiency Program [B]. The results of this analysis are shown in the table below. The “Total Equipment + Labor Cost” column includes a summation of individual projects that installed the VSD measure.

Measure Costs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project Bundle #** | **Climate Zone** | **Total Equipment + Labor Cost** | **Annual kWh Saved** | **Cost per kWh** | **Cost per Pound of Milk with conversion factor of 0.000466 kWh/lb. milk** |
| 1 | 10 | $7,427.58 | 40,072 | $0.185/kWh | $0.000086/lb. milk |
| 2 | 13 | $126,018.32 | 80,144 | $1.572/kWh | $0.000733/lb. milk |
| 3 | 13 | $25,365.92 | 60,108 | $0.422/kWh | $0.000197/lb. milk |
| Overall | - | $158,811.82 | 180,324 | $0.881/kWh | $0.000410/lb. milk |

As a result, the measure case equipment + labor cost is $0.41 per 1000 lbs. of milk produced. Please see Attachment #3 for more information.

## 4.3 Full and Incremental Measure Cost

**Full and Incremental Measure Cost Equations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| REA | MEC + MLC | MEC + MLC | N/A |

MEC = Measure Equipment Cost; MLC = Measure Labor Cost

BEC = Base Case Equipment Cost; BLC = Base Case Labor Cost

**Full and Incremental Costs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Measure** | **Installation Type** | **Incremental Measure Cost** | **Full Measure Cost** | |
| **1st Baseline** | **2nd Baseline** |
| PR-59192 | REA | $0.41 | $0.41 | N/A |

# Attachments

1. 2. 3.

# References



[A] Attachment 2- EnSave CA 2004-2005 Multi Measure Farm Program for Milk Transfer Pump VSD

[B] Attachment 3-Cost Calculations Milk Transfer VSD 2007 and 2008 Work Sheet (past data from prior projects in the Agricultural Energy Efficiency Program)

[C] California Department of Food and Agriculture, California Dairy Statistics 2011, 2012