Wastewater Pump Measure Development

Final Report

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Disclaimer

Executive Summary

In collaboration with the CalNEXT program, designed and implemented by Energy Solutions and funded by California (CA) utility customers, Alternative Energy Systems Consulting (AESC) has developed the necessary data for the development of a deemed measure offering for the replacement of wastewater pumps, for eventual application within the statewide program. The CA Electronic Technical Reference Manual (eTRM) is an online repository for all statewide deemed measures for CA that ensures the accuracy, transparency, and accessibility of all deemed measure values. Among the 171 offerings within the eTRM is an offering for the replacement of clean water pumps (Statewide Measure ID SWWP004) with high-efficiency units. As the existing offering is applicable only to clean water pumps within the commercial, industrial, and agricultural sectors, a gap exists for the replacement of pumps within the wastewater industry. The study draws upon data from hundreds of pumps supported by CA wastewater treatment plant (WWTP) program-related projects as well as the existing measure methodologies to provide the framework needed for the development of a new statewide offering.

The measure development followed methodology of the existing approved statewide measure for Water Pump Upgrade, SWWP004-02. The bulk of the analysis used pumping data from Southern California Edison's Hydraulic Services for a variety of pumping systems used to derive annual use profiles for the various bin sizes of pumps, which were used to establish the following metrics:

Pump HP	Control Strategy	Measure PEI Range	Energy Savings (per HP)	Incremental Measure Cost (per HP)
1 <= HP <=15	Variable Speed	PEI <= 0.41	150	$ 58.17
1 <= HP <=15	Variable Speed	PEI <= 0.43	100	$ 38.78
1 <= HP <=15	Variable Speed	PEI <= 0.45	50	$ 19.39
1 <= HP <=15	Constant Speed	PEI <= 0.88	162	$ 58.17
1 <= HP <=15	Constant Speed	PEI <= 0.90	108	$ 38.78
1 <= HP <=15	Constant Speed	PEI <= 0.92	54	$ 19.39
15 <= HP <=50	Variable Speed	PEI <= 0.43	82	$ 21.50
15 <= HP <=50	Variable Speed	PEI <= 0.45	54	$ 14.33
15 <= HP <=50	Variable Speed	PEI <= 0.47	27	$ 7.17
15 <= HP <=50	Constant Speed	PEI <= 0.88	88	$ 21.50
15 <= HP <=50	Constant Speed	PEI <= 0.90	59	$ 14.33
15 <= HP <=50	Constant Speed	PEI <= 0.92	29	$ 7.17
50 <= HP <=250	Variable Speed	PEI <= 0.45	51	$ 4.84
50 <= HP <=250	Variable Speed	PEI <= 0.47	26	$ 2.42
50 <= HP <=250	Constant Speed	PEI <= 0.89	83	$ 7.26
50 <= HP <=250	Constant Speed	PEI <= 0.91	55	$ 4.84
50 <= HP <=250	Constant Speed	PEI <= 0.93	28	$ 2.42

Figure 1: Overview of energy savings and incremental measure cost

The data and findings presented in this report are recommended to be utilized by the lead investor-owned utility (IOU) team to facilitate the development of a statewide offering to complement the existing clean water pump offering.

Abbreviations and Acronyms

Acronym	Meaning
Cal TF	California Technical Forum
DOE	Department of Energy
ECIP	Efficient Commercial and Industrial Pumps
ECS	Energy Conservation Standard
eTRM	Electronic Technical Reference Manual
EUL	Estimated Useful Life
GSIA	Gross Savings Installation Adjustment
HI	Hydraulic Institute
IMC	Incremental Measure Cost
IOU	Investor-Owned Utilities
kW	Kilowatt
kWh	Kilowatt-Hour
NEEA	Northwest Energy Efficiency Alliance
NTG	Net-to-Gross
PG&E	Pacific Gas and Electric
PEI	Pump Energy Index
RAS	Return Activated Sludge
RTF	Regional Technical Forum
RUL	Remaining Useful Life
SCE	Southern California Edison
UEC	Unit Energy Consumption

Acronym	Meaning
UES	Unit Energy Savings
WWTP	Wastewater Treatment Plant

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Introduction

The California (CA) Electronic Technical Reference Manual (eTRM) is an online repository for all statewide deemed measures for CA that ensures the accuracy, transparency, and accessibility of all deemed measure values. Among the 171 offerings within the eTRM is an offering for the replacement of clean water pumps (Statewide Measure ID SWWP004) with high-efficiency units. In this instance, the United States (U.S.) Department of Energy (DOE) defines a "pump" as equipment used to move liquids (which may contain entrained gases, free solids, and totally dissolved solids) by physical or mechanical action and includes a bare pump and mechanical equipment, driver, and controls. In order to standardize pump efficiency requirements and move the market toward minimally efficient pumps, the DOE developed the Energy Conservation Standard (ECS) for commercial, industrial, and agricultural clean water pumps. The Hydraulic Institute (HI) and DOE developed the pump energy efficiency rating system Pump Energy Index (PEI) to achieve this goal. The PEI is the weighted average performance of the rated pump at specific load points and normalized with respect to the performance of a minimally compliant pump. Since 2016, pumps have been sold with ECS labels that include PEI.

As the existing offering is applicable only to clean water pumps within the commercial, industrial, and agricultural sectors, a gap exists for the replacement of pumps within the wastewater industry. Although the chemistry of the fluid is different, both clean water pumps and wastewater pumps have similar viscosity and experience the same efficiency-related challenges. Typically, these issues include degradation and deterioration of efficiency due to changing operating conditions, and in general, newer pumps have slightly better efficiency due to better manufacturing techniques. Additionally, pumps within the wastewater sector have a higher variability of a typical pump's operating hours; whether they are installed in a sewer collection system or in a (WWTP). The focus of this study is to develop the data needed to develop a deemed measure for wastewater pumps. The study will draw upon data from hundreds of pumps supported by CA WWTP program-related projects as well as the existing measure methodologies to provide the framework needed for the development of a new statewide offering.

Background

In CA, there are more than 900 WWTPs that manage the roughly four billion gallons of wastewater generated throughout the state each day. Throughout the state, it is estimated that as much as 19 percent of the total electric consumption is for pumping, treating, collecting, and discharging water and wastewater, and the costs can represent 30-40 percent of a municipality's energy bill (Copeland). Figure 2 represents end-use energy usages in a typical wastewater treatment facility. As shown below, pumping in wastewater facilities accounts for roughly 14.8 percent (Wastewater Pumping and Return Sludge Pumping) of a typical site's energy usage.

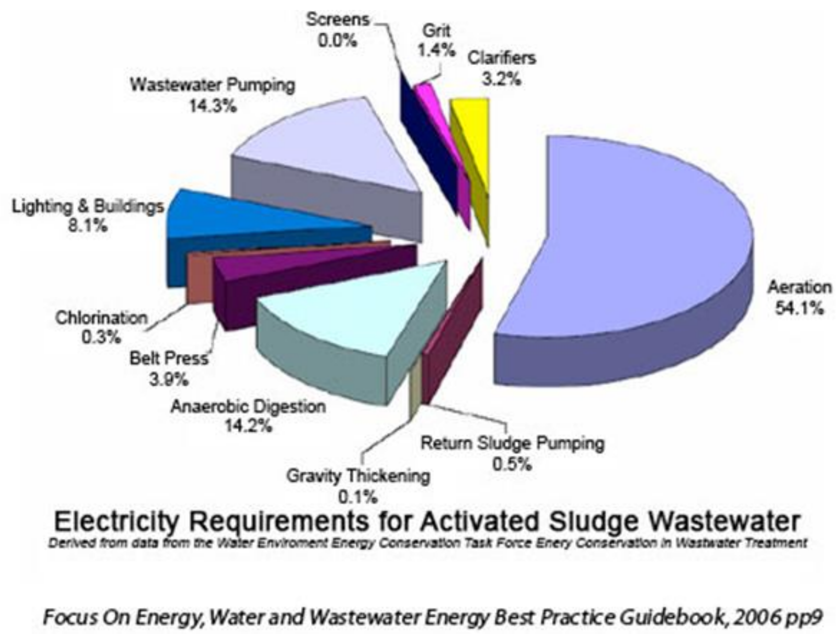

Figure 2: Energy profile of sample sites

Source: (Focus on Energy, 2006, p. 9)

Depending on the plant design, there are a variety of pumps associated with the treatment process including process influent pumps, return activated sludge (RAS) and waste activated sludge (WAS) pumps, sump pumps, and collection system conveyance pumps with conditions ranging from raw wastewater to thickened sludge. The terrain of the WWTP site and the influent sanitary sewer depth govern the need for and location of pumping applications to allow continuous and cost-effective treatment through unit processes within the plant. The types of pumps most commonly used include centrifugal, progressive cavity, and positive displacement, with examples of the typical application for each shown in Table 1 below.

Table 1: Pump Types and Applications

Pump Type	Typical Application
Centrifugal	Raw Wastewater
	Primary Sludge
	Secondary Sludge
	Effluent Wastewater
	Flush Water

Pump Type	Typical Application
	Spray Water
	Seal Water
Positive Displacement	Primary Sludge
	Thickened Sludge
	Digested Sludge
	Slurries
	Chemical Feed Applications
Progressive Cavity	Primary Sludge
	Secondary Sludge
	Thickened Sludge
	Digested Sludge
	Slurries

Source: (AECOM, 2014)

Within a typical WWTP, energy consumption of the various pumping applications varies based on volume of flow as well as the hydraulic profile. The figure below depicts the ranges of energy consumption per 1,000 gallons processed. Of the typical pumping applications, influent pumping of raw wastewater is typically the most energy intensive (0.12-0.17 kWh/1,000 gallons) as this provides the required lift to build the hydraulic profile for proceeding processes. These types of pumping applications typically operate continuously and are arranged in arrays of multiple pumps to handle the diurnal flows as well as wet-weather events. Internal process pumping such as RAS, WAS, and sludge within digestion systems operate at a lower energy performance (0.03-0.05 kWh/1,000 gal) as they are typically intermittent processes with lower lift requirements within the WWTP. To show the magnitude of energy use at a sample WWTP, see Figure 2 below.

Technology	Energy consumption[b]	
	kWh/10³ gal	kWh/m³
Conventional secondary treatment WWTP[c]	0.38 to 0.67	0.10–0.18
Wastewater influent pumping	0.12–0.17	0.032–0.045
Screens	0.001–0.002	0.0003–0.0005
Grit removal (aerated grit removal)	0.01–0.05	0.003–0.013
Trickling filters	0.23–0.35	0.061–0.093
Trickling filter-solids contact	0.35	0.093
Activated sludge for BOD removal	0.53–4.1	0.14
Activated sludge with nitrification/denitrification	0.87–0.88	0.23
Membrane bioreactor	1.9–3.8	0.5–1.0[d]
Return sludge pumping	0.03–0.05	0.008–0.013
Secondary settling	0.013–0.015	0.003–0.004
Dissolved air flotation	0.12–0.15	0.03–0.04
Tertiary filtration (depth filtration)	0.1–0.3	0.03–0.08
Tertiary filtration (surface filtration)		
Chlorination (sodium hypochlorite)	0.001–0.003	0.0003–0.0008
UV (ultraviolet) disinfection	0.05–0.2	0.01–0.05
Microfiltration/ultrafiltration	0.75–1.1	0.2–0.3
Reverse osmosis (without energy recovery)	1.9–2.5	0.5–0.65
Reverse osmosis (with energy recovery)	1.7–2.3	0.46–0.6
Electrodialysis (TDS range 800–1200 mg/L)	4.2–8.4	1.1–2.2
UV photolysis with O_3 or H_2O_2 (advanced oxidation)[e]	0.2–0.4	0.05–0.1
Sludge pumping	0.003	0.0008
Gravity thickening	0.001–0.006	0.0003–0.0016
Aerobic digestion	0.48–1.2	0.13–0.32
Mesophilic anaerobic digestion (primary plus waste activated sludge)[f]	0.35–0.6	0.093–0.16
Mesophilic anaerobic digestion with thermal hydrolysis pretreatment (primary plus waste activated sludge)[f]	0.58–0.6	0.015–0.02
Sludge dewatering (centrifuge)	0.02–0.05	0.005–0.013
Sludge dewatering (belt filter press)	0.002–0.005	0.0005–0.0013

Figure 2: Energy intensity for sample WWTP

Source: (AECOM, 2014)

Objectives

The objective of this study is to develop the necessary data for the development of a deemed measure offering for the replacement of wastewater pumps, for eventual application within the statewide program. This would assist with submission of the measure package to the CA Technical Forum (Cal TF) as well as identification of a utility sponsor to support the application process. The scope of this project includes:

1. Form the project team, including the lead Investor-Owned Utility (IOU) for wastewater pumps, Cal TF measure screening committee representatives, and CalNEXT partners.
2. Review and collect project data from sources such as the Pacific Gas and Electric (PG&E) RAPIDS program for pump projects, 2018-2020 Commercial Building Fresh Water Measure Program by Energy Solutions, and the Northwest Regional Technical Forum (RTF), including:
    a. The pump types for wastewater lift stations and WWTP applications.
    b. Operating parameters for calculation requirements.
    c. The cost data for wastewater pump projects.
3. Calculate energy savings following the methodology used in the existing statewide measure package for SWWP004-02.

Methodology and Approach

The measure development followed methodology of the existing approved statewide measure for Water Pump Upgrade, SWWP004-02. This entails sufficient data collection for all claims per Resolution E-5152 for upstream delivery types, including:

1. SiteID
2. EquipmentID
3. Building Type
4. Rated Efficiency: PEI
5. Pump Control Type: Constant Speed, Variable Speed
6. Equipment Nameplate Information:
    a. Equipment Manufacturer
    b. Equipment Model Number
    c. Pump Horsepower (HP)
    d. Motor HP
    e. Pump Nominal Speed (RPM)
7. Pump Classes (i.e. End Suction Frame Mount, End Suction Close Coupled, In-Line, Radially Split Multi-Stage Vertical In-Line Diffuser Casing, Vertical Turbine Submersible)
8. Pump operating hours and possible seasonal fluctuations
9. Baseline conditions: new construction vs. normal replacement, existing equipment characteristics such as control strategy, pump size, pump type, and application type
10. Service Account ID

11. Installation documents (invoices, commissioning reports, photograph)
12. Quantity per sales transaction or project site

Findings

The existing deemed measure has been leveraged to determine inputs for a deemed measure offering as outlined in the subsections below.

Technology Summary

The U.S. DOE defines a “pump” as equipment used to move liquids (which may contain entrained gases, free solids, and totally dissolved solids) by physical or mechanical action; a pump includes a bare pump and mechanical equipment, driver, and controls. Water pumps are the second most commonly sought equipment after the motor and are found across all sectors. In addition, nearly one-fifth of electricity generated in CA supports water-related uses. In order to standardize pump efficiency requirements and move the market toward minimally efficient pumps, the DOE developed the ECS for commercial, industrial, and agricultural clean water pumps. The HI and DOE developed the pump energy efficiency rating system PEI to achieve this goal. The PEI is the weighted average performance of the rated pump at specific load points and normalized with respect to the performance of a minimally compliant pump. Since 2016, pumps have been sold with ECS labels that include PEI.

Measure Case Description

This measure is defined as the installation of a wastewater pump with a PEI rating as specified below. The measure case PEI tiers were set by incrementally improving the PEIs by values of 0.02 for each tier. These efficiency tiers were selected based on a review of the PEI distribution of eligible pumps in the HI pump database. Note that only two tiers were approved for the largest HP variable speed bin because no products currently exist in the highest PEI bin for that size and control combination. As shown in **Error! Reference source not found.** below, measure offerings (and therefore measure impacts) vary by load type (variable or constant) and by pump HP range.

Table 2: Measure Case Pump Ratings by HP

Pump HP	Control Strategy	PEI Rating
1 ≤ HP ≤ 15	Variable Speed	0.41, 0.43, 0.45
1 ≤ HP ≤ 15	Constant Speed	0.88, 0.90, 0.92
15 ≤ HP ≤ 50	Variable Speed	0.43, 0.45, 0.47
15 ≤ HP ≤ 50	Constant Speed	0.88, 0.90 ,0.92
50 ≤ HP ≤ 250	Variable Speed	0.45, 0.47
50 ≤ HP ≤ 250	Constant Speed	0.89, 0.91, 0.93

Source: (CA eTRM 2022)

Base Case Description

The base case for this measure is a wastewater pump with a PEI rating specified below. These baseline values were calculated from a database of performance data collected from major manufacturers and the HI. Per direction from the CA Public Utilities Commission (CPUC), the baseline PEI ratings are representative of the most commonly available (mode) of the dataset for each control strategy and pump HP range. Note that the federal standard requires a clean water pump system to have a PEI rating ≤ 1.0. An overview of the base case description is provided in Table 3 below.

Table 3: Base Case Pump Ratings by HP

Pump HP	Control Strategy	PEI Rating
1 ≤ HP ≤ 15	Variable Speed	0.47
1 ≤ HP ≤ 15	Constant Speed	0.94
15 ≤ HP ≤ 50	Variable Speed	0.49
15 ≤ HP ≤ 50	Constant Speed	0.94
50 ≤ HP ≤ 250	Variable Speed	0.49
50 ≤ HP ≤ 250	Constant Speed	0.95

Source: (CA eTRM 2022)

Code Requirements

This measure is not governed by CA state codes and standards. Under Title 10 Section 431.462, the U.S. DOE developed the ECS for commercial, industrial, and agricultural pumps. As of January 2020, all clean water pumps sold are required to have an ECS label with a PEI rating ≤ 1.0. An overview of the applicable codes is provided in Table 4 below.

Table 4: Code Requirements

Code	Applicable Code Reference	Effective Date
CA Appliance Efficiency Regulations – Title 20	N/A	N/A
CA Building Energy Efficiency Standards – Title 24	N/A	N/A
Federal Standards	Title 10 Section 431.462	January 27, 2020

Source: (CA eTRM 2022)

Program Requirements

Eligible Products

Wastewater pumps that have a nominal HP rating of ≤ 250 and meet the PEI requirements specified in the Measure Case Description section above are eligible. In addition, the PEI should be confirmed on the HI database. Any of the following pump classes are eligible:

- End Suction Frame Mount
- End Suction Close Coupled
- In-Line
- Radially Split Multi-Stage Vertical In-Line Diffuser Casing
- Vertical Turbine Submersible

Eligible Climate Zones

This measure is applicable in all CA climate zones.

Program Exclusions

There are no Program exclusions.

Data Collection Requirements

For all delivery types, the following site information data must be collected for all claims as per *Resolution E-5152* for upstream and midstream delivery types and *Draft Impact Evaluation Non-*

Residential Deemed Pump and Food Service Program Year 2020 for downstream and direct install delivery types.

Table 5: Program Data for All Delivery Type Programs

Program Data for All Delivery Type Programs
SiteID
EquipmentID
Building Type
Rated Efficiency: PEI
Pump Control Type: Constant Speed, Variable Speed
Equipment Nameplate Information: Equipment Manufacturer, Equipment Model Number, Pump HP, Motor HP, Pump Nominal Speed (RPM)
Pump Classes: i.e. end suction frame mount, end suction close coupled, in-line, radially split multi-stage vertical in-line diffuser casing, vertical turbine submersible
Pump operating hours and possible seasonal fluctuations
Baseline Conditions: new construction vs. normal replacement, existing equipment characteristics such as control strategy, pump size, pump type, and application type
Service Account ID
Installation Documents: invoices, commissioning reports, photographs
Quantity per sales transaction or project site

Electric Savings (kWh)

The unit energy savings (UES) analysis is adopted from the pump savings analysis approved by the RTF for the Northwest Energy Efficiency Alliance (NEEA) Efficient Commercial and Industrial Pumps (ECIP) Project. This analysis was approved in April 2022, and included extensive pump modeling, DOE database information, and customer/vendor field data. The UES from retrofitting a base case pump to a more efficient measure case pump is based on the NEEA modification of the HI pump energy savings calculation. The HI energy savings calculation assumes a conservative base case efficiency scenario and does not include adjustment factors to account for pump nominal power and actual pump performance variances. The NEEA modifications of the HI calculation considered baseline market average pump efficiencies and adjustment factors that account for nominal versus actual power draw and actual pump system curves. The base case PEI values were found by determining the most common PEI values for each speed control and pump HP bin. The measure case PEI tiers were set by incrementally improving the PEIs by values of 0.02 for each tier. These efficiency tiers were selected based on review of the PEI distribution of eligible pumps in the HI pump database.

The energy savings analysis by NEEA was streamlined for this measure. The electric unit energy consumption (UEC) and UES for installing high-efficiency pumps were calculated using the calculations below.

$$\frac{(opHrsYr * adjFactor * pumpSize * PEI * kWHPConst)}{mtrSize}$$

Where,

$opHrsYr$ = Annual operating hours (hrs)
$adjFactor$ = Final load profile adjustment factors by application and speed control case
$pumpSize$ = Representative pump size (HP)
PEI = PEI rating
$kWHPConst$ = Conversion factor of 0.746 (kW/HP)
$mtrSize$ = Representative motor size (HP)

Table 6 below illustrates the calculated deemed savings per HP for the various technology combinations. These values are based on the following assumptions derived from analysis of available pumping data, including:

- Annual operating hours
    - 1 ≤ HP ≤ 15: 4,014 hours per year
    - 15 ≤ HP ≤ 50: 1,925 hours per year
    - 50 ≤ HP ≤ 250: 1,690 hours per year
- Adjustment factor
    - Variable Speed: 1.214
    - Constant Speed: 1.310

Table 6: UES

Pump HP	Control Strategy	Measure PEI Range	Energy Savings (per HP)
1 <= HP <=15	Variable Speed	PEI <= 0.41	150
1 <= HP <=15	Variable Speed	PEI <= 0.43	100
1 <= HP <=15	Variable Speed	PEI <= 0.45	50
1 <= HP <=15	Constant Speed	PEI <= 0.88	162
1 <= HP <=15	Constant Speed	PEI <= 0.90	108
1 <= HP <=15	Constant Speed	PEI <= 0.92	54
15 <= HP <=50	Variable Speed	PEI <= 0.43	82
15 <= HP <=50	Variable Speed	PEI <= 0.45	54
15 <= HP <=50	Variable Speed	PEI <= 0.47	27
15 <= HP <=50	Constant Speed	PEI <= 0.88	88
15 <= HP <=50	Constant Speed	PEI <= 0.90	59
15 <= HP <=50	Constant Speed	PEI <= 0.92	29
50 <= HP <=250	Variable Speed	PEI <= 0.45	51
50 <= HP <=250	Variable Speed	PEI <= 0.47	26
50 <= HP <=250	Constant Speed	PEI <= 0.89	83
50 <= HP <=250	Constant Speed	PEI <= 0.91	55
50 <= HP <=250	Constant Speed	PEI <= 0.93	28

Peak Electric Demand Reductions (kW)

Some peak demand reduction is expected to be associated with pump efficiency improvements. However, no study could be found for CA and sector-specific peak demand reductions. Therefore, no peak demand reduction is being claimed for this measure.

Gas Savings (Therms)

There are no gas savings anticipated for this measure.

Life Cycle

Effective Useful Life (EUL) is an estimate of the median number of years that a measure installed through a program is still in place and operable. EUL is often, but not always, derived from measure persistence or retention studies. Remaining Useful Life (RUL) is an estimate of the median number of years that a technology or piece of equipment replaced or altered by an energy efficiency program would have remained in service and operational had the program intervention did not cause the replacement or alteration. The EUL and RUL for this measure are specified below in Table 7Table 7. This EUL was adopted for the 2008 Database for Energy Efficient Resources (DEER) and is based upon estimates reported in several CA-based retention studies. Note that RUL is only applicable for add-on equipment and accelerated replacement measures and is not applicable for this measure.

Table 7: Measure EUL

EUL ID	EUL Description	Sector	EUL (yrs)	Start Date
Motors-pump	Water Loop Pumps	Com	15	2013-01-01

Source: (CA eTRM 2022)

Measure Cost

Material cost for this measure was determined from the incremental cost (IMC) analysis developed by the RTF. The RTF developed a clean water pump cost curve to calculate the incremental pump cost per both pump HP and delta PEI. This cost curve was used with the representative pump size values associated with this measure. Subsequently, the cost was multiplied by the delta PEI values for each measure tier to arrive at the normalized cost per HP for each measure. The cost curve represented costs deflated to 2012 dollars and therefore the costs were adjusted by historical factors from 2012 to 2022 retrieved from RSMeans Historical indices. The incremental costs were calculated by the following equation:

$$(A * mtrSize^{B}) * \left((PEI_{Base} - PEI_{Meas}) * 100\right) * \left(\frac{i2022CA}{i2012US}\right)$$

Where,

A = coefficient from IMC cost curve = 29.82
B = coefficient from IMC cost curve = -0.71
$mtrSize$ = representative motor size (HP)
PEI_{Base} = Base PEI
PEI_{Meas} = Measure PEI
$i2022CA$ = 2022 historical cost index – CA average = $276.10
$i2012US$ = 2012 historical cost index – City national average = $194.00

Table 8: Unit IMC

Pump HP	Control Strategy	Measure PEI Range	Incremental Measure Cost (per HP)
1 <= HP <=15	Variable Speed	PEI <= 0.41	$ 58.17
1 <= HP <=15	Variable Speed	PEI <= 0.43	$ 38.78
1 <= HP <=15	Variable Speed	PEI <= 0.45	$ 19.39
1 <= HP <=15	Constant Speed	PEI <= 0.88	$ 58.17
1 <= HP <=15	Constant Speed	PEI <= 0.90	$ 38.78
1 <= HP <=15	Constant Speed	PEI <= 0.92	$ 19.39
15 <= HP <=50	Variable Speed	PEI <= 0.43	$ 21.50
15 <= HP <=50	Variable Speed	PEI <= 0.45	$ 14.33
15 <= HP <=50	Variable Speed	PEI <= 0.47	$ 7.17
15 <= HP <=50	Constant Speed	PEI <= 0.88	$ 21.50
15 <= HP <=50	Constant Speed	PEI <= 0.90	$ 14.33
15 <= HP <=50	Constant Speed	PEI <= 0.92	$ 7.17
50 <= HP	Variable Speed	PEI <= 0.45	$ 4.84
50 <= HP	Variable Speed	PEI <= 0.47	$ 2.42
50 <= HP	Constant Speed	PEI <= 0.89	$ 7.26
50 <= HP	Constant Speed	PEI <= 0.91	$ 4.84
50 <= HP	Constant Speed	PEI <= 0.93	$ 2.42

Net-to-Gross

The net-to-gross (NTG) ratio represents the portion of gross impacts that are determined to be directly attributed to a specific program intervention. These NTG values are based upon the average of all NTG ratios for all evaluated 2006–2008 nonresidential sector programs, as documented in the 2011 DEER Update Study conducted by Itron, Inc. These sector average NTGs ("default NTGs") are applicable to all energy efficiency measures that have been offered through agriculture, commercial, and industrial sector programs for more than two years and for which impact evaluation results are not available. The NTG for this measure is 0.60.

Gross Savings Installation Adjustment (GSIA)

The gross savings installation adjustment (GSIA) rate represents the ratio of the number of verified installations of the measure to the number of claimed installations reported by the utility. This factor varies by end-use, sector, technology, application, and delivery method. This GSIA rate is the current "default" rate specified for measures for which an alternative GSIA has not been estimated and approved and is 1.00 for all delivery types.

Non-Energy Impacts

Non-energy impacts for this measure have not been qualified.

DEER Differences Analysis

This section provides a summary of DEER-based inputs and methods, and the rationale for inputs and methods that are not DEER-based.

Table 9: DEER Differences Analysis

DEER Item	Comment
Modified DEER Methodology	No
Scaled DEER Measure	No
DEER Base Case	No
DEER Measure Case	No
DEER Building Types	No
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

Recommendations

The findings as outlined in this report are recommended to be used as the basis for submission of the measure package to be integrated into the statewide eTRM. The lead program administrator (PA) for wastewater pumping, as identified by the Cal TF, is IOU Southern California Edison (SCE). Their measure development team should work with the identified third-party implementer to facilitate construction of the deemed workpaper in accordance with the eTRM guidelines. This offering will support a streamlined process for claimable savings for the statewide third-party program (WISE) that encompasses the targeted wastewater sector. While the data presented in this report covers most of the requirements for eTRM adoption, additional work will be needed to develop the workpaper, permutation files, and other submission documents for approval by the statewide deemed offering review party.

Regarding tech transfer initiatives of this measure development project, Alternative Energy Systems Consulting (AESC) has presented updates to the Cal TF's Measure Screening Committee and has been in communication with PG&E and SCE to allow for feedback. AESC has also communicated with the statewide third-party program implementer to facilitate the handoff after completion of this CalNEXT project.

Conclusion

This report utilized the existing structure of the clean water pump replacement along with wastewater program data from the IOU to develop the necessary data for the development of a deemed measure offering for the replacement of wastewater pumps. This data has been presented in a manner that will assist with submission of the measure package to Cal TF and streamline the process of developing the necessary permutations and requirements associated with the new deemed offering. To ensure all stakeholders had the opportunity to provide feedback, project updates and scope development were presented to the Cal TF Measure Screening Committee as well as PG&E and SCE. The Cal TF Measure Screening Committee was provided with the energy efficiency portfolio need, market potential, and opportunities within the sector as well as the timeline with the request of identification of the appropriate lead IOU and guidance on the handoff process. SCE was identified by the committee to be the most appropriate lead to facilitate the next steps for integration of the findings to a measure package submittal. In discussions with SCE, it has been identified that, due to resource constraints, a third-party would be needed to take the measure through the approval process with the recommendation that the WISE program be the logical candidate. The conversation with the third-party implementer is ongoing, however they have expressed that the availability of a measure package enabling savings claims and incentives for the replacement of wastewater pumps would benefit their statewide program. PG&E did not provide feedback with regards to the outreach of this measure. AESC will continue to engage the third-party implementer to ensure handoff of this effort and facilitate support as necessary in developing the measure package submittal.