**Work Paper WPSDGENRWH1204**

**Revision 1**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Outdoor/Indoor Pool Covers**

### Core Measure Summary Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| General Measure Information | | | | | | | | PT | | 1st Baseline Period | | | | 2nd Baseline Period | | | | TOU |
| Measure Name | Measure RunID | Solution Code | CZ | Building Type | Load Shape | EUL | Unit Definition | Program Type (NEW, ROB, RET) | Applicable Code | Gross Unit Annual Electricity Savings (kWh/unit) | User Entered kW Savings per unit (kW/unit) | Gas Savings (Therms) | 1st Baseline Useful Life | kWh Saving per unit (kWh/unit) | kW Savings per unit (kW/unit) | Gas Savings (Therms) | 2nd Baseline Useful Life | % TOU |
| Indoor Pool Cover | Engineering calculations | N/A | ALL | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.70 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Coastal) | Engineering calculations | N/A | 04 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 5.06 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Coastal) | Engineering calculations | N/A | 05 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 5.06 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 06 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 4.31 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 07 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 4.31 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 08 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 4.31 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 09 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 4.31 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 10 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 4.31 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 13 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 3.90 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 14 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 3.90 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 15 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 3.90 | 6 | N/A | N/A | N/A | N/A | 0 |
| Lg. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 16 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 3.90 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Coastal) | Engineering calculations | N/A | 04 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 3.82 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Coastal) | Engineering calculations | N/A | 05 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 3.82 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 06 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.97 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 07 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.97 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 08 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.97 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 09 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.97 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Mediterranean) | Engineering calculations | N/A | 10 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.97 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 13 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.44 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 14 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.44 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 15 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.44 | 6 | N/A | N/A | N/A | N/A | 0 |
| Sm. Outdoor Pool Cover (Central Valley) | Engineering calculations | N/A | 16 | ALL | N/A | 6 | Sq. ft. | RET-Add | N/A | N/A | N/A | 2.44 | 6 | N/A | N/A | N/A | N/A | 0 |

Note: **For the complete list of Measures, refer to the attached calculation spreadsheet**

### Costing and NTG Summary Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| General Measure Information | | | | PT | | NTG | | | IR | 1st Baseline Period | 2nd Baseline Period | IMC | DIM |
| Measure Name | Solution Code | CZ | Unit Definition | Program Type (NEW, ROB, RET) | Applicable Code | NTG Non-Res. | NTG Res. | NTG Multi Family | Installation Rate | Gross Measure Cost per unit | Gross Measure Cost per unit | Incremental Measure Cost per unit | Delivery & Incentive Method |
| Indoor Pool Cover | N/A | ALL | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Coastal) | N/A | 04 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Coastal) | N/A | 05 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Mediterranean) | N/A | 06 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Mediterranean) | N/A | 07 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Mediterranean) | N/A | 08 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Mediterranean) | N/A | 09 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Mediterranean) | N/A | 10 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Central Valley) | N/A | 13 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Central Valley) | N/A | 14 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Central Valley) | N/A | 15 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Lg. Outdoor Pool Cover (Central Valley) | N/A | 16 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $2.28 | N/A | $2.28 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Coastal) | N/A | 04 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Coastal) | N/A | 05 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Mediterranean) | N/A | 06 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Mediterranean) | N/A | 07 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Mediterranean) | N/A | 08 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Mediterranean) | N/A | 09 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Mediterranean) | N/A | 10 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Central Valley) | N/A | 13 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Central Valley) | N/A | 14 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Central Valley) | N/A | 15 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |
| Sm. Outdoor Pool Cover (Central Valley) | N/A | 16 | Sq. ft. | RET-Add | N/A | 0.60 | 0.60 | 0.60 | 0.38 | $1.68 | N/A | $1.68 | Downstream-Deemed |

Note: **For the complete list of Measures, refer to the attached calculation spreadsheet**

# Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Revision # | MM/DD/YY | Author/Affiliation | Summary of Changes |
| 0 | 06/15/2012 | Kelven Valenzuela, SDGE | 1. Adopted from WPRSGNRWH0002, R0 Pool Covers –PREPS-.docx. Added CZ7 values. 2. Changed NTG to DEER 2011 values. |
| 1 | 03/11/2014 | Rocaciano Vega, RMS | 1. Reformatted workpaper to new format. 2. Added DEER Differences Analysis, Code Analysis, and Load Shape sections. 3. Updated the NTG and IR per “Work Disposition for Commercial Pool Covers” dated March 1, 2013. 4. Updated So Cal Gas reference workpaper number 5. Added GSIA |

# Section 1. General Measure & Baseline Data

## 1.1 Measure & Delivery Description

This measure is to install pool covers on commercial use pools that are heated with gas-fired equipment for indoor and outdoor pools. This measure can be used for pools that currently do not have pool covers or have pool covers that are past their useful lives.

Pool covers have two modes of failure, which may lead the pool covers to either become ineffective, or create a situation where pool operators discontinue use of the covers. The first mode of failure is tears in the pool cover where water pools on top and evaporates from the pool. Since the main source of heat loss in a pool is from evaporation, this greatly diminishes the effectiveness of the cover to a point where the pool is consuming energy as if no cover were being used. The second mode of failure is deterioration of the cover where particles from the cover fabric begin detaching and clogging the filtration system. In this situation, pool operators stop using the covers so that the filters do not unnecessarily clog.

In both situations the pool is in operation, but uses significantly more energy than necessary. Pool operators often do not purchase new covers because the expense of the upfront cost of new covers. This rebate help offset the cost and encourage pool operators to order replacement covers for pools that either are no longer using their covers or are using covers that are ineffective.

The larger and longer the pool the more difficult it becomes to manage the pool cover deployment process. To facilitate the use of the pool covers for large pools such as Olympic size range, the program will mandate pools greater than 11,000 square feet to include a power assisted winder to ensure that the covers are employed. Regardless of size, all pool covers must have a reel to assist in removing the pool cover and storage. In cases where reels are no longer operable, the pool operator will be required to purchase new reels as well. Pool covers must have a manufactures warranty of 5 years or greater to ensure savings persistence over the effective useful life of the measure.

**Technical Description**

By installing pool covers, the heating load on the pool boiler will be reduced by reducing the 1) heat loss from the water to the environment and 2) the amount of actual water lost due to evaporation (which then requires additional heated water to make up for it).

The main source of energy loss in pools is through evaporation. This is particularly true of outdoor pools where wind plays a larger role. The point of installing pool covers is threefold.

1. First, it will reduce convective losses due to the wind by shielding the water surface.
2. Second, it will insulate the water from the colder surrounding air.
3. Third, it will reduce radiative losses to the night sky. In doing so, evaporative losses will also be minimized and the boiler will not need to work as hard in replenishing the pool with hot water to keep the desired temperature.

The calculations based on these types are savings are done using the RSPEC! Energy Smart Pools Software that was created by the U.S. Department of Energy.

## 1.2 DEER Differences Analysis

DEER does not contain the appropriate information for this measure, so the savings are based on engineering calculations.

Table 1 DEER Difference Summary

|  |  |
| --- | --- |
| DEER Difference Summary Table | |
| Modified DEER Methodolgy | No |
| Scaled DEER Measure | No |
| DEER Building Prototypes Used | No |
| Deviation from DEER | DEER does not contain this type of measure. |
| DEER Version | N/A |
| DEER Run ID and Measure Name (Sample) | N/A |

## 1.3 Code Analysis

This measure does not fall under Title 20, Title 24, or any Federal Standards for existing pools. However, for new pool installations Section 114(b) of Title 24 states:

(b) **Installation**. Any pool or spa system or equipment shall be installed with all of the following:

1. ***Covers****. A cover for outdoor pools or outdoor spas that have a heat pump or gas heater.*

Table 2 Code Summary

|  |  |  |
| --- | --- | --- |
| Code | Applicable Code Reference | Effective Dates |
| Title 24 (2008) | Existing Pools: N/A  New Pools: Section 114 – Mandatory Requirements For Pool And Spa Systems And Equipment | 01/01/2010 |

## 1.4 Measure Effective Useful Life

The effective useful life of a pool cover is typically one year longer than its warranty period. Pool covers are typically offered with 3 and 5 year warranties with at least one company offering a 6 year warranty. Facilities must purchase 5 year minimum warranty covers. Thus, using 5 year warranty covers as the baseline, the EUL of pool covers are typically 6 years.

Table 3 DEER08 EUL Value/Methodology

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Market | Enduse | Measure | EUL (Years) | RUL (Years) |
| Non-Residential | Gas | Outdoor Pool Covers | 6 | N/A |
| Non-Residential | Gas | Indoor Pool Covers | 6 | N/A |

## 

## 1.5 Net-to-Gross Ratios for Different Program Strategies

The NTG value was obtained from the “2011 NTG Table.xls” [E]. The relevant NTGR for this measure is shown in Table 5 below.

Table 4 Net-to-Gross Ratio

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NTGR\_ID\* | Description\* | Sector\* | BldgType\* | ProgDelivID | NTG\* |
| Com-Default>2yrs | Outdoor Pool Covers | Com | Any | N/A | 0.60 |
| Com-Default>2yrs | Indoor Pool Covers | Com | Any | N/A | 0.60 |

\*Denotes that the column is taken from the DEER NTG Table.

The installation rate (IR) of 0.38 is obtained from the “Work Disposition For Commercial Pool Covers” dated March 1, 2013. As stated in the disposition:

“The use of a “regressive baseline” is not allowed: An installation rate of 0.28 shall be applied to PG&E savings values and 0.38 to SDG&E and SCG savings values. All workpapers allow this measure when an existing pool cover has reached the end of its useful life. Based on preliminary economic analysis, staff does not agree with the assumption that, once pool covers become non-functional, that customers will not replace them without IOU incentives. A review of historical photographic records from Google Earth indicates that approximately 28% of pool cover savings occur for pools with no previous use of covers.”

Table 5 Gross Savings Installation Adjustment (GSIA) IDs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| GSIA\_ID | Description | Sector | BldgType | UseCategory | TechType | Installation Rate |
| ND-Com-PoolCover | Commercial Pool Cover | Any | Any | Any | Any | 0.38 |

## 1.6 Time-of-Use Adjustment Factor

As directed by the CPUC in decision 06-06-063 dated June 29, 2006, time-of-use (TOU) adjustment factors are to be applied for residential A/C and commercial A/C (packaged and split-system direct-expansion cooling) measures only. Since this is not an A/C measure, the TOU adjustment factor is 0. Additionally, if a measure is assigned a DEER08 load shape, i.e. the load shape starts with “DEER:” the TOU assigned to that measure should also be zero.

Table 6 TOU Summary Table

|  |  |
| --- | --- |
| Measure | % |
| Pool Covers | 0 |

\*Note: Check Section 3 if a measure appears to require a non-zero percentage but is assigned zero. If the load shape is a DEER08 load shape, a TOU of 0 is correct.

# Section 2. Energy Savings & Demand Reduction Calculations

# The U.S. Department of Energy (DOE) produced a software tool for estimating pool energy consumption as part of their Reduce Swimming Pool Energy Costs! Program (RSPEC!). This RSPEC! software tool (Energy Smart Pools Version 2.0a) was used to evaluate the typical energy savings for this measure. Runs were performed with a weather site set to Los Angeles, Sacramento, and San Francisco.

# In addition, this program was evaluated by an independent party (Sandia National Laboratories) which concluded that:

# *“… the best load predictions are obtained using either the RSPEC! software tool…”* [C]

# Climate Zones 04 and 05 were taken as an average of the Coastal climate zones represented by San Francisco in the RSPEC! Tool, as this was the closest representation of the areas. Climate Zones 06, 08, 09, and 10 were taken as an average of the Mediterranean climate zones represented by Los Angeles in the RESPEC! Tool, as this was the closest representation of the areas. Climate Zones 13, 14, 15, and 16 were taken as an average of the Central Valley climate zones represented by Sacramento in the RESPEC! Tool, as this was the closest representation of the areas

The RSPEC! program has 15 primary user inputs to perform savings calculations for pool covers. Fifteen different iterations were run, varying four of the inputs that effect savings for pool cover the most: locations, schedule, wind speed, and solar shading. Below is a list of the 15 different inputs including explanations of how the variables were modified. These inputs were defined by empirical data taken from previous projects that were completed under the Statewide Customized retrofit program [D].

**Indoor Pool Assumptions**

Type Owner: School

Type Pool: (1) Indoor

Schedule: Jan 15th to Dec 15th , 8:00 AM to 6:00 PM M-F, 12:00pm to 4:00 PM S-SU

Weather Site: (1) Sacramento (Central Valley climate zones)

(2) San Francisco (Coastal climate zones)

(3) Los Angeles (Mediterranean)

Windspeed: (1) 1%

Shading: (1) 0%

**General Pool Data:**

Pool Area: 6187 square feet (savings varies linearly so does not have an effect on calculations)

Pool Temp: 80 degrees F (typical pool temperature)

Activity Level: Low

Pool Heater Fuel: Natural Gas

**Pool Cover Data:**

Cover Type: Insulated

System: Manual

Cover R-Value: 2.0

Pool Coverage %: 100

**Outdoor Pool Assumptions**

Type Owner: School

Type Pool: Outdoor

Pool Size: (1) Large Pool: 12,000 sqft

(2) Small Pool: 6,400 sqft

Schedule: (1) Large Pool: Jan 15th to Dec 15th , 8:00 AM to 6:00 PM M-F, 12:00pm to 4:00 PM S-SU

(2) Small Pool: March 1st to September 30th, 8:00 AM to 6:00 PM M-F, 12:00 PM to 4:00 PM S-SU

Weather Site: (1) Sacramento (Central Valley climate zones)

(2) San Francisco (Coastal climate zones)

(3) Los Angeles (Mediterranean)

Windspeed: (1) 1%

(2) 5%

(3) 15% (small pools)

Shading: (1) 0%

(2) 5%

**General Pool Data:**

Pool Temp: 80 degrees F (typical pool temperature)

Activity Level: High

Pool Heater Fuel: Natural Gas

**Pool Cover Data:**

Cover Type: Insulated

System: Manual

Cover R-Value: 2.0

Pool Coverage %: 100

Below is a summary of the iterations that were completed and the associated savings:

Table 7 Pool Covers Energy Savings

|  |  |  |  |
| --- | --- | --- | --- |
| Measure | Reference Number | Measure Unit | Gas Savings (therms/unit) |
| Indoor Pool Covers | WPRSGNRWH0002 | Sq Ft | 2.70 |
| Small Outdoor Pool Covers (Mediterranean) | WPRSGNRWH0002 | Sq Ft | 2.97 |
| Small Outdoor Pool Covers (Central Valley) | WPRSGNRWH0002 | Sq Ft | 2.44 |
| Small Outdoor Pool Covers (Coastal) | WPRSGNRWH0002 | Sq Ft | 3.82 |
| Large Outdoor Pool Covers (Mediterranean) | WPRSGNRWH0002 | Sq Ft | 4.31 |
| Large Outdoor Pool Covers (Central Valley) | WPRSGNRWH0002 | Sq Ft | 3.90 |
| Large Outdoor Pool Covers (Coastal) | WPRSGNRWH0002 | Sq Ft | 5.06 |

Below is a summary of the iterations that were completed in RESPEC! and the associated savings:

Table 8 Therms/sq. ft. Savings Summary: Indoor Pool

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Location | Pool Size | Schedule  (hrs) | Wind % | Solar % | Therm Savings | Therms/sqft |
| Los Angeles | 6,187 | 2,880 | 1 | 0 | 16,553 | 2.68 |
| Sacramento | 6,187 | 2,880 | 1 | 0 | 16,583 | 2.68 |
| San Francisco | 6,187 | 2,880 | 1 | 0 | 16,948 | 2.74 |
|  |  |  |  | **Average** | **16,695** | **2.70** |
| \*assuming 58 hrs per week, closed from Dec 15th to Jan 15th | | | | | | |
| \*\*high activity level | | | | | | |
| \*\*\*6,187 sq ft | | | | | | |
| \*\*\*\*heater eff. 80, pool temp 80 | | | | | | |

Table 9 Therms/sq. ft. Savings Summary: Small Outdoor Pool

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Location | Pool Size | Schedule  (hrs) | Wind % | Solar % | Therm Savings | Therms/sqft |
| Los Angeles | Small | 1,568 | 1 | 0 | 14,233 | 2.22 |
| Los Angeles | Small | 1,568 | 15 | 5 | 23,768 | 3.71 |
|  |  |  |  | **Average** | **19,001** | **2.97** |
| Sacramento | Small | 1,568 | 1 | 0 | 10,354 | 1.62 |
| Sacramento | Small | 1,568 | 15 | 5 | 20,841 | 3.26 |
|  |  |  |  | **Average** | **15,598** | **2.44** |
| San Francisco | Small | 1,568 | 1 | 0 | 18,380 | 2.87 |
| San Francisco | Small | 1,568 | 15 | 5 | 30,565 | 4.78 |
|  |  |  |  | **Average** | **24,473** | **3.82** |
| \*assuming 58 hrs per week, closed from Oct 1 to Feb 28th | | | | | | |
| \*\*high activity level | | | | | | |
| \*\*\*6,400 sq ft | | | | | | |
| \*\*\*\*heater eff. 80, pool temp 80 | | | | | | |

**Table 10 Therms/sq. ft. Savings Summary: Large Outdoor Pool**

| **Location** | **Pool Size** | **Schedule**  **(hrs)** | **Wind %** | **Solar %** | **Therm Savings** | **Therms/sqft** |
| --- | --- | --- | --- | --- | --- | --- |
| Los Angeles | Large | 2,880 | 1 | 0 | 47,114 | 3.93 |
| Los Angeles | Large | 2,880 | 5 | 5 | 56,281 | 4.69 |
|  |  |  |  | **Average** | **51,698** | **4.31** |
| Sacramento | Large | 2,880 | 1 | 0 | 42,339 | 3.53 |
| Sacramento | Large | 2,880 | 5 | 5 | 51,348 | 4.28 |
|  |  |  |  | **Average** | **46,844** | **3.90** |
| San Francisco | Large | 2,880 | 1 | 0 | 56,082 | 4.67 |
| San Francisco | Large | 2,880 | 5 | 5 | 65,365 | 5.45 |
|  |  |  |  | **Average** | **60,724** | **5.06** |
| \*assuming 58 hrs per week, closed from Dec 15th to Jan 15th | | | | | | |
| \*\*high activity level | | | | | | |
| \*\*\*12,000 sq ft | | | | | | |
| \*\*\*\*heater eff. 80, pool temp 80 | | | | | | |

# Section 3. Load Shapes

Load shapes are not applicable to gas measures because the price of gas is not dependent on time-of-use.

# Section 4. Base Case & Measure Costs

## 4.1 Base Case Cost

There is no base case cost as the pool had no covers originally.

## 4.2 Gross Measure Cost

Based on a review of 7 pool cover projects, the following results were derived. [A]

Table 11 Pool Cover Measure Cost Results

|  |  |
| --- | --- |
| Parameter | Value |
| Small Pool Cover Cost1(length < 50 yards) | $1.68/sq.ft. |
| Large Pool Average Cover Cost | $1.68/sq.ft. |
| Average Power Winder Cost | $8,125/winder |
| Average Large Pool Size (length>50 yards) | 13,523 sq.ft. |
| Average Winder Cost per sq.ft. | $0.60 |
| Total Large Pool Cover Cost | $2.28/sq.ft. |

Table 12 Outdoor Pool Covers Measure Costs

|  |  |
| --- | --- |
| Measure | Full Installed Cost $/unit |
| Large Outdoor Pool Covers | $2.28/sq ft |
| Small Outdoor Pool Covers | $1.68/sq ft |
| Indoor Pool Covers | $1.68/sq ft |

## 4.3 Incremental Measure Cost

There is no installation cost associated with pool covers.

Table 13 Outdoor Pool Covers Incremental Measure Cost

|  |  |  |
| --- | --- | --- |
| Measure | Equipment Cost | Total Cost |
| Large Outdoor Pool Covers | $2.28/sq ft | $2.28/sq ft |
| Small Outdoor Pool Covers | $1.68/sq ft | $1.68/sq ft |
| Indoor Pool Cover | $1.68/sq ft | $1.68/sq ft |

# Attachments

1. 
2. 
3. 
4. 
5. 
6. 

# References

1. **Resource Solutions Group**. WPRSGNRWH0002.0 Pool Covers. 2010.
2. **SolaPool Covers**. Pool Covers Website, FAQ- "How long will my SolaPool cover blanket last?". [Online] <http://www.solapoolcovers.com.au/faq.php>.
3. **Sandia National Laboratories**. Large Scale Municipal and Commercial Solar Pools- Engineering Tools and Heating Loads. [Online] <http://energy.sandia.gov/engineeringtools.htm>.
4. Attachments #1-4: Previous Statewide Custom Project rebates
5. Attachment #5: 2011 NTG Table