Short Form Work Paper PGECOPRO108

**Revision 1**

**Pacific Gas & Electric**

**Pipe Insulation (Non-Space Conditioning)**

**April 16, 2018**

# PG&E Pipe Insulation

## Introduction

This short form workpaper (WP) documents the values adopted from SCG’s WP entitled “Pipe Insulation (Non-Space Conditioning)” (WPSCGWP110812A\_Rev4\_Pipe Insulation.docx). PG&E adopts all SCG measures.

## Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 4/1/2018 | Linda Wan (PG&E) | Adopted all lead IOU workpaper measures from SCG’s workpaper “WPSCGWP110812A\_Rev4\_Pipe Insulation” dated December 26, 2017 except for Pipe Insulation 1” Indoor, which overlaps with PGECOHVC104 R7 Pipe Insulation workpaper. This workpaper adopts new measures that are not in PGECOHVC104 R7 Pipe Insulation workpaper. |
| 1 | 4/16/2018 | Linda Wan (PG&E) | Adopting Pipe Insulation 1” Indoor lead IOU workpaper measures from SCG’s workpaper “WPSCGWP110812A\_Rev4\_Pipe Insulation” effective 5/1/2018. This workpaper now includes measures that are in the retired PGECOHVC104 R7 Pipe Insulation workpaper. |

## Measure Summary

Table : Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts for SCG’s “Pipe Insulation (Non-space Conditioning)”. The base energy consumption and measure energy consumption values are from SCG’s workpaper, WPSCGWP110812A, Revision 4. Please note that the measures for Large Commercial and Small Commercial have been combined and the savings are weighted 70% and 30%, respectively. |
| **1.1 Measure & Baseline Data** | Measures:   |  |  |  | | --- | --- | --- | | PG&E Measure Code | SCG Measure Code | Description | | PR051 | TBD | 1 inch Insulation layer, <= 1 inch pipe, <=15 psig steam, Outdoor | | PR052 | TBD | 1 inch Insulation layer, <= 1 inch pipe, >15 psig steam, Outdoor | | PR053 | TBD | 1 inch Insulation layer, <= 1 inch pipe, Hot Water, Outdoor | | PR054 | TBD | 1 inch Insulation layer, > 4 inch pipe, <=15 psig steam, Outdoor | | PR055 | TBD | 1 inch Insulation layer, > 4 inch pipe, >15 psig steam, Outdoor | | PR056 | TBD | 1 inch Insulation layer, > 4 inch pipe, Hot Water, Outdoor | | PR057 | TBD | 1 inch Insulation layer, 1 inch < pipe <= 4 inch, <=15 psig steam, Outdoor | | PR058 | TBD | 1 inch Insulation layer, 1 inch < pipe <= 4 inch, >15 psig steam, Outdoor | | PR059 | TBD | 1 inch Insulation layer, 1 inch < pipe <= 4 inch, Hot Water, Outdoor | | PR060 | TBD | 1 inch Insulation layer, <= 1 inch pipe, <=15 psig steam, Indoor | | PR061 | TBD | 1 inch Insulation layer, <= 1 inch pipe, >15 psig steam, Indoor | | PR062 | TBD | 1 inch Insulation layer, <= 1 inch pipe, Hot Water, Indoor | | PR063 | TBD | 1 inch Insulation layer, > 4 inch pipe, <=15 psig steam, Indoor | | PR064 | TBD | 1 inch Insulation layer, > 4 inch pipe, >15 psig steam, Indoor | | PR065 | TBD | 1 inch Insulation layer, > 4 inch pipe, Hot Water, Indoor | | PR066 | TBD | 1 inch Insulation layer, 1 inch < pipe <= 4 inch, <=15 psig steam, Indoor | | PR067 | TBD | 1 inch Insulation layer, 1 inch < pipe <= 4 inch, >15 psig steam, Indoor | | PR068 | TBD | 1 inch Insulation layer, 1 inch < pipe <= 4 inch, Hot Water, Indoor | | PR069 | TBD | Fitting Insulation <= 1 inch pipe, <= 15 psig steam, Indoor | | PR070 | TBD | Fitting Insulation <= 1 inch pipe, >15 psig steam, Indoor | | PR071 | TBD | Fitting Insulation <= 1 inch pipe, Hot Water, Indoor | | PR072 | TBD | Fitting Insulation > 4 inch pipe, <=15 psig steam, Indoor | | PR073 | TBD | Fitting Insulation > 4 inch pipe, >15 psig steam, Indoor | | PR074 | TBD | Fitting Insulation > 4 inch pipe, Hot Water, Indoor | | PR075 | TBD | Fitting Insulation 1 inch < pipe <= 4 inch, <=15 psig steam, Indoor | | PR076 | TBD | Fitting Insulation 1 inch < pipe <= 4 inch, >15 psig steam, Indoor | | PR077 | TBD | Fitting Insulation 1 inch < pipe <= 4 inch, Hot Water, Indoor | | PR078 | TBD | Fitting Insulation, <= 1 inch pipe, <=15 psig steam, Outdoor | | PR079 | TBD | Fitting Insulation, <= 1 inch pipe, >15 psig steam, Outdoor | | PR080 | TBD | Fitting Insulation, <= 1 inch pipe, Hot Water, Outdoor | | PR081 | TBD | Fitting Insulation, > 4 inch pipe, <=15 psig steam, Outdoor | | PR082 | TBD | Fitting Insulation, > 4 inch pipe, >15 psig steam, Outdoor | | PR083 | TBD | Fitting Insulation, > 4 inch pipe, Hot Water, Outdoor | | PR084 | TBD | Fitting Insulation, 1 inch < pipe <= 4 inch, <=15 psig steam, Outdoor | | PR085 | TBD | Fitting Insulation, 1 inch < pipe <= 4 inch, >15 psig steam, Outdoor | | PR086 | TBD | Fitting Insulation, 1 inch < pipe <= 4 inch, Hot Water, Outdoor | |
| **1.2 Technical Description** |  |
| Measures | As cited per SCG workpaper  Table I: Base, Standard, and Measure Cases   |  |  | | --- | --- | | **Case** | **Description of Typical Scenario** | | Measure | Adding a minimum of one inch of insulation to existing bare pipe used to transport a hot fluid ranging from half-inch to four inches in diameter either in the commercial or industrial sector. | | Existing Condition | Uninsulated commercial or industrial pipe used to transport hot fluids | | Code/Standard | -Title 24: Section 120.3  -Occupational Safety and Health Administration (OSHA) applicable requirements. | | Industry Standard Practice | Minimally insulating to comply with applicable code. | |
| Code for All Measures | As cited per SCG workpaper  Table XII: Code Summary   |  |  |  | | --- | --- | --- | | **Code** | **Reference** | **Effective Dates** | | Title 24 (2016) | Section 120.3 Pages 131-133 | January 1st, 2017 | | Title 20 (2014) | N/A | N/A | | DOE | N/A | N/A | | OSHA | [1910.261(k)(11)](https://www.osha.gov/pls/oshaweb/owalink.query_links?src_doc_type=STANDARDS&src_unique_file=1910_0261&src_anchor_name=1910.261(k)(11)) | August 19, 1998 | |
| Requirements | As cited per SCG workpaper  Eligibility Requirements: This measure is applicable to small, large commercial and industrial buildings with existing uninsulated pipe systems. These buildings must be within the IOU territory and shall use natural gas provided by an IOU.  Implementation Requirements:   * These measures are applicable to any small, large commercial and industrial pipe insulation retrofit (i.e., non-new construction) application. They cannot be used for residential purposes. * Insulation required by California Building Code (Title 24) or employee safety laws (Occupational Safety and Health Administration: OSHA) is not eligible for a rebate. * The pipes must transfer hot water, low-pressure steam, or medium-pressure steam directly from gas-fired equipment. The fluid type must be indicated. If the fluid is steam, the pressure of the steam must also be indicated. * Maximum qualifying pipe diameter is four inches, and minimum qualifying pipe diameter is half-inch. * The length of insulation to be installed at each pipe size must be indicated. * A minimum of one inch of pipe insulation must be added to existing bare commercial or industrial steel or copper pipe. * The hours of operation must be indicated on the top of the application. * Acceptable types of insulation for hot water pipes include: elastomeric foam rubber, polyethylene foam, UV-resistant polyethylene foam and rigid polyurethane foam. * Acceptable types of insulation for steam pipes include silicone foam rubber, melamine foam, rigid urethane-based foam, cellular glass, rigid fiberglass and rigid mineral wool. * Replacement of damaged (existing) insulation is not eligible for a rebate. * The manufacturer’s specification sheet must be submitted with the application. |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | Retrofit Add-on (REA) |
| Delivery Mechanisms | Downstream Rebate – Deemed  Direct Install |
| **1.4.1 DEER Data** |  |
| Net-to-Gross Ratio | Per SCG Workpaper  For all measures in this Workpaper, the NTGR found in the “ESPI Pipe Insulation Reports” was used.  Table VII: NTGR ID   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **NTGR ID** | **Description** | **Sector** | **BldgType** | **Measure Delivery** | **NTGR** | | NonRes-sAll-mPipeIns-deemed | Pipe insulation: non-HVAC or DHW applications; deemed; all delivery mechanisms except upstream | Ind | Any | NonUpStrm | 0.6 | |
| Effective and Remaining Useful Life | Per SCG Workpaper  Table XI: EUL ID   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **EUL ID** | **Description** | **Sector** | **UseCategory** | **EUL (Years)** | **RUL (Years)** | | WtrHt-PipeIns-Gas-2017 | Pipe Insulation | Com  Ind | SHW | 20 | 6.67 | |
| **Section 2. Calculation Methodology** | Per SCG Workpaper  Table VI: DEER Difference Summary   |  |  | | --- | --- | | **DEER Item** | **Used for Workpaper?** | | Modified DEER methodology | Yes | | 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 | DEER 2017 | | Reason for Deviation from DEER | DEER does not contain this type of measure | | DEER Measure IDs Used | N/A | |
| Energy Savings/Peak Demand Reduction – All Measures | Please see refer to the SCG workpaper for energy savings values.  The savings for Large Commercial and Small Commercial have been combined and uses a 70% and 30% weighting, per the Observations column in Table 4-2 Comparison of Ex Ante and Ex Post Annual Operating Hours by Customer Type. Please refer to the “SmallLargeCombinedCalculations” worksheet in the excel file, “SCG to PGE Measure Mapping.xlsx.” |
| **Section 3. Load Shapes** | Per SCG Workpaper  Table XIII: Building Types and Load Shapes   |  |  |  | | --- | --- | --- | | **Building Type** | **Load Shape** | **E3 Alternate Building Type** | | Commercial | Misc. Commercial | DHW HtPmp | | Industrial | Industrial | DHW HtPmp | |
| **Section 4. Costs** | The Gross Measure Cost is obtained from costs documented by SCG work paper “WPSCGWP110812A\_Rev4\_\_Pipe Insulation.docx” Section 4- Cost. |
| **Section 4.1 Base and Measure Costs** |  |
| Base Cost | The base case cost is $0.00, as this will be not doing anything to reduce the heat loss from a pipe. |
| Measure Cost |  |
|  | As per SCG workpaper  Table XIV: Pipe Insulation Cost   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Cost Case Description** | **Program Delivery Strategies** | **Material Cost** | **Installation Labor Cost - Retrofit** | **Unit** | **Gross Measure Cost** | | Pipe Insulation  -Hot Water/Steam | Downstream Prescriptive Rebates/Incentives | $3.49 | $3.18 | Ln. Ft. | $6.68 |   Table XV: Fitting Insulation Costs (Material and Installation) Provided by Vendor   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Parameter** | **Hot Water** | | **Low-pressure Steam (0-15 psig), High Pressure Steam ( > 15 psig)** | | | Pipe Size  (inch) | 0.75 <= OD <2 | 2 <= OD <= 4 | 0.75 <= OD <2 | 2 < OD <= 4 | | Insulation Thickness (inch) | 1 | 1 | 1.5 | 1.5 | | Indoors ($/fitting) | $7.73 | $7.87 | $7.60 | $9.47 | | Outdoors ($/fitting) | $7.87 | $9.60 | $8.67 | $7.33 | |
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