

Short Form Work Paper PGECOPRO108
Revision 0

Pacific Gas & Electric

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

April 1, 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

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.

MEASURE SUMMARY

Table 1: 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
	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	

Section	Value		
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 1 st , 2017
	Title 20 (2014)	N/A	N/A
	DOE	N/A	N/A
	OSHA	1910.261(k)(11)	August 19, 1998

Section	Value
Requirement s	<p>As cited per SCG workpaper</p> <p>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.</p> <p>Implementation Requirements:</p> <ul style="list-style-type: none"> • 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 Mechanism s	
Installation Type	Retrofit Add-on (REA)
Delivery Mechanisms	Downstream Rebate – Deemed Direct Install
1.4.1 DEER Data	

Section	Value					
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	Value					
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	