

PRESCRIPTIVE INCENTIVE BUSINESS CASE

INSULATION OF BARE HOT WATER, STEAM OR THERMAL FLUID PIPING

MEASURE DESCRIPTION

This measure is intended for *retrofit only* applications for customers on a qualified CNG rate schedule who use gas fired DHW, boilers, or other thermal fluid heating systems, and have bare, uninsulated distribution piping runs that convey hot water, steam, or other thermal fluids located in unheated spaces. New construction is not eligible because WA State Energy Code requires minimum insulation for such situations. Uninsulated piping that conveys thermal fluids will lose heat to the atmosphere thus adding to inefficiency of the intended heating source. Adding insulation to the pipe runs will greatly reduce this heat loss, increasing the overall efficiency of the system in question.

Direct Benefits

- Energy savings and attendant natural gas cost savings
- Faster heat-up of the hot water, steam or thermal fluid system end user

Indirect Benefits

- Freeze protection of piping exposed to low ambient temps
- Greenhouse gas emissions are reduced, creating a better environment

MARKET APPLICABILITY and IMPACT

The purpose of this measure is to help those customers defray the capital costs of installing insulation for significant bare piping runs in unconditioned spaces that convey hot water, steam, or other thermal fluid generated in gas fired heating equipment.

MEASURE ANALYSES AND COST EFFECTIVENESS

The yearly energy savings achievable by insulating bare piping with a specified minimum thickness of insulation is calculated using conventional steady state heat transfer equations. We then average the reduction in heat loss energy saved over a period of time that corresponds to a conservative number of annual heating hours in our WA State climate during a typical year. While many combinations of heat transfer medium temperature, piping diameter, insulation thickness and insulation materials are available

for such measures, we have chosen to use the average combinations shown in the following table for purposes of this measure standardization. Insulation thicknesses for the two temperature levels of interest were chosen for their general agreement with WA State Energy Code for new construction. The thermal conductivity (k value) of the insulation was based on a polyisocyanurate insulation material. Other insulation materials will vary somewhat in k factor, but overall effects on insulation value will be nominal. We have chosen normalized units of *per lineal foot of piping* for all the measure metrics. The ASHRAE recommended 20 years for the measure life was used in the cost effectiveness calculation.

Medium Temp	Pipe Diameter Range (in)	Minimum Required Insulation Thickness (in)	Range of Therm Savings/year (per LF)	Proposed Deemed Therm Savings/year (per LF)	Incremental Cost (per LF)	Proposed Incentive (per LF)
<= 200F	1-3	1.5	3.5-9.5	6	\$8	\$4.50
>= 200F	1-3	2.5	6.5-18	12	\$18	\$9

For projects with significantly higher medium temperature levels, pipe sizes, or insulation thickness, we reserve the right to evaluate customer energy savings and incentives on a custom basis.

Incremental insulation costs were obtained from a combination of CA-DEER and CNG-WA CIC program historical average costs/foot for commercially installed insulation at the indicated thickness levels.

See attached supporting documents - Pipe Insulation ES and CNG CE Calculators.