

**Measure: Solar Hot Water- Private and Public Pools (G10a/b)**

Mandate new pool heaters (commercial and residential) use passive solar systems and that all government owned pools install solar hot water systems.

**COT ARRA RFP Summary:**

Emission reduction potential by 2020:	1,305 tCO <sub>2</sub> e (in 2020)
Percentage of goal (2012):	0.007%
Percentage of goal (2020):	0.06%
Total annual average implementation costs:	\$120 (residential)
Entity that bears the costs of implementation:	Ratepayer
Cost/Savings per tCO <sub>2</sub> e:	\$267 / tCO <sub>2</sub> e (residential)
Net annual savings:	\$705
Entity that realizes the financial return:	Ratepayer
Equitability (progressive/regressive, income/revenue neutral, etc):	Only applicable to homeowners and commercial entities that can afford a pool
Potential unintended consequences:	Minimal

## **Background information:**

Solar hot water mechanisms for pools utilize passive solar to meet, or augment, the heating needs via a renewable resource as opposed to more conventional gas heaters. The US DOE states that such heaters are:

*“...cost competitive with both gas and heat pump pool heaters, and they have very low annual operating costs. Actually, solar pool heating is the most cost-effective use of solar energy in many climates.”<sup>1</sup>*

Although mandatory solar pool heaters will not result in material GHG reductions for the COT (as will be shown below), such a policy is a step in the right direction for utilizing the regions most abundant natural resource.

The system pumps pool water through the solar collector(s) that heat the water and then return the heated water to the pool. The use of such systems reduce or complete replace the need for gas heaters, therefore reducing the need for natural gas and the associated emissions.

The capital investment, which can be partially offset via local and federal rebates and incentives, is borne by the home/pool-owner. The payback period depends on the size of the system and the volume of heating that is demanded of it.

## **Business As Usual:**

Under a business as usual scenario, pool-owner's that choose to heat their pools will do so with traditional natural gas heating equipment. This scenario also assumes that these pools are not covered during periods of nonuse.

## **Description of Measure and Implementation Scenario:**

This analysis quantifies the potential GHG reductions from requiring that all new pool heaters (commercial and residential) use passive solar systems and that all government owned pools install solar hot water systems. Projected new construction pool permits are based on historical trends and the percentage of those that install a heating system is assumed to be 10% of that total.<sup>2</sup> There are also 9 public pools covered by this analysis; the City owns and operates 27 pools, but only 9 are heated year around.

## **Has the Measure been implemented elsewhere and with what results?:**

Legislation for pool-only solar hot water systems could not be found. However, in 2011, California is requiring that all new pools are installed “solar ready” (Title 24- 114(b)). In a

larger step towards solar hot water integration, Hawaii now requires all new home construction to include solar hot water systems (legislation SB644) (see Measure G2d for a discussion on Hawaii’s legislation).

For public pool solar hot water implementation, El Paso, Texas has installed solar systems on 9 of their pools. They have reported a 40% savings on their energy bills and an average simple payback of 4 years.<sup>3 4</sup>

**Energy/Emission analysis:**

The energy and economic analyses are completed over 20-years assuming the legislation takes effect 2011 (NOTE: the commencement year is essentially arbitrary other than assumed rate increases for natural gas from SW Gas as explained below).

Major assumptions:

<b>Description</b>	<b>Input</b>	<b>Notes</b>
RESIDENTIAL- Assumed annual pool construction	264.2	
RESIDENTIAL- Assumed % using heaters	10%	
COMMERCIAL- Assumed annual pool construction	4.2	
COMMERCIAL- Assumed % using heaters	100%	
RESIDENTIAL- GHG saved per pool per year	3	tCO <sub>2</sub> e (see example calc below)
COMMERCIAL- GHG saved per pool per year	9	tCO <sub>2</sub> e
PUBLIC- GHG saved per pool per year	13.5	Assumes 1,000 sqft pool surface, uncovered, and heated to 82°
RESIDENTIAL- Total GHG in 2020	801	tCO <sub>2</sub> e
COMMERCIAL- Total GHG in 2020	382	tCO <sub>2</sub> e
PUBLIC- Total GHG in 2020	122	tCO <sub>2</sub> e

<b>Contribution analysis:</b>		
COT 1990 Citywide GHG emissions (baseline): <sup>5</sup>	5,461,020	tCO <sub>2</sub> e
MCPA 7% reduction target for COT:	5,078,749	
2012 BAU GHG emissions projection:	7,000,000	
2020 BAU GHG emissions projection:	7,343,141	
GHG emissions reduction to meet 7% goal (2012):	1,921,251	
GHG emissions reduction to meet 7% goal (2020):	2,264,392	
<b>Mandatory Solar Hot Water Heating for New and Public Pools</b>		
Contribution of G10a/b Pool Heating Measure (in 2020):	1,305	tCO <sub>2</sub> e
2020 Contribution of G10a/b Pool Heating Measure:	0.06	%

To calculate the emissions savings per pool, the numbers for uncovered residential pools (assumed 200 sqft surface area), uncovered commercial pools (assumed 600 sqft surface area), and public pools (assumed 1,000 sqft surface area) were interpolated from a cost of \$1,385 per year per 1,000 sqft of surface area based on \$0.50 per therm.<sup>6</sup> The costs were updated based on \$1.19 per therm for 2011 and increasing 2.3% annually. Based on these numbers, a residential pool is estimated to save 554 therms, a commercial 1662 therms, and a public 2470 therms, annually. Based on 5470 gCO<sub>2</sub>e per therm, the savings are converted to 3, 9, and 13.5 tCO<sub>2</sub>e for residential, commercial, and public pools, respectively.<sup>7</sup>

### **Economic analysis:**

This analysis, per residential pool, assumes a 20-year life of the investment, a gas rate of \$1.19 per therm in 2011 increasing 2.3% annually, a savings of 554 therms annually (residential) a capital cost (residential) of \$2K, O&M costs of 10% of the capital.

- Based on this the cost **savings** equal: \$ 14,106
- The **savings** per tCO<sub>2</sub>e equal: \$ 266.50 / tCO<sub>2</sub>e

Using a capital cost of \$5,000 for a commercial pool and the same inputs listed above, the cost **savings** and abatement **savings** for commercial pools are \$43,517 and \$268/tCO<sub>2</sub>e. For the public pools the cost **savings** and abatement **savings** are, \$55,590 and \$206/tCO<sub>2</sub>e (assuming a \$15,000 installation cost) per pool.

### **Co-benefits:**

A potential co-benefit from a community standpoint is a small migration to using publically available heated pools due to the increased capital costs and possible

reduction in heated residential pools. The government savings from the energy reductions at the public pools could be used to fund further mitigation projects.

### **Equitability:**

This measure is only applicable to homeowners and commercial entities that can afford a pool.

### **Potential unintended consequences:**

There may be some constituency backlash to the new legislation owing to the increased capital costs of solar hot water systems. It will be important to convey the very quick payback period for such an investment.

*General Note: All references retrieved October through December of 2010 unless otherwise noted.*

### **Endnotes:**

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<sup>1</sup> [http://www.energysavers.gov/your\\_home/water\\_heating/index.cfm/mytopic=13230](http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13230)

<sup>2</sup> Based on information given in COT Measure Matrix titled and dated: GHG Measures Combined List\_9.24.10- transmitted 10.1.10

<sup>3</sup> <http://www.kvia.com/news/22936666/detail.html>

<sup>4</sup> <http://www.sunquestenergy.com/wp-content/uploads/Case-Study-City-El-Paso.pdf>

<sup>5</sup> PAG Regional Greenhouse Gas Inventory- 2010

<sup>6</sup> <http://www.swimmingpool.info/pool-heater.html>

<sup>7</sup> [http://carbon-calc.erg.berkeley.edu/documentation/CoolClimate\\_TA\\_methods\\_121709.pdf](http://carbon-calc.erg.berkeley.edu/documentation/CoolClimate_TA_methods_121709.pdf)