



Reducing Built Environment Greenhouse Gas Emissions in Thurston County

Summary January 2016

I. Introduction

This paper provides background and analysis of the greenhouse gas emissions produced by energy used in buildings within Thurston County, and effective strategies for reducing those emissions.

II. Transportation-Related Emissions in Thurston County

Based on Thurston Climate Action Team’s inventory of 2010 County greenhouse gas emissions, emissions for the built environment for that year were 4,444,406 metric tons of carbon dioxide equivalent. This was about 52.5% of total emissions for the county. Using target percentages recommended by the Sustainable Thurston project, and an estimate of Thurston County emissions in 1990, built environment emission targets and gaps are summarized in the following table:

Baseline Scenarios	1990 (actual)	2010 (actual)	2020	2035	2050
Business as Usual (no mitigation/ actual emissions)	1,096,450	1,444,406	1,847,548	2,247,966	
After Current Policy Impacts			1,571,459	1,710,981	
Gap in need of Action			749,122	1,107,933	
Targets			822,338	603,048	219,290

The “After Current Policy Impacts” category is based on the estimated impacts of existing programs (as examined by the Governor’s Climate Legislative and Executive Workgroup, or CLEW).

III. Strategies for Reducing Built Environment Emissions

This paper examined three principal strategies for reducing built environment greenhouse gas emissions:

- Increasing the use of renewable energy sources
- Residential energy efficiencies
- Commercial energy efficiencies
- Industrial energy efficiencies

Information sources used in this analysis included reports produced by the Governor's Climate Legislative and Executive Workgroup, including reports by Leidos, the consulting company contracted by the workgroup for detailed analysis; Puget Sound Energy's Integrated Resource Plan for 2009 and 2013; the 2007 Census; the Department of Energy's Sunshot Initiative; the Union of Concerned Scientists; and Thurston Climate Action Team's Greenhouse Gas Inventory for 2010.

A. Increasing the use of renewable energy sources

In 2009 Puget Sound Energy estimated that solar photovoltaic (solar PV) energy had a technical potential of 1,912 annual megawatts across their service territory by 2029. Though their estimate of achievable potential was much less (21 MW), still solar was far and away the most promising of the renewable energy sources they examined. (The others were renewable combined heat and power, small hydro, and small wind.) Achievable potential is influenced by economic considerations (cost), awareness of the technology, and permitting or interconnection concerns, all of which can and do change significantly over time.

Our conclusion is that solar PV is the most promising renewable energy resource for reducing Thurston County's emissions. The extent of that potential today should be further examined, in light of the percentage we represent of PSE's total customer base, and changes in cost and public awareness that have taken place since 2009. Rooftop solar can also have significant financial payoff for individual households (\$74/year), as well as reducing our carbon footprint (1.25 MTCO₂e per year for 25 years for a typical installation).

B. Residential energy efficiency

Based on estimates contained in PSE's IRP, most of the potential for residential gas savings is in space heating and hot water. On the electrical side, removing and disposing of inefficient stand-alone freezers, and secondary refrigerators and freezers, accounted for 21% of Puget's total estimate for the cumulative achievable potential from residential electrical efficiencies in 2033. Converting

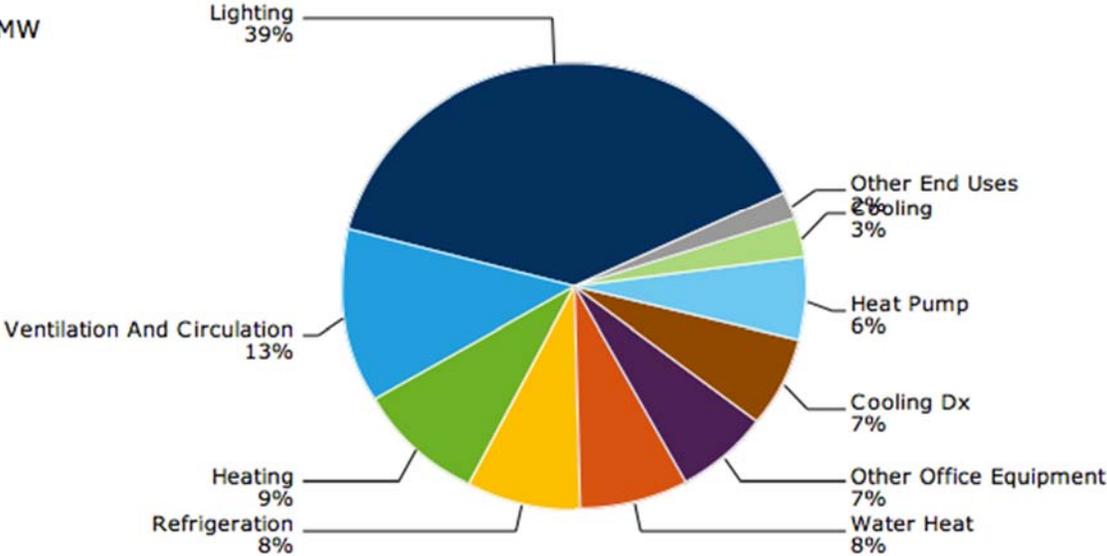
baseboard heating to ductless heat pumps offered almost another 13% of the estimated cumulative achievable potential, at an estimated cost of about 10¢/kWh, and conversions of electric furnaces to air source heat pumps accounted for an additional 10%, though that was estimated to cost about 20¢/kWh.

C. Commercial energy efficiencies

As with residential gas, almost all commercial use goes to space heating (67%) and to providing hot water (28%). So these two areas represent the best opportunities for energy efficiency in commercial buildings.

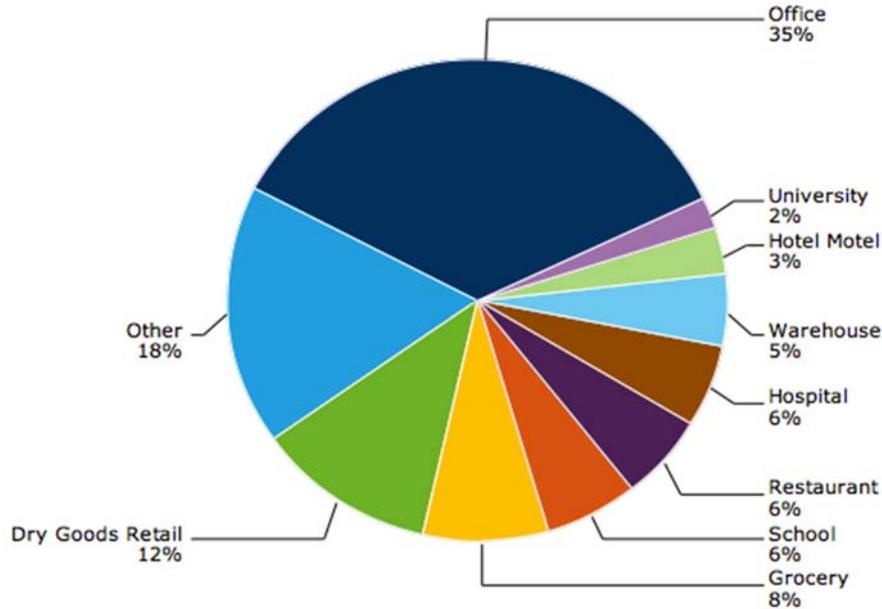
The following figure shows Puget's estimate of the “available” cumulative savings by 2033 from conservation reducing commercial buildings' use of electricity. Assuming these estimates translate to the highest potential for energy efficiency improvements in Thurston County, lighting, ventilation and circulation, heating, refrigeration are the top opportunities for improving energy efficiency in our commercial buildings.

Total: 258 aMW



Note: 'Other End Uses' includes:
Cooling DX: <1%, Lighting Interior Hid: <1%, Appliances: <1%, Cooking: <1%

As the following figure shows, over a third of these savings are expected to come from offices, while the rest are distributed among a variety of other kinds businesses and organizations. So in Thurston County we may want to start with a focus on office buildings.



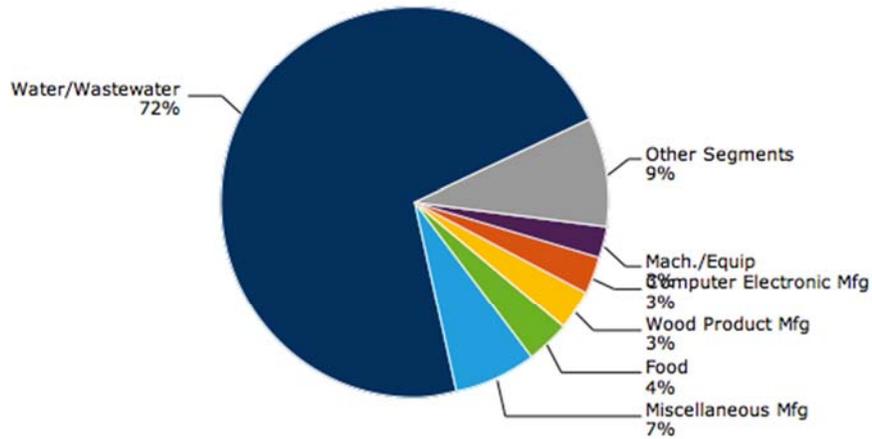
A. Industrial energy efficiencies

According to PSE, the technical potential for industrial gas efficiency is only about 1.1% of Puget's estimate of the total technical potential for gas efficiency in its service area – 4 million therms a year out of a total of 320 million. Industrial use is a relatively small part of their total baseline sales, only 2.4%, and they estimated the technical potential in this sector at 16%, about half that in the other sectors. So industrial natural gas energy efficiencies are not expected to be a significant source of energy efficiency in Thurston County.

Puget's analysis of the potential for electrical conservation by industrial customers differs in several ways from that in other areas. The percentage of installations that are technically feasible is generally a lot lower for these measures, although every measure is estimated as 100% incomplete in those installations. The following chart shows Puget's estimate of the potential efficiency savings from different types of industry in its service area. It indicates the largest potential improvements in electrical energy efficient being related to water and wastewater.

Figure B.4.3 Electric Achievable Technical Potential: Industrial by Segment

Total: 23 aMW



Note: 'Other Segments' includes:

Printing Related Support: 2%, Transportation: 1%, Fabricated Metal Products: 1%, Paper: 1%, Nonmetallic Mineral Products: <1%, Electrical Equipment Mfg: <1%, Plastics Rubber Products: <1%, Chemicals: <1%, Petroleum Coal Products: <1%, Metals: <1%

Their estimate of the total cumulative “achievable” potential for all industrial conservation in their service area by 2033 is only 23 annual megawatts. So efforts to improve energy efficiency for Thurston County’s industrial facilities may not be the highest priority.