

Energy Assessment Report

The first part of this report, from *the sectors* section through the *comparisons* section applies to those who receive energy from the City. This data comes from the City of Forest Grove Utilities. The second part of the report, from *importance of energy conservation and efficiency* until the end is useful for everyone, regardless of the energy source. Energy consumption associated with transportation is NOT included in this report.

Energy Sources

Forest Grove Light & Power receives energy from the Bonneville Power Administration and the Grant County Public Utility District. Light & Power purchases 3 mega watts from Grant PUD, roughly 12% of the total energy brought in. The Bonneville Power Administration receives most of its energy (78.6%) through hydro, 11.8% from nuclear, and the other 9.6% comes from other resources. The energy from Grant County PUD is 100% hydro.

Residents also have the option of purchasing power through natural gas from NW Natural.

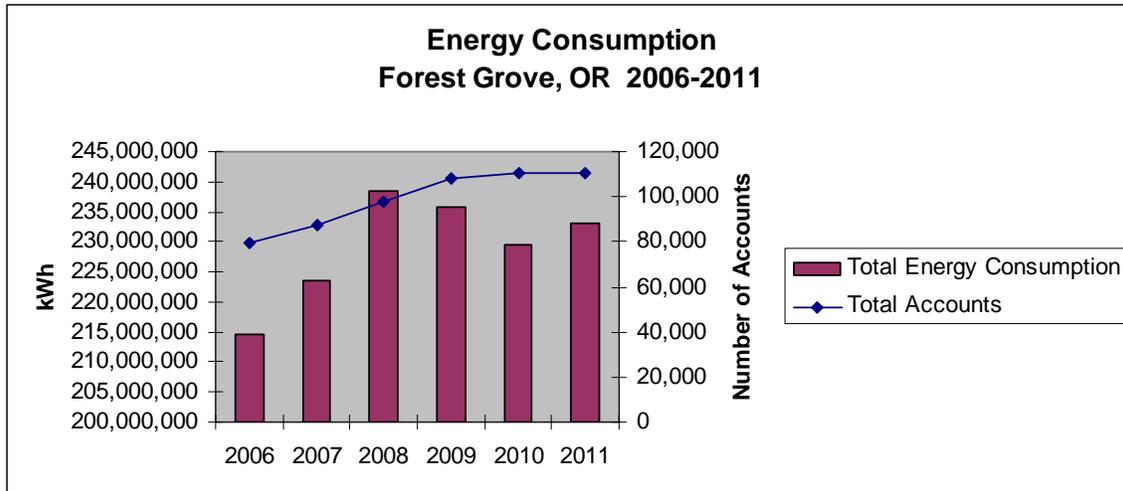
The Sectors

- Residential vs Multifamily- Residential is a single or duplex unit. Multifamily housing is a triplex or bigger. Multifamily accounts often represent the actual multifamily building, such as an apartment building. The energy from these accounts is for the common spaces of an apartment building such as laundry rooms or lights in hallways. Most tenants in a multifamily building are responsible for setting up their own electricity bill as each unit has a meter. These tenant accounts are under the Residential sector.
- Commercial- Retails, restaurants, office spaces
- Industrial- Manufacturing, warehouses, fabrication
- City- City services and owned property
- School- the Forest Grove School District schools and district office

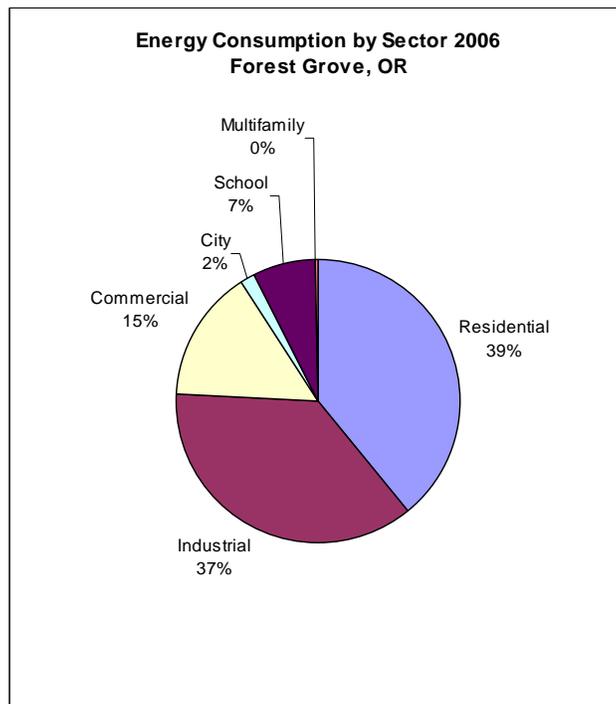
Summary of Results

From 2006-2008, energy consumption and the number of accounts increased. Consumption dropped from 2008-2010, and then increased again from 2010 to 2011. The number of accounts leveled off from 2009 until 2011. This “zig-zag” pattern could be a result of the economic downturn in 2009.

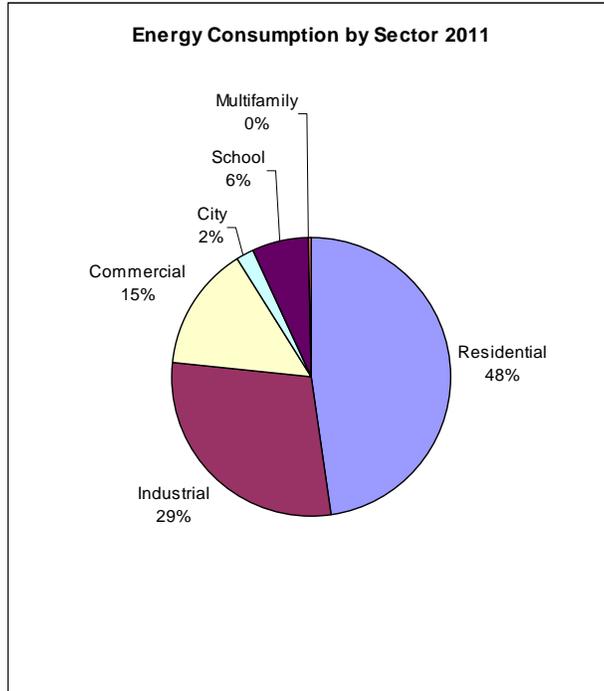
	2006	2007	2008	2009	2010	2011
Consumption (kWh)	214,531,306	223,629,417	238,359,513	235,751,228	229,461,318	233,146,254
Accounts	79,329	87,169	97,548	107,721	110,156	110,486
Energy Intensity per Account	2,704 kWh/Account	2,565 kWh/Account	2,433 kWh/Account	2,188.9 kWh/Account	2,083 kWh/Account	2,110 kWh/Account



In 2006, the Residential and Multifamily sectors consumed the most using 84,797,133 kWh (39.5%) of energy, but have 86.5% of all accounts. Industry uses 78,411,741 kWh (36.6%), and as only 1.7% of all accounts. Commercial consumes 32,566,277 kWh (15.2%) with 9.6% of accounts. Schools use 15,087,085 kWh (7.0%) with 1.3% of accounts, and the City uses 3,669,070 kWh (1.7%) with 0.9% of accounts.



In 2011, the Residential and Multifamily sectors used 112,624,346 kWh (48.3%) with 88.8% of all accounts; Industry used 67,198,516 kWh (28.8%) with 1.4% of accounts; Commercial used 33,828,321 kWh (14.5%) with 8.1% of accounts; Schools used 14,995,819 kWh (6.4%) with 1.0% of accounts; and City used 4,499,252 kWh (1.9%) with 0.7% of accounts.



In relation to the other sectors on the amount of energy they use, the Residential and Multifamily sectors use more energy, while Industry used less. This makes sense as the Residential and Multifamily sectors have seen an increase in the number of accounts as Forest Grove’s population expands. The Industrial accounts have remained relatively constant, indicating higher efficiency or a less intensive industry.

Total (top number) and Monthly Average per Account (second number) Energy Use (in kWh)
 Total Accounts (third number) and Monthly Average of Accounts for that Year (bottom number)

	2006	2007	2008	2009	2010	2011
Residential	84,084,796	91,971,781	102,901,224	112,991,535	107,718,715	111,711,333
	1,241	1,231	1,219	1,199	1,115	1,152
# of Accounts	67,731	74,726	84,419	94,202	96,566	97,011
	5,644	6,227	7,035	7,850	8,047	8,084
Multifamily	712,337	872,231	945,405	909,540	882,907	913,013
	824	935	936	863	836	863
# of Accounts	864	933	1,010	1,054	1,056	1,058
	72	78	84	88	88	88
Industrial	78,411,741	78,780,199	80,366,434	67,864,635	68,465,512	67,198,516
	56,493	49,672	47,837	41,031	41,419	43,410
# of Accounts	1,388	1,586	1,680	1,654	1,653	1,548
	116	132	140	138	138	129
Commercial	32,566,277	33,497,008	34,279,836	33,732,787	32,375,652	33,828,321
	4,287	4,117	4,009	3,808	3,628	3,790
# of Accounts	7,597	8,136	8,550	8,859	8,925	8,926
	633	678	713	738	744	744

Total (top number) and Monthly Average per Account (second number) Energy Use (in kWh)
 Total Accounts (third number) and Monthly Average of Accounts for that Year (bottom number)

	2006	2007	2008	2009	2010	2011
City	3,669,070	3,625,007	3,928,197	4,199,328	4,340,715	4,499,252
	5,182	5,149	5,316	5,525	5,481	5,634
# of Accounts	708	704	739	760	792	799
	633	678	713	738	744	744
School	15,087,085	14,883,191	15,938,417	16,053,403	15,677,817	14,995,819
	14,493	13,730	13,859	13,468	13,469	13,108
# of Accounts	1,041	1,084	1,150	1,192	1,164	1,144
	87	90	96	99	97	95

2010 shows the least amount of energy use between 2006 and 2011. Five of the six sectors reflect this pattern, while the Industrial sector used the least amount of energy in 2009. The year with the peak energy consumption differs between sectors- 2011 for the Residential sector (because of a growth in households); 2008 for Multifamily, Commercial, and School; 2007 for Industrial; and 2011 for City. While the other sectors increase and decrease in energy usage, the City's energy use steadily increases.

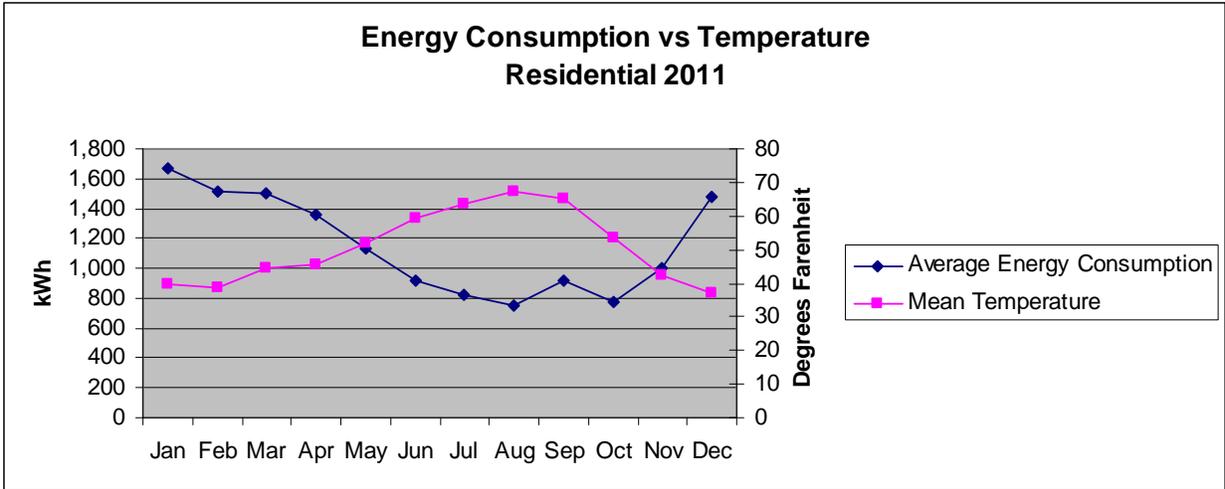
The average consumption of each account also reflects the increases and decreases in energy use. For example, in 2006 the average industrial account consumed 56,493 kWh. For the next three years usage decreased, and then slowly increased in 2010 and 2011. However, total energy use for all sectors reflect the exact opposite, with energy consumption *increasing* from 2006 to 2009, and then dropping in 2010 before increasing again.

City Accounts

The City accounts are for the public buildings and City offices such as the Community Auditorium or Utilities. The accounts are also for the street lights within the City.

Climate

Energy consumption correlates with the seasons. During the coldest months energy consumption reaches a high, while during the warmest months, energy consumption reaches a low. Here is an example from the Residential sector, 2011:

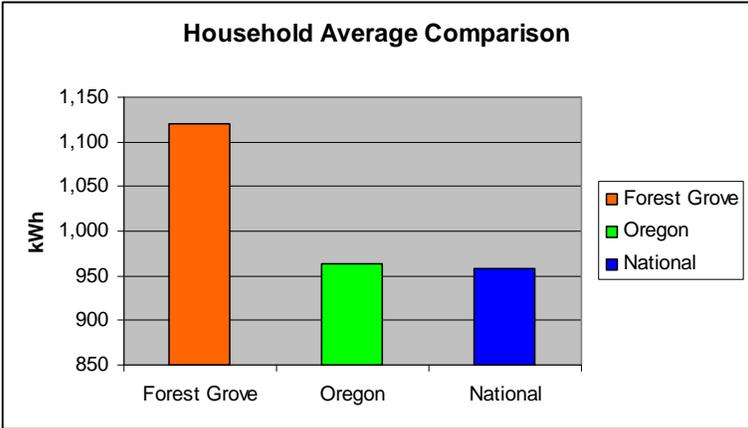


Perhaps one reason for this is that households require heat during the winter months. While summer temperature can get hot, most of the houses in Forest Grove probably do not have air conditioning. Most houses have heating for the winter when temperature drop. This would increase the amount of energy used. However, since this report only focuses on electric consumption from the Forest Grove Utilities, those who heat via natural gas are not included within this report.

Comparisons

According to data collected by the U.S. Energy Information Administration, the average residential household in Oregon uses 964 kWh. This is comparable to Nevada (914 kWh) and Kansas (985 kWh), and numerous other states. Regionally, New England uses the least with 657 kWh, while East South-Central states use the most at 1,350 kWh. The average for the Pacific Contiguous states (Oregon, Washington, and California) is 675 kWh. Nationally, the average household uses 958 kWh.

In 2010, when energy usage was the lowest of 2006-2011, the average Residential unit in Forest Grove used 1,121 kWh. This number is higher than the Oregon and national averages.



Residential Average Monthly Bill by Census Division, and State 2010

Run Date: 11/3/2011

Census Division	Number of	Average Monthly
Pacific Contiguous	17,402,274	675
California	12,947,917	562
Oregon	1,629,076	964
Washington	2,825,281	1,030
U.S. Total	125,717,935	958

Source: U.S. Energy Information Administration

http://www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls

The average commercial account in Oregon uses 5,401 kWh, while the national average is 6,272 kWh. Forest Grove's commercial sector uses much less energy in comparison, consuming between 3,628 kWh, and 4,287 kWh.

The average industrial account in Oregon uses 54,662 kWh, while the national average is 108,200 kWh. The Forest Grove industrial average, between 41,031 kWh and 56,493 kWh is around the Oregon industrial average, but much less than the national average.

Based upon this data, the residential sector can greatly reduce their electricity consumption.

Importance of Energy Conservation and Efficiency

The production and consumption of energy creates many environmental problems that in turn affect the health of communities and ecosystems. The process of mining, drilling, transportation, and production electricity produces air pollution which causes health problems for workers and communities in nearby areas and impacts the habitat in which species depend upon.

Reducing energy usage comes from conservation (reducing the amount of energy used), and efficiency (using products that require less energy to function). According to the U.S. Energy Information Administration, buildings account for 48% of energy consumption. The recommendations below address energy problems associated with buildings.

The following identify energy usage problems and potential solutions

Problem- Energy Lost Through Heating and Cooling

Poor insulation and leaks create an uncomfortable living environment inside the home and wastes energy. The Environmental Protection Agency estimates that through proper home weatherization, homeowners can save up to 20% of heating and cooling costs.

In 1983, the State of Oregon started adding insulation values to walls, roofs, ceilings, floors, and windows using a R-value. Since its inception, the values for the ceiling have remained the same at R-38. The R-value for walls has increased slightly from R-19 to R-21. Required floor insulation has increased from R-11 to R-30. The most recent version of the Building Code, 2011, adds more performance values that could increase insulation. R represents the thermal resistance, the material's ability to resist heat flow. Houses built before 1983, were not subject to insulation

requirements, and therefore may have very poor to none insulation. According to the American Community Survey, 2009 1-year Estimates, 41% of housing units in Washington County were built before 1980. Unless those homes have been remodeled or updated, these houses are not built for the local climate, making living conditions very uncomfortable.

Solution: Conduct an Energy Audit

A home energy audit, conducted by either a professional or resident, will provide insight onto where the house can be made more energy efficient.

Forest Grove Programs-

Forest Grove Light & Power does free energy audits for interested residents. The resident must have electric heating.

Energy Saver Energy Audit Guide:

http://www.energysavers.gov/your_home/energy_audits/index.cfm/mytopic=11170

Solution: Insulate, Seal Cracks

Proper air sealing and thick insulation will create a more energy efficient building. Leaks can be sealed through caulking or weather-stripping. Insulation can be added with various types of fiberglass and foam. These installations can be do-it-yourself or completed by a professional.

Insulating a water heating tank can save 4%-9% in water heating bills, and 25%-45% in heat loss.

Forest Grove Programs-

Because such installations can be costly, Forest Grove Light & Power offers rebates to homeowners. These include ceiling insulation, floor insulation, window replacements, and ductless heat pumps. In 2008, 42 rebates worth \$26,599.95 were returned to Forest Grove residents. This amount increased the next two years with 66 rebates worth \$51,147.33, and 69 rebates worth \$60,318.61. This decreased the next year with 48 rebates worth \$32,374.58. This decrease in rebate returns is due to lower rebate costs and reduced number of rebates.

Energy Saver and Energy Star Guides:

http://www.energysavers.gov/your_home/insulation_airsealing/index.cfm/mytopic=11220

http://www.energystar.gov/index.cfm?c=diy.diy_index

R Value Calculator:

<http://www.ornl.gov/sci/roofs+walls/AWT/InteractiveCalculators/NS/Calc.htm>

Water heating:

http://www.energysavers.gov/your_home/water_heating/index.cfm?mytopic=12850.

Solution: Efficient, Clean Technology

Energy Star offers an in-depth guide on increasing the efficiency of heating and cooling products. These include regular maintenance on air filters to installing Energy Star products and programmable thermostats.

Forest Grove Programs:

Light & Power offers rebates to those who purchase ductless heat pumps. Through 2008-2011, 59 households took advantage of this.

Energy Star Guide:

http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac.

Solution: Use the Surrounding Environment

Buildings oriented towards the south maximize the sun's potential for heating. The low winter sun warms the house through windows while during the summer, porches and tall trees can provide shade because the summer sun is higher. Passive House refers to a certification of a passive solar building through principles such as superinsulate, airtightness, and optimizing passive solar. These buildings must achieve certain rigorous requirements. Through passive solar, less energy is required to cool and heat a house.

While energy use in the summer is much lower than in the winter, summer days can reach high temperatures creating discomfort to residents. Planting trees or a trellis along a wall can shade a house, reducing the air temperature directly under a tree up to 25°F, and up to 9°F in the surrounding area. This would increase the comfort for residents, and provide relief from the summer heat. For houses in exposed areas prone to wind, closely planted thick trees and shrubs such as evergreen trees can provide wind protection. Plant these trees about one foot away from the wall of the house to provide more insulation. Partnerships can be created with local nurseries to help supply trees and boost the local economy.

Forest Grove Programs:

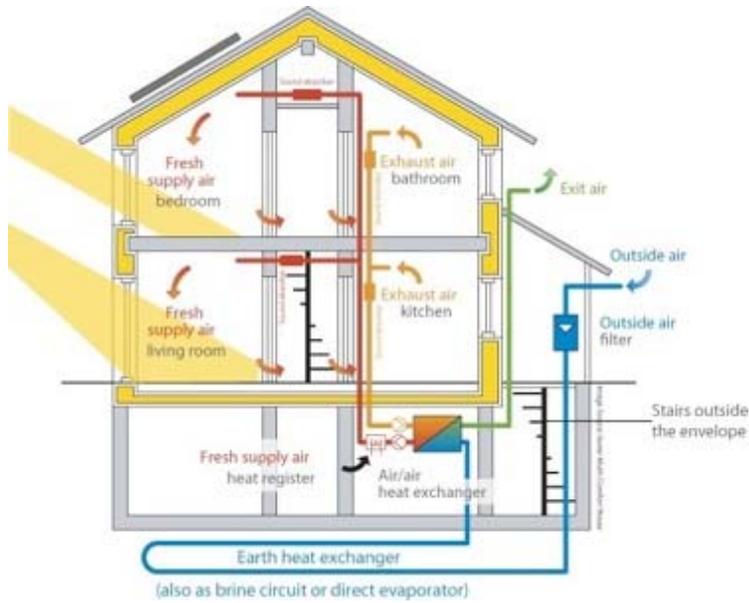
None in existence. New homes must comply with the Oregon Residential Specialty Code. The most recent version, 2011, requires wall insulation to have an equivalent value of R-15. The Passive House requirement is between R-40 and R-60. Perhaps incentives could be offered to builders who go beyond normal requirements, though not necessarily reaching Passive House standards.

There could also be an educational tour of houses that utilize passive solar or efficient energy designs and technology.

Passive solar design information:

<http://www.consumerenergycenter.org/home/construction/solardesign/index.html>

<http://www.passivehouse.us/passiveHouse/PassiveHouseInfo.html>



Source: Passive House Institute

Solution: Use fans

Ceiling fans are useful for hot days. Turn them off when you're not in the room; a moving fan not cooling down anyone just wastes energy. Place fans by a window if to draw cool air out, or bring cool air in. Similarly, attic fans draw cool air in and push hot air out. If a house is air-conditioned, it is important to make sure the attic is insulated so as to not draw the cool air out.

Problem- Energy Lost Through Appliances

The U.S. Department of Energy estimates that 20% of a home's energy use goes to appliance and home electronics.

Solution: Energy Efficient Products

Energy Star products are government labeled appliances that are energy efficient, saving energy and money in the long run.

Forest Grove Programs:

None, but there are various rebate programs and financial aid for those who want to purchase a more energy efficient appliance.

Energy Star Products: http://www.energystar.gov/index.cfm?c=products.pr_find_es_products.

Solution: Clean clothes efficiently

Wash full loads of clothes, wash them in cold water, and hang them up on a clothes line.

Solution: Change your light bulbs

Traditional incandescent light bulbs waste 90% through heat loss. Energy saving incandescent light bulbs are 25% more efficient, compact fluorescent lamps (CFLs) are 75% more efficient, and light emitting diodes (LEDs) are 75%-80% more efficient. These light bulbs will not only save money and energy, but last a lot longer.

Forest Grove Programs:

Light & Power offered a Change-a-Light Promotion which saw 47 residents and businesses participating amounting in \$50,299.75 returned.

For more information:

http://www.energysavers.gov/your_home/lighting_daylighting/index.cfm/mytopic=11975.

Solution: Push reel mowers and brooms

Push mowers use no energy and provide a great workout. Instead of using a leaf blower to push away driveway and sidewalk debris, use a broom. This will save money in both energy and appliance costs.

Solution: Unplug

Even turned off, plugged appliances still consume energy. This standby mode can waste up to 67 watts of energy. The Three Actions Project suggests to plug similar appliances in the same power strip, that way they can be unplugged and plugged at the same time. This makes plugging and unplugging more convenient.

The Washington County library offers a tool that tests for such ghost power and how much energy appliances use.

Products and their energy used, from the Lawrence Berkeley National Laboratory:

<http://standby.lbl.gov/summary-table.html>

Solution: Turn off lights and appliances

Turn off lights when not in use. When leaving a computer for more than 20 minutes, turn off the monitor; when leaving a computer for more than two hours, turn everything off. Don't use a fancy colorful screen saver. The Environmental Protection Agency estimates that turning off a screen saver can save between \$25 and \$75 a year.

Problem: Greenhouse gas emissions and air pollution

Because energy received from the City comes from hydropower, greenhouse gas emissions and air pollution is not a problem. However, even though hydropower is clean energy, there are still environmental impacts associated with the creation of hydropower through dams. Therefore, it is important to have other renewable energy options for residents to choose from. Furthermore, though natural gas is cleaner than other fossil fuel options, there are associated air pollution risks.

Being in the Pacific Northwest, solar energy might not seem applicable to Forest Grove. However, the Oregon Department of Energy states that "Western Oregon receives as much solar as the national average."

Forest Grove Programs:

Residents have the option of purchasing wind power through the Pure Power Renewable Energy Program. \$4 blocks supply 200 kWh. There are 89 residential accounts with 185 units. There

are three businesses and organizations with 12 units. Combined, 39,400 kWh of wind energy supplies the community, saving 591,000 lbs of pollution. The City is aware of four residential households with solar panels. Solar Oregon, a non-profit based in Portland offer support through Solarize programs. These community programs allow homeowners to purchase solar panels in conjunction with other homeowners in their community.

Visit their website at: <http://solaroregon.org/>

Problem- Lack of Awareness

One challenge in conserving energy is community lack of awareness of the main issues associated with energy conservation. If people do not understand how climate change or peak oil will effect them right here, right now, they will not care as much about conserving energy. But if people realize how peak oil will affect their wallets, then there is more incentive and reason to take action and conserve.

Solution- Educate

Booths at the Farmers Market can educate the public about the importance of energy conservation and what steps they can do to help. Information via Utility Billing may be sent out with monthly tips about easy simply energy savings. Teachers can educate their students through quick and easy lessons. It is important to focus the message on the target audience. For example, business owners might be more receptive to energy conservation as energy savings. A series of articles could be published in the News Times. It is important to possible solutions that are quick and easy for residents.

Conclusion

Forest Grove residents consume more energy than the Oregon and national averages. This leaves opportunity for improvement. While some measures to be taken can be costly in both time and money, the community can work together to mitigate some of those costs. Furthermore, there are rebates at all levels of government to provide financial aid.