DRAFT ENERGY PLAN 2007

CITY OF LYNNWOOD

- Background Report for developing an Energy Element for Lynnwood’s Comprehensive Plan

Prepared by:
Anindita Mitra, AICP
Alex Sandoval
CREÄ Affiliates, LLC
PO Box 30125
Seattle, WA 98113-0125
206.850.4293

Rita Schenck, PhD
Institute for Environmental Research and Education (IERE)
P.O. Box 2449
Vashon, WA 98070
206.463.7430
# Table of Contents

1. Preface .......................................................................................................................1
2. Introduction ..............................................................................................................3  
   What is Energy? ..............................................................................................3  
   Energy Planning in the Northwest .................................................................3  
   How Energy Choices Affect Communities ..................................................4  
   Integrating City Planning and Energy ..........................................................8  
   The Relevance of an Energy Element ..............................................................8  
3. Lynnwood’s Physical Framework and its Influence on Energy .........................11  
   Land Use Patterns .........................................................................................11  
   Transportation .............................................................................................14  
   Municipal Facilities and Other Services .....................................................21  
   Lynnwood Utility Services ..........................................................................26  
   Municipal Capital Facilities ........................................................................28  
   Energy Efficiency Incentives .......................................................................32  
4. Energy Implications of Lynnwood’s 2006 Comprehensive Plan .........................33  
5. Geo-political Implications of Lynnwood’s Energy Use ........................................41  
   Geographic Locations of Energy Sources ..................................................41  
   Natural Gas ..................................................................................................41  
   Electricity ......................................................................................................47  
   Propane .........................................................................................................49  
   Crude Oil and Petroleum Sources ..................................................................50  
   Conclusion .....................................................................................................53  
6. Lynnwood’s Carbon Footprint .............................................................................56  
   A. Transportation ............................................................................................56  
   Electricity ........................................................................................................58  
   Heating with Fossil Fuels ............................................................................60  
   Municipal Operations .....................................................................................62  
   Summary & Conclusions ...............................................................................62  
7. Vision for an Energy Efficient Lynnwood ............................................................64  
   Kyoto Protocol ...............................................................................................64  
   State Of Washington: Executive Order 07-02 (Washington Climate Change Challenge) ..................................................................................................65  
   Oregon Strategy for Greenhouse Gas Reductions .........................................66  
   California Global Warming Solutions Act (AB 32) .......................................66  
   City of Seattle, United States Mayors Climate Protection Agreement ............66  
   City of San Francisco ......................................................................................67
San Francisco Climate Action Plan: Greenhouse Gas Emissions -
Reduction Target ................................................................. 67
City of Chicago ..................................................................... 67

8. **Goals and Strategies** ............................................................................................................ 69
   Need for a Shift in Thinking ................................................................................................. 69
   Imminent Peak Oil .................................................................................................................. 70
   Less is More ............................................................................................................................ 70
   Uncertain Future ..................................................................................................................... 70
   Technological Innovation ....................................................................................................... 70
   Lynnwood’s Characteristics as they Affect Its Energy Demand .................................... 70
   Reduce Petroleum use ......................................................................................................... 71
   Generate Locally .................................................................................................................... 72
   Energy Aware Management and Operations .......................................................................... 73

9. **Federal Incentives for Renewable Technologies and Energy Efficiency** ............ 75

10. **State Funding Opportunities** ............................................................................................ 81
    Buildings ............................................................................................................................... 81
    Renewable Technologies ...................................................................................................... 82
    Utility Requirements ............................................................................................................ 83
    Vehicles ................................................................................................................................. 84
    State Facilities Operations .................................................................................................. 85
    Green Highway Partnership: Bringing Together Transportation and the Environment ...... 85
    Global Warming Mitigation Initiative – West Coast ....................................................... 86

11. **Suggested Additional Incentive Programs** .................................................................... 87

12. **Appendix** .......................................................................................................................... 95
    Summary of draft Sno-PUD IRP ......................................................................................... 95

13. **Glossary** ............................................................................................................................ 97

14. **List of Tables** ..................................................................................................................... 102

15. **End Notes** ........................................................................................................................ 105
1. Preface

In July 2006, the City of Lynnwood procured a grant from the Washington State Department of Community Trade and Economic Development to prepare an energy element for the city’s comprehensive plan. While not presently required under the Growth Management Plan, there is burgeoning interest among Washington State planners to include an Energy Element among the other mandatory elements described in RCW 35A.63.070. A bill to this effect was filed in the 2006 Legislative session by the Washington Chapter of the American Planning Association. The City of Lynnwood is thus leading the way in the preparation of a model energy element in the State of Washington.

South Carolina is the only state in the country to have thus integrated land use planning and energy delivery by requiring an energy element in comprehensive plans. Greenwood County and the City of Summerville are the two jurisdictions in South Carolina to have received state grants to prepare their comprehensive plan Energy Elements in 2002. Greenwood continues to report progress towards its goals by systematically taking on the strategies listed in the document.

Many jurisdictions in the US and internationally are conducting some level of energy and carbon assessment through ICLEI, the International Council for Local Environmental Initiatives, a United Nations private non-profit organization.

In March 2007, the City of Lynnwood retained the services of CREÄ Affiliates, LLC and the Institute for Environmental Research and Education (IERE) to assist the city in the development of the city’s energy plan and analysis of background data. Data was collected and provided to the consulting team by City Staff. Due to the limited time available, this process could not avail of community input or the most current and complete data for all fuel sources (such as propane) or city services (such as solid waste). Therefore this discussion is specific to the city of Lynnwood only as much as was allowed.
by the available data. As more relevant data is collected, the numbers and analysis in the report can be updated.

This report approaches the issue of energy from two outcomes: overall usage patterns (efficiency, cost, renewability, life cycle analysis and net energy) and its impact on carbon emissions. It does not deviate into larger sustainability issues through the examination of, for instance, Lynnwood’s ecological footprint. Since a city’s carbon footprint is a subset of its ecological footprint, the authors are confident that this energy plan will direct the city towards a smaller ecological footprint and greater sustainability.

The focus of this plan is to describe, simply, the city’s energy consumption patterns; identify factors behind current trends; and to recommend ways to reduce the current energy demand while planning for more renewable energy sources at the same time. This report argues for an energy element for the city of Lynnwood and shows how the subject of energy relates to other elements of the City’s Comprehensive Plan.

The report concludes with a description of federal and state incentives as well as grant programs that might apply to Lynnwood businesses and residents.

The authors of this report would like to thank the following in the preparation of this report:

- Keith Maw, AICP, City of Lynnwood, Project Manager
- Ron Hough, AICP, City of Lynnwood
- Paul Hesse, National Energy Information Center
- Tim Stearns, Department of Community Trade and Economic Development, Washington
2. Introduction

What is Energy?

Energy is defined in the “Webster” dictionary as the ability to do work. For this report, we look at community-level “work” including transportation; personal comfort (lighting, heating and cooling); operation of appliances for homes, businesses and institutions (stoves, washer dryers, washing machines, computers, printers, fax machines, espresso machines and so on); urban services (water treatment, solid waste disposal, street light and signals, stormwater management).

In order to do the above work, the energy is consumed in one of three forms: thermal energy for heating and cooking (natural gas and propane); electricity (nuclear, hydro, wind and biomass) and chemical energy (in gasoline and bio-diesel). This report does not discuss newer technologies such as solar, wave or tidal energy, since they are not currently operational in Lynnwood.

Energy Planning in the Northwest

Energy planning is a process by which the current demand for energy is assessed against available or projected supply. It is now generally conducted as an internal investigation by Utilities using a supply-demand model. Utilities determine how best to serve the approximated demand and record their strategies in their individual Integrated Resource Plans (IRP).

Energy Delivery

Under a supply-demand model, energy is provided as requested. The demand for energy is based on projections of population growth or decline; density distribution of that population; the type and distribution of other uses such as industry, offices, stores, and institutions; and to a certain extent, municipal facility operations. Northwest utilities’ decisions are influenced by a least-cost mandate established by the Northwest Power Planning Council (NWPPC) for all utilities within its 5-state jurisdiction. This
approach unfortunately does not always result in solutions that are efficient, environmentally prudent and ultimately, sustainable. What is missing in current energy planning is an integration of values and priorities that goes beyond a bottom line assessment. Also, without local partnerships and knowledge, IRPs generally omit local opportunities for energy generation.

Energy plans differ for the many utilities in the state. In Washington State, there are 63 electric utilities that range from Independent Owned Utilities (IOU), Municipal Utilities, Public Utility Districts (PUDs) and Cooperatives. While there are only 2 IOUs in the state, they deliver about 45% of the State’s electric needs. PUDs contribute to 30% of the service while Municipal Utilities (20%) and Cooperatives (5%) serve the remaining 25% of the market. Unlike other states, electricity policy in Washington State has to be cognizant of many levels of regulatory oversight including, federal electric policy such as those of the Federal Energy Regulatory Commission’s (FERC), the Regional Transmission Organization (RTO), and Standard Market Design (SMD); as well as the policies laid out by the NWPCC, the Washington Utilities and Transportation Commission (WUTC), and the state government.

Paying for Growth

Not all Utilities operate under the same guiding principles for service. For instance, there may be marked differences in their approach to extending or upgrading distribution lines. Some, like Chelan PUD, require that “growth pay for growth” while others spread the costs of upgrades and extensions among all users within a service area. In the case of the latter, the cost of that upgrade or extension (even into remote areas) is borne by all the Utility’s customers. Therefore without a broader holistic approach, while remote locations may benefit from the inexpensive land and subsidized electricity, driving to and from these locations creates a large burden on the road and transportation infrastructure. However, since Utilities do not have to account for gasoline usage and related emissions, the increase in overall community energy consumption and pollution from inexpensive electricity to outlying development is currently not considered or calculated in the preparation of an IRP.

Promoting Conservation

Being demand driven, however, Utilities rarely investigate or collaborate with their service areas to plan for energy conservation measures until recently. Lately, Utilities such as Seattle City Light, Snohomish PUD, Chelan County and others are looking to offset major capital infrastructure outlay to meet increased demand by promoting conservation.

Renewable Portfolio Standards

In 2006, with the passage of I-937, Utilities in Washington State will have to establish energy efficiency resource standards to guarantee more efficient generation. This legislation establishes renewable energy standard of 15 percent of electricity sales for Washington State utilities by 2020 and requires electric utilities to pursue all low-cost energy conservation opportunities. The legislation also requires each utility to establish its ten-year cost-effective conservation resource potential by January 1, 2010. Every two years hence, each public utility will be required to review and update this assessment for the next ten-years.

How Energy Choices Affect Communities

Energy infrastructure and delivery affect the way communities and their surroundings are developed. Extraction and transmission of fuel creates large swaths of land for quarries, wells and pipe corridors that can mar a community’s landscape. If the fuel is processed at a plant, then
the socio-economic and environmental impacts of the plants have to be addressed by the surrounding community. All these processes are associated with risks of failures. With some technologies, such as nuclear, the risks can be serious and damages can last for several hundreds of years. Now, there is the added concern related to global warming from energy consumptions and it’s associated environmental impacts on communities across the world.

Cities can no longer afford to ignore energy issues. The following summarizes some additional issues that both Utilities and communities like Lynnwood will have to contend with over the next several decades.

**Unabated Population and Construction Industry Growth**

The population in Lynnwood is projected to grow at a steady rate. This will cause a corresponding demand for more energy. Construction is expanding even more rapidly than population as new housing is matched by an increasing portfolio of new offices, shops and apartments. The repercussions of this unabated construction and energy patterns are many: Utility providers will be forced to investigate different ways to meet the new demand; consider new infrastructure such as new or upgraded distribution lines and substations; and in the worst case scenario - new generation plants. This will in turn cause more damage to the environment, irreversible impact on land and water, and further increase CO2 emissions. In Lynnwood, the current comprehensive plan strategy for new growth will not affect its natural environment (its urban forest canopy and parkland) significantly since the area targeted for commercial development is already fairly well-paved. In fact, the redevelopment planned for the commercial area, if guided properly, has a chance to reduce the current CO2 emissions per capita and the urban heat island affect in the city. This is discussed in further detail in the Strategies Section, later on in the report. There may be more negative impacts from residential densification as areas that have soft landscaping are paved over for new housing units and driveways. This too can be somewhat mitigated through appropriate codes. The biggest repercussion of projected growth will be the greater number of cars and vehicular trips in the city from more residents, compounded by the projected new commercial development, unless the number of transit patrons and those using non-motorized means to travel is disproportionately improved.

*Change in the Fuel Portfolio*

The fuel sources that the current generation has grown accustomed to is undergoing some change as geologists are realizing that peak oil is either already upon us or imminent. The current carbon-based fuel economy is a significant contributor to the global warming phenomenon and its symptomatic concentration of carbon dioxide in the atmosphere. In the Northwest, this carbon-based economy is propelled predominantly by the fuel-based car culture. Elsewhere, coal power plants are the biggest culprit. Unless there are significant technological advances to sequester carbon and other toxins that are released from coal-burning power plants and cars, global warming will continue unabated.

Communities are resisting the use of coal for power and the construction of new coal plants. There is some talk about using Liquefied Natural Gas (LNG) for power generation in the Northwest since it is cleaner than coal – but using gas for power generation is 50% efficient. Whereas using gas for space heating is about 90-95% efficient and therefore a more appropriate use of natural gas.

Scientists speculate that atmospheric changes are affecting the snow pack that the Puget Sound region has relied on for potable
water as well as hydroelectric energy. There is some discussion that global warming may adversely affect hydroelectric power generation as the snow pack may melt earlier and rivers may run relatively dry during summer months. This will reduce the amount of water that can be safely dammed during dry summer months without adversely affecting fish flow. The above phenomenon has given rise to an alternate technology sector and more vehicles that are either electric, hybrid, run on bio-diesel, ethanol or ethanol blend. The major growth has been in remote centralized wind power generation, and renewed interest in solar power and geothermal technology. Others, like wave and tidal are still in their experimental phases.

Land Use Implications of Fuel Type and Source

Communities are becoming more aware of the advantages and drawbacks of the many fuel sources. As discussed earlier, every fuel type has a land use implication. The land use impacts occur during extraction of the fuel, processing the fuel, transporting it to distribution centers from where they are sent to remote regions across the world. Often the receiving communities will build large storage facilities from where the fuel is transported to power plants. From some plants, the waste (fly ash, nuclear) is collected and transported to remote storage sites or other processing plants. The energy generated from the plants is then transmitted to the many end users through miles of power lines. Each step of the process has land use implications in terms of land for facility siting, laying distribution lines, transformers etc.

Renewable sources have fewer land use impacts since their primary fuel source – sun, wind, water and deep earth, are free and do not need extraction. Their typically higher capital costs per kWh generated for the manufacture and transport of the machinery is offset by no cost of extracting, purchasing, and transporting fuel. Some of this cost can be forestalled if the machinery is manufactured and power generated close to communities. Yet, if renewable energy based plants are sited in remote locations, they will generate a similar level of environmental impacts in their transmission of energy from the plant to the end user through a vast network of distribution lines. Therefore if these plants are smaller and distributed, and closer to communities, this would greatly reduce the amount of electricity that is lost in transmission, (which can range from 30-60% of energy generated, depending on the line conditions and distance of the end user from the power plant) and associated environmental impacts.

Environmental Implications of Fuel Type and Source

Renewable fuels have much lower environmental impacts than traditional carbon-based fuels. Non-renewable carbon-based fuels also emit noxious gases (carbon monoxide, sulfur dioxide, and nitrogen oxide), volatile organic compounds (VOC), particulate matter (PM) and heavy metals such as lead and mercury. Sulphur oxide causes acid rain, and carbon monoxide and nitrous oxide contribute to ground level ozone. Particulate matter cause haze in urban areas and along with ozone can contribute to asthma or chronic bronchitis. As the table below shows, vehicles are not only the biggest contributor of carbon dioxide, but also of nitrous oxides, volatile organic compounds and carbon monoxide.

For car-dependant cities, even if they are supported through clean energy, air pollution and high green house gas emissions will remain a significant challenge unless car ridership is reduced and/or less palliative vehicles are encouraged such as hybrids, electric cars or alternative fuel-based cars such as hydrogen vehicles.
Economic Benefits of Fuel Efficiency

Traditional centralized gas plants consume large amounts of energy not only in their construction and operation but more significantly for generating energy. Furthermore, energy is lost in transmission, especially in the form of electricity from central plants to regional transformers and from there to sub-stations. The same can be said of coal plants. This system is not only inefficient, since extra gas is needed to generate a unit of energy, but the consumption of this additional fuel is associated with additional carbon emissions. Improving energy efficiencies therefore can not only reduce the amount of GHGs generated but can also reduce the overall cost of generation, and the price of electricity.

Net Energy by Fuel Type and Source Efficiencies

Energy decisions should ultimately be based on life cycle assessments of the different fuel sources and technologies. Currently the energy market is warped by a myriad of subsidies to all the different technological sectors. The prices for the many fuels are also distorted by the subsidization of the environmental costs of extraction, transportation and consumption of the many fuel types. With most of these impacts unmitigated, future generations will be left to manage the environmental fallouts of our energy choices and in effect subsidize our current energy economy. When the data becomes available, it would make sense to pursue those fuels and technologies that are the most energy efficient in and of themselves, and most cost effective (after considering the full life cycle cost and environmental impact of fuel sources). This information is currently not available.

Geo-political Implications of Fuel Dependencies

The US imports more than 65% of its crude oil. Its natural gas resources are currently imported from Canada and Mexico. Soon it will also be imported from different parts of Asia. Large sums of money from the local economy thus end up in remote corners of the world. Energy is currently a net import item into the country, and the state of Washington. As discussed in a later chapter, Lynnwood’s domestic energy fuel sources include biomass, hydro, nuclear and coal use for electric generation. However Lynnwood, too, is dependant on imports from other countries for its crude oil and natural gas.

In comparison to remotely mined non-renewable energy sources, renewable energy technologies offer the distinct advantage of recirculating local dollars, since local dollars are not expended to purchase foreign fuel sources for energy. The country however still imports technology and parts for its wind turbines and

<table>
<thead>
<tr>
<th>Source</th>
<th>SO2</th>
<th>NOX</th>
<th>PM</th>
<th>VOC</th>
<th>CO</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Power Plants (coal, natural gas, oil)</td>
<td>12.7</td>
<td>5.7</td>
<td>0.35</td>
<td>0.06</td>
<td>0.45</td>
<td>2,500</td>
</tr>
<tr>
<td>Vehicles (gasoline, diesel etc)</td>
<td>1.3</td>
<td>14</td>
<td>1.4</td>
<td>8.53</td>
<td>75</td>
<td>2,000</td>
</tr>
<tr>
<td>Residential Heating (fuel, oil, gas)</td>
<td>0.1</td>
<td>0.72</td>
<td>0.04</td>
<td>0.03</td>
<td>0.25</td>
<td>410</td>
</tr>
<tr>
<td>Commercial Buildings (fuel, oil, gas)</td>
<td>0.26</td>
<td>0.35</td>
<td>0.03</td>
<td>0.03</td>
<td>0.14</td>
<td>240</td>
</tr>
</tbody>
</table>

solar PV systems, though domestic generation of these technologies has been set in motion and might even be visible in the region in the near future.

**Integrating City Planning and Energy**

Energy dependency patterns thus impacts the environment, influences geo-political relationships, and in the long-run affects a community’s affordability and to some extent, poverty.

Until recently however, cities had very little understanding or appreciation for how their land use and urban design approaches dictated their energy infrastructure and demand, and how this energy demand contributed to the cities’ greenhouse gas (GHG) emissions and global warming.

Land use distribution, density, transportation choices, municipal services, building codes etc all have a direct impact on a city’s total energy demand. Cities therefore can play a direct and active role to reduce demand for energy, promote clean energy and partner in the generation of energy.

Cities like Lynnwood also construct and maintain infrastructure; purchase and manage land; set standards and regulations, taxes and fees; purchase large amount of goods and products; and provide key services such as lighting, water, waste management and transportation. By interweaving energy concerns in daily decisions, policies and procedures, Lynnwood can set an example for local businesses and residents for efficiency and clean energy. The city also sets zoning and land development standards and building codes – that can promote energy conservation and renewable energy.

Local governments can also influence energy consumptions through codes, incentives, educational programs and so on. During capital upgrades and expansions of the energy infrastructure, planners can offer their insights into facility siting, environmental issues, permitting and so on. At the same time, by coordinating infrastructure outlay with growth, cities can grow more efficiently and affordably.

**Utility and Municipality Coordination**

There are many reasons for Utilities to start working closely with local and county governments. NW Utility providers will on occasions coordinate in a limited way with city staff and elected officials to confirm their projected demand assumptions. Much of the data Utilities seek in terms of population and development projections are recorded in a community’s comprehensive plan. Nevertheless, there is little indication that a city’s comprehensive plan is ever incorporated into a Utility’s IRP for their land use, environmental or economic development compatibility. The planning that is undertaken to determine a community’s energy infrastructure is currently disassociated from its land use plan.

It would seem that for more accurate accounting of a community’s energy needs, Utilities will be well-served by coordinating with local and county governments for more accurate data, exploration of partnering opportunities for energy production, and developing beneficial goals and plans. Calculating energy demand should take into account development densities, land use distribution, building standards and so on. It should also consider municipal facilities and utilities in the calculation of a community’s energy demand.

**The Relevance of an Energy Element**

Washington State Growth Management Act (GMA) (1990) requires municipalities to prepare Comprehensive Plan documents. These documents are reviewed and plans updated on a
regular basis. As discussed in Lynnwood’s 2006 Comprehensive Plan, the document helps formalize land use and development related goals, objectives and policies, and provides officials with a consistent policy reference for decision making. By anticipating future development, population growth and the municipal services that will be necessary to serve this projected growth, the plan helps coordinate the development and investment into the city’s infrastructure.

A city’s energy infrastructure is rarely considered in this broad overview other than to list local facilities and infrastructure in the Utility and Capital Facilities Elements. As a result the land use, economic and environmental fallouts of energy related decisions are made by Utility service Providers with little to no coordination or ratification by local government or the community.

A city-driven Energy Element provides an opportunity for jurisdictions like Lynnwood to work collaboratively with its Utility providers to seek solutions that are mutually beneficial. Unlike a typical IRP, an Energy Element starts with goals and visions established by community stakeholders. In developing an Energy Element, the delivery of energy is not an end to itself; rather it provides the framework for the city to achieve the future that it has set out for itself.

An Energy Element begins to establish the linkages between city infrastructure, plans and facilities to its energy consumption patterns. It also begins to link land use and design decisions to a city’s GHG emissions. As a record of community values, a community’s comprehensive plan can also clearly state policies that describe its preference for clean and domestic fuels.

Analyzing a city’s overall energy consumption and dependency therefore provides the framework for developing strategies towards energy-independence; higher system efficiencies and lower GHG emissions. While GHG emissions do not share a direct relationship with energy use, energy consumption remains a significant contributor of GHG emissions.³

Local governments can instead collaborate with Utilities to develop a joint sustainable plan for energy. This also affords local governments the opportunity to integrate social and environmental concerns into energy planning while expediting the permitting of well-designed sustainable energy systems. In this manner, energy systems could reflect whole system review and priorities. For instance by broadening cost calculations and including life cycle assessments of technologies and fuels Utilities can approach fuel and technology selection from a holistic point of view.

As the state population continues to grow exponentially, and existing infrastructure including power plants and transmission lines reach their capacity, Utility providers will be looking to either reduce demand for energy or investigate ways of getting new supply. While Northwest Utilities already rank among the country’s leaders for their conservation records, there are still many other initiatives and markets that can be targeted for more conservation. This may be the route that many Utilities take given that expansion of capital infrastructure through new supply investments could increasingly face greater challenges from the environmental community.

With the growing awareness of GHG emissions and the recent passage of a mandatory Renewable Portfolio Standard requirement for Washington State utilities, Utilities will also be looking to diversify their portfolio with fuel that are less polluting and renewable, perhaps approaching energy issues from a different perspective. Upgrading energy infrastructure can be greatly expedited if it is coordinated with a
community’s land use and economic development plans. Whether it is to reduce local demand, help identify and locate sites for generation or upgrade infrastructure, local jurisdictions can partner with Utilities for mutual benefit. For instance, local governments can intervene early and assist with land acquisition, coordination of capital facilities improvements, regulatory oversight and the buy-in of the community.
3. Lynnwood’s Physical Framework and its Influence on Energy

This section explores Lynnwood’s current and planned physical environment for opportunities to inject energy considerations and savings. Most of this information is based on the 2006 Comprehensive Plan with additional data analysis courtesy City Staff and the City’s GIS department. The analysis covered land use, transportation, city facilities and buildings, municipal services, and utilities.

**Land Use Patterns**

According to the city’s 2001 (revised September 2006) Comprehensive Plan Background Report, the City of Lynnwood is about 95 percent developed. Therefore the thrust of the city’s comprehensive plan is on infill and the redevelopment of older areas, particularly within the designated City Center, and growth through annexation.

The plan proposes the concentration of commercial development along SR 99, in the City Center and in the Alderwood Mall area. Most of the new employment and high density housing are planned for the College District and the Sub Regional Center (that includes the City Center and Alderwood Mall).

Projections for the Sub Regional Center include:

- 113% increase in employment from 7,970 to 16,490
- 65% of new employment (9/10 of city’s employment base)
- ⅓ of the city’s employment square footage
- 42% increase in population to include 1/3 of new population (+1,325 persons)
- 1/3 of new dwelling units (+547)

According to the Land Use Plan, (see Figure 2) it is apparent that most of the city’s land is used
for single family neighborhoods. As shown in Figure 3, the Comprehensive Plan calls for strengthening of these single family neighborhoods by somewhat increasing the quantity of land zoned for single family residential but mostly by increasing the density options for single family neighborhoods. The plan presumes about 1,161 additional units within the Single Family Land Use zones in the city.

Figure 2: Land Use Plan, Lynnwood 2006
Figure 3: Proposed Changes in Land Use (1999-2026)

<table>
<thead>
<tr>
<th>EXISTING (1999)</th>
<th>PROPOSED (2026)</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND USE</td>
<td>ACRES (%)</td>
<td>LAND USE</td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>1,728 35</td>
<td>1,848 37.2</td>
</tr>
<tr>
<td>Low Density Single Family Residential</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>Medium Density Residential</td>
<td>51 1</td>
<td>62 1.2</td>
</tr>
<tr>
<td>Medium Density Single Family Residential</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Mobile Home Park</td>
<td>59 1.2</td>
<td>0 0</td>
</tr>
<tr>
<td>Mobile Home Park</td>
<td>59 1.2</td>
<td>0 0</td>
</tr>
<tr>
<td>High Density Multiple Family</td>
<td>272 5.5</td>
<td>287 5.8</td>
</tr>
<tr>
<td>High Density Multiple Family</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Residential</td>
<td>2,110 42.69</td>
<td>2,324 46.72</td>
</tr>
<tr>
<td>Retail Commercial</td>
<td>553 11.2</td>
<td>(Not continued) -553</td>
</tr>
<tr>
<td>Office Commercial</td>
<td>195 3.9</td>
<td>(Not continued) -195</td>
</tr>
<tr>
<td>Auto Service Commercial</td>
<td>37 0.7</td>
<td>(Not continued) -37</td>
</tr>
<tr>
<td>Recreational Commercial</td>
<td>26 0.5</td>
<td>(Not continued) -26</td>
</tr>
<tr>
<td>Local Commercial</td>
<td>85 1.7</td>
<td>85 1.7</td>
</tr>
<tr>
<td>Community Commercial</td>
<td>84 1.7</td>
<td>84 1.7</td>
</tr>
<tr>
<td>Regional Commercial</td>
<td>785 15.8</td>
<td>785 15.8</td>
</tr>
<tr>
<td>Business Technical Park</td>
<td>69 1.4</td>
<td>69 1.4</td>
</tr>
<tr>
<td>Commercial</td>
<td>811 16.41</td>
<td>1,023 20.57</td>
</tr>
<tr>
<td>Industrial</td>
<td>143 2.9 %</td>
<td>84 1.7</td>
</tr>
<tr>
<td>Transportation</td>
<td>21 0.4</td>
<td>(Not continued) -21</td>
</tr>
<tr>
<td>Institutional</td>
<td>453 9.2</td>
<td>325.6 6.6</td>
</tr>
<tr>
<td>Parks Recreation and Open Space</td>
<td>258 5.2%</td>
<td>326 6.6%</td>
</tr>
<tr>
<td>Tracts and Lakes</td>
<td>45 0.9</td>
<td>(Not continued) -45</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>255 5.2</td>
<td>(Not continued) -255</td>
</tr>
<tr>
<td>Rights of Way</td>
<td>847 17.1%</td>
<td>854 17.2%</td>
</tr>
<tr>
<td>Total</td>
<td>4,943 100</td>
<td>4,974 100</td>
</tr>
</tbody>
</table>
One factor that influences a home’s energy efficiency standards can be its ownership status. It has been observed that owner-occupied homes and condominium units are more efficient. This is presumed to be due to the fact that owners are able to recoup the extra cost of installing energy efficient appliances and technologies. Rental units are generally not as energy efficient since unit owners are less reluctant to make the extra investment. In Lynnwood, this is an issue that local government can get involved in. They can offer incentives or loans to motivate rental owners to make their units more energy efficient.

The single most significant change will be de-emphasizing the large-box or strip mall retail and focusing instead on large commercial towers with ground floor retail in the City Center. This high density development in the center will be complimented with high density residential development. Approximately 676 new residential units are targeted for the Sub-regional Center by 2012.

Increased commercial use, particularly offices, implies a greater demand for daytime energy overall, and definitely contributing to a higher peak demand in the city. The projected increase in residential population, on the other hand is unlikely to significantly affect day time energy demand in the city, since there is a high percentage of the population that commutes beyond city limits.

Another factor that is closely scrutinized for its impact on local energy demand is the amount of open space and natural areas that naturally temper the urban heat island effect of developed areas. For “built out” cities like Lynnwood, that is also surrounded by developed areas, increased development, with out an equal if not greater increase in natural areas will increase the ambient temperature. This increased temperature can have significant impact on summer cooling loads and therefore summer peak energy demand. The comprehensive plan in the

The comprehensive plan de-emphasizes industrial development but resumes a modest increase in mixed use development outside the City Center.

**Transportation**

Distribution of land use and development density (or residential density) have a direct effect on the demand for gasoline or diesel for transport. About 3,890 residents (around 10% of the population) live and work in the city. The rest of the employed population commutes outside the city.

As shown in the chart below, less than 2,443 persons or 15% of the resident population used alternative modes. Most of these either depended on a bus or ferry. A little less than 3.5% of commutes either involved walking or biking to work while about 4% of Lynnwood residents telecommute.
Figure 4: Means of Transportation To Work For Workers 16 Years and Over, Lynnwood, WA

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>16,624</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car, truck, or van</td>
<td>14,181</td>
</tr>
<tr>
<td>Drove alone</td>
<td>11,680</td>
</tr>
<tr>
<td>Carpoled</td>
<td>2,501</td>
</tr>
<tr>
<td>Public transportation</td>
<td>1,248</td>
</tr>
<tr>
<td>Bus or trolley bus</td>
<td>1,229</td>
</tr>
<tr>
<td>Streetcar or trolley car</td>
<td>0</td>
</tr>
<tr>
<td>Subway or elevated</td>
<td>0</td>
</tr>
<tr>
<td>Railroad</td>
<td>7</td>
</tr>
<tr>
<td>Ferryboat</td>
<td>12</td>
</tr>
<tr>
<td>Taxicab</td>
<td>0</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>0</td>
</tr>
<tr>
<td>Bicycle</td>
<td>45</td>
</tr>
<tr>
<td>Walked</td>
<td>414</td>
</tr>
<tr>
<td>Other means</td>
<td>67</td>
</tr>
<tr>
<td>Worked at home</td>
<td>669</td>
</tr>
</tbody>
</table>

Source: Census 2000 Summary File 3 (SF 3) - Sample Data

Road network

Approximately 17% of city land is dedicated to rights-of-way. This is approximately 2.5 times as much as parkland. Not including highways, there are about 90 linear miles (or 475,200 linear feet) of roadway in the city. This works out to an average of 14 linear feet of roadway per resident. More than half of these are neighborhood collectors. See Figure 5 below.

While most of the city is defined by a grid, there are many subdivision collectors that terminate in cul de sacs. This negatively impacts the connectivity in the city. Each break in the grid lengthens trips with a corresponding increase in the use of gasoline and CO2 emissions. For the sake of illustrating the impact of a poorly connected street network, if one compared conventional suburban development to a well-connected grid street pattern, the Vehicle Miles Traveled (VMT) on the grid network can be up to 60% lower.1

Figure 5: Road Mileage, Lynnwood (2006)

<table>
<thead>
<tr>
<th>CLASS</th>
<th>MILES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Arterial</td>
<td>7.95</td>
<td>9%</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>17.85</td>
<td>20%</td>
</tr>
<tr>
<td>Collector Arterial</td>
<td>13.75</td>
<td>15%</td>
</tr>
<tr>
<td>Neighborhood Collector</td>
<td>50.80</td>
<td>56%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>90.40</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Lynnwood Department of Public Works, City of Lynnwood Comprehensive Plan Update 2006

Traffic Flow

Flow of traffic is also important. In this regard, synchronized traffic lights can help reduce gasoline consumption by up to 19% in a typical city. This study could not avail of data of how many traffic signals were synchronized in Lynnwood to reduce emission build up during signal breaks and maximize capacity of the road infrastructure.

Non-Motorized Travel

For car-dependent cities non-motorized travel provides a relatively easy way to reduce the dependence on end use of cars. However, a successful pedestrian environment draws upon more than a well-connected network. The design of the network, distribution of land use, safety and so on are all needed to tear the average resident from his/her dependence on the single occupied vehicle.

1 Energy Plan for Greenwood County, South Carolina
2 Ibid.
Depending on the road cross-section, they can provide a safe and comfortable environment for walking or not.

"...sidewalks, where they exist often do not connect with each other or primary activity centers...over half of the city’s 95 miles of streets are without continuous pedestrian facilities at least on one side of the road." The City made about $1 million investment in walkway improvements from 2000-2006. Trees add to the street ambience and can increase comfort by providing shade and color to a pedestrian environment. The character and appearance of safety of the pedestrian environment determines a city’s walkability and residents’ choice to walk, bike or not.

The 2006 Comprehensive Plan references a bike plan (See Figure 5). If a ¼ mile buffer is drawn around existing and planned routes, it appears that most of the city’s residents have access to a bike route. A 4-6’ bike lane, marked along a travel road lane is the classic bike route in the city. The purple “existing route” is a “Class 3” route. It has signage that allows bicycles to use portions of restricted lanes as through lanes, and has an extra three feet of right-of-way to support this. It is, however, not striped.

The lanes, future routes, and planned improvements in the bike plan have not been officially designated. While striping a portion of asphalt may appeal to the fast-paced experienced bicycle, it does not offer the safety characteristics that children, the elderly and families may need in order to carry out their daily trips on bikes. Therefore the current investment plan for biking serves only a small portion of the city’s population and will affect the city’s total VMT marginally.

Increased biking can lower gasoline consumption significantly:
- For trips of up to 5 miles or less (which are typically 60% of all trips within a community) if only 5% of those trips were made by bike or on foot, 3% of all personal vehicle trips would be eliminated and fuel use would drop by more than 1%.³
- For trips less than ½ mile (7% of vehicle trips to work and 11% of non-work trips) if 20-50% of these trips were made on foot or bicycle, then total vehicle trips would be reduced by 2-5%.

**Transit Network**

Transit offers another effective method to reduce greenhouse gases and energy consumption by lowering VMT traveled in the city. Commuters who switch from driving to transit 3 days a week decrease their overall gasoline consumption by 160, to 235 gallons a year.

According to the 2006 Comprehensive Plan, Lynnwood residents work throughout the region, particularly in downtown Seattle, followed closely by employment centers at University of Washington and Bellevue. There is some commuting out of the city into Bothell and Mountlake Terrace. The ratio of local jobs to housing, which is a measure of a city’s bedroom community characteristics, is 1:1.6 for Lynnwood demonstrating that it is primarily a bedroom community. Some population that commutes out of the city is replaced by residents of Snohomish County and north King County, living within a 6-mile radius who commute into Lynnwood for work.

Sound Transit has plans to extend light rail to Everett through Lynnwood. A possible route under review is shown in Figure 6.

Community transit (CT) provides transit services throughout Snohomish County and intra-county to neighboring counties. The comprehensive plan states that approximately 60% of all CT buses pass through Lynnwood on a daily basis. All those that serve the city of

³ Ibid.
Lynnwood either start or end at the Lynnwood Transit Center. There is a transit center in Lynnwood at I-5 and 44th Avenue W., and the park and ride at 202nd Street SW and 46th Street W. Another is at the Ash Way HOV access at I-5 and 164th SW, immediately beyond Lynnwood city limits on 164th Street SW.

Community Transit (CT) reported a total annual ridership of over 8 million in 1998. They also operate 262 vanpool vehicles. The three large commute destinations are downtown Seattle, the University District in Seattle and Bellevue. CT is also pursuing developing a Bus Rapid transit System on SR 99. The 2000 Census Journey-to-work statistics show Lynnwood’s transit mode share as 7.5%. As shown in Figure 8 most city residents are within a ¼ mile radius of a transit stop. This belies the relatively low transit ridership and suggests that perhaps to increase ridership in addition to access, there may be additional need for transit agencies to review the frequency of buses, layout of routes, and bus stop design among other factors.

Comment [AM1]: This number conflicts with the comprehensive plan data in Figure 3.
Figure 7: Comprehensive Plan Bike Plan (2006)
Figure 8: Community Transit Routes, Lynnwood

Transit Routes
CTRouteDescriptions.RT_TYPE
- Sound Transit Express
- Inter-County Commuter
- In-County Commuter
- University District
- Local
- 1200 feet buffer
Therefore while Lynnwood is predominantly a bedroom community and as such is a perfect candidate for peak hour transit service to major regional centers, cities that have high percentage of transit users throughout the day are structured differently. Improving transit ridership for non-commute purposes will require a fairly different approach to land use planning.
Municipal Facilities and Other Services

Municipalities pay a premium for providing basic capital facilities and infrastructure. As Figure 10 below shows, these costs have been rising steadily since 1950. In 2000 this amounted to approximately $9,445 per person. While this number is averaged across the many different cities in the country, with Lynnwood being a smaller city, it is likely that it will register less spending per resident. The City spends about $1.3 million per annum on energy including electricity, gasoline, diesel, and natural gas. This cost is described in greater detail below.

A municipality’s typical energy expenses includes:

- public buildings,
- streetlights and traffic signals,
- solid waste disposal,
- fleet,
- water and sewage treatment, and
- stormwater pumping (and sometimes treatment).

In Lynnwood its energy related expenses have been gradually increasing over the years. In 2006, it crossed the 1.5 million dollar mark. As shown in Figure 11, while electricity expenditures have actually fallen over the past few years, (due to strategic interventions in 2003) gasoline and diesel expenses have been increasing along with natural gas expenditure.

<table>
<thead>
<tr>
<th>Year</th>
<th>Education</th>
<th>Local Streets and Highways</th>
<th>Sanitation</th>
<th>Water</th>
<th>Transit</th>
<th>Other</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>$955</td>
<td>$286</td>
<td>$137</td>
<td>$139</td>
<td>$94</td>
<td>1,185</td>
<td>$2,796</td>
</tr>
<tr>
<td>1960</td>
<td>$1,050</td>
<td>$370</td>
<td>$190</td>
<td>$207</td>
<td>$83</td>
<td>1,803</td>
<td>$4,303</td>
</tr>
<tr>
<td>1970</td>
<td>$2,527</td>
<td>$367</td>
<td>$233</td>
<td>$219</td>
<td>$200</td>
<td>2,848</td>
<td>$6,314</td>
</tr>
<tr>
<td>1980</td>
<td>$2,534</td>
<td>$327</td>
<td>$333</td>
<td>$236</td>
<td>$171</td>
<td>3,144</td>
<td>$6,747</td>
</tr>
<tr>
<td>1990</td>
<td>$3,047</td>
<td>$352</td>
<td>$386</td>
<td>$315</td>
<td>$204</td>
<td>3,144</td>
<td>$8,328</td>
</tr>
<tr>
<td>2000</td>
<td>$3,634</td>
<td>$373</td>
<td>$397</td>
<td>$336</td>
<td>$302</td>
<td>4,024</td>
<td>$9,445</td>
</tr>
</tbody>
</table>

Source: US Census (www.demographia.com)
Figure 11: City of Lynnwood’s Energy Related Expenses

![Energy Related Expenses Chart]

Public Buildings

As Figure 12 shows, more than half of the City of Lynnwood’s electricity bill goes to pay for waste water treatment. Outdoor lighting (that includes street lighting, parks lighting, traffic signals and crosswalk signals or lighting) comprises an additional 20% with buildings taking up another 25%.

Figure 12: Annual Electricity Consumption for City of Lynnwood Facilities

Of the buildings, the largest users of electricity are the Justice Center ($46K), the Recreation Center ($47K), City Hall ($32K), and Library ($31K).

Figure 13: Electricity Use by Lynnwood Public Building

The buildings in the “Other” Category include:
- Utility Maintenance Center (20525 60th)
- Maintenance Shop (18930 44th)
- North Administration Building (19000 44th)
- Park Maintenance Building (20522 60th)
- Business Park (7010 196th)
- Business Park (7014 196th)
- Heritage Park Information Center (19921 Popular Way)
- Senior Center Expansion (5800 198th #11)
- Senior Citizen Center (5800 198th #9)
Scriber Lake Restroom (5601 198th),
Fire Station #14 (6825 188th), and
Fire Station #15 (18800 44th)

In 2003, based on the recommendations of an energy audit, the City undertook several energy efficiency upgrades. Many recommendations made by the consulting company SIEMENS Ltd were implemented. The payback period for the $756,000 improvements was approximated at 12.1 years. A summary of the energy improvements and their costs are listed below.

Figure 14: Electrical Energy Retrofits and Estimated Annual Savings, City of Lynnwood

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>COST</th>
<th>ESTIMATED ANNUAL KWH SAVINGS</th>
<th>ESTIMATED ANNUAL COST SAVINGS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duct outside air to compressors, adjust air pressure</td>
<td>$2,780</td>
<td>25,403</td>
<td>$1,760</td>
</tr>
<tr>
<td>Retrofit lighting Maintenance Shop</td>
<td>$2,983</td>
<td>2,500</td>
<td>$173</td>
</tr>
<tr>
<td>Retrofit lighting Fire Station 14</td>
<td>$6,772</td>
<td>10,547</td>
<td>$731</td>
</tr>
<tr>
<td>Retrofit lighting, WWTP</td>
<td>$11,469</td>
<td>37,523</td>
<td>$2,599</td>
</tr>
<tr>
<td>Retrofit lighting City Hall, Council Chamber, NAB</td>
<td>$31,516</td>
<td>75,751</td>
<td>$5,248</td>
</tr>
<tr>
<td>Retrofit lighting Recreation Center</td>
<td>$45,132</td>
<td>91,750</td>
<td>$6,356</td>
</tr>
<tr>
<td>Install VFD 200HP Aeration blower, WWTP</td>
<td>$137,473</td>
<td>252,845</td>
<td>$17,516</td>
</tr>
<tr>
<td>Occupancy controls HVAC &amp; lighting, City Hall, Recreation Center, NAB, Library, Justice, cold deck reset City Hall, thermostats at Justice Center</td>
<td>$517,493</td>
<td>282,880</td>
<td>$19,597</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$755,620</strong></td>
<td><strong>779,199</strong></td>
<td><strong>$53,980</strong></td>
</tr>
</tbody>
</table>

*Electrical rate estimated at $0.07/kWh.

Figure 15 shows a series of charts that illustrate the variation in electrical use in the many municipal buildings that went through some level of retrofit in 2003. The fact that they vary in their energy performance is an indicator that some retrofits were more successful than others. In buildings that were less successful, other factors such as poor insulation, how the building is used and so on may actually bring down energy.

Comment [AM4]: Why is this number less than the $917,826 shown in Figure 11?
Of all the buildings, the Library retrofit (this is one of the two newer buildings), is showing major savings for the insulation and HVAC systems upgrades that were undertaken. The North Administration is the newest building and has the best equipped HVAC, with quite a bit of space in individual offices. Again, like the library, the retrofit seems to have worked well with little seasonal variation. It appears that the Justice Center and the Recreation Center efficiencies could be improved further through appropriate interventions.

**Gas**

The Recreation Center and its pool are the biggest natural gas users – more than $90K in
2006. There appears to be a 65/35 split between the building and the pool. The gas bill for Humble House in Heritage Park, a structure of about 1000 sq ft — was $5,276, compared with only $5,722 for the much larger library. The Wickers Building next door, somewhat larger than Humble House, was about $2,700 for the same period.

This discrepancy can be explained by the fact that the Wickers Building had a more or less complete renovation while the Humble House had little. For the Wickers building renovation the specifications included HVAC upgrades, minimal fresh air ventilation requirements, energy star or other energy requirements for the furnace, and a 24-hour thermostat. Incandescent lighting were specified for more than half of the building lighting fixtures.

A partial list of space heating requirements (City Hall, jail, courthouse, fire station, recreation center, library, north administration building, senior center, park buildings, golf course, and the City Shop) shows that the City in 2006 spent an average of $106,650 for space heating alone for its many facilities. For pool heating, the City spent another $56,990. Therefore the City’s total gas bill to Puget Sound Energy for 2006 for was in the range of $163,637, an increase of nearly $50,000 in only 5 years. This is clearly a reflection of the volatility of the energy market and pricing.

**Figure 16: Natural Gas Use in Lynnwood Public Buildings**

<table>
<thead>
<tr>
<th>BUILDING</th>
<th>PURPOSE</th>
<th>THERMS</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLF COURSE-GROUNDS</td>
<td>Space Heating</td>
<td>901</td>
<td>$1,176.56</td>
</tr>
<tr>
<td>PARKS OPERATIONS</td>
<td>Space Heating</td>
<td>2,078</td>
<td>$2,676.70</td>
</tr>
<tr>
<td>SENIOR CENTER</td>
<td>Space Heating</td>
<td>2,532</td>
<td>$3,021.60</td>
</tr>
<tr>
<td>COURT</td>
<td>Space Heating</td>
<td>2,581</td>
<td>$3,180.09</td>
</tr>
<tr>
<td>JUSTICE</td>
<td>Space Heating</td>
<td>3,308</td>
<td>$3,803.40</td>
</tr>
<tr>
<td>BUSINESS PARK</td>
<td>Space Heating</td>
<td>4,405</td>
<td>$5,276.68</td>
</tr>
<tr>
<td>LIBRARY</td>
<td>Space Heating</td>
<td>5,033</td>
<td>$5,722.15</td>
</tr>
<tr>
<td>NORTH ADMIN BLDG (NAB)</td>
<td>Space Heating</td>
<td>6,021</td>
<td>$6,852.51</td>
</tr>
<tr>
<td>FIRE STATION 14</td>
<td>Space Heating</td>
<td>2,580</td>
<td>$2,992.80</td>
</tr>
<tr>
<td>FIRE STATION 15</td>
<td>Space Heating</td>
<td>8,546</td>
<td>$9,943.02</td>
</tr>
<tr>
<td>CITY HALL</td>
<td>Space Heating</td>
<td>13,635</td>
<td>$14,944.13</td>
</tr>
<tr>
<td>UMC</td>
<td>Space Heating</td>
<td>14,609</td>
<td>$16,368.80</td>
</tr>
<tr>
<td>RECREATION CENTER</td>
<td>Space Heating</td>
<td>32,027</td>
<td>$30,687.36</td>
</tr>
<tr>
<td>RECREATION CENTER POOL</td>
<td>Pool Heating</td>
<td>42,241</td>
<td>$56,990.80</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>142,496</td>
<td>$163,636.69</td>
</tr>
</tbody>
</table>
Lynnwood Utility Services
Solid Waste Disposal

Collecting solid waste from buildings, sorting the waste and transporting them to remote landfill and recycling locations can be fairly energy intensive. Minimizing waste (by aggressive recycling, local composting and/or aerobic digestors) and implementing waste to energy programs can significantly reduce a city’s expenses and carbon footprint with respect to solid waste disposal.

Natural Gas

Puget Sound Energy (PSE) provides natural gas to Lynnwood. Natural gas is supplied to the city through the two supply mains owned and operated by the Williams Company. In July 2000, there were about 10,482 natural gas customers in Lynnwood and the surrounding Urban Growth Areas. The average residential customer uses about 50 cubic feet per hour during winter. The energy use at office, commercial and industrial development varies. Most new developments are pursuing PSE connections for space heating which is about 90-95% efficient.

The new 16” line identified in Lynnwood’s 2006 Comprehensive Plan Update is scheduled for construction in the summer of 2007. This will be operated by the Williams Company. Beyond this project, the Comprehensive Plan also identifies system reinforcements to improve reliability; new installations to cater to increased demand from new development or to supplement existing development; and the replacement or relocation of facilities due to municipal and state improvement projects.

With the increased densities projected for the City Center and the College Districts, PSE may need to soon undertake several of the above improvements to serve the projected population increase.

Figure 17: High Pressure PSE Gas Main Lines, City of Lynnwood

To reduce the projected demand on PSE infrastructure; the company has in place many grants and rebate incentives for energy conservation. These are summarized below:

Commercial and Industrial Building

- PSE Grants (50-70% on energy efficient retrofits); (for energy modeling of new construction that shows a minimum of 10% energy savings over the energy code baseline - 40cents per square foot; and $1.20 per square foot if energy savings exceed 25% of energy code baseline)
- Non-residential HVAC Rebate program ($50-800 for energy efficient thermostats, motors, boilers)
- Energy Star® appliances (qualified steam cooker ($750) electric or natural gas; deep fat fryer ($250 for electric and $750 for natural gas); hot food holding cabinets ($500 for electric or natural gas))
- Lighting Rebate Program for small businesses – ($3 to $160 for commercial lighting retrofits)
- Lighting control rebate program ($30-$60 for each occupancy sensor and timer control)
- LED exit sign rebate program ($35 for each exit sign lit by incandescent or fluorescent lamps that are replaced by an Energy Star® qualified exit sign lit with an efficient long-lasting LED module)
- High Efficiency Coin-Operated Commercial Clothes Washer Rebate Program ($200)
- Energy Star® qualified NEMA TP-1 dry-type transformer ($2.50 kVa rebate)

**Residential**

- Manufactured Home Rebate Program (new Energy Star® gas and electric Customers with Super Good Cents® ($300 with PSE served electric heating) or Natural Choice™ Certification ($550 with PSE served natural gas)
- Energy Star® Appliance Rebate Program (includes $50 for Energy Star® qualified clothes washer with an Modified Energy Factor (MEF) of 1.8 or higher; $2-20 rebates for various Energy Star® CFL bulbs and fixtures; $250 rebate for an Energy Star® Qualified Natural Gas furnace; $40 rebate for high efficiency natural gas water heater with an energy factor of 0.62 or higher
- Solar PV system ($525 per kw DC based on system capacity and location)
- PSE is a voluntary participant of Washington State Renewable Energy Cost Recovery Program (production-based incentive from $0.12-0.54 per kWh to individuals, businesses and local government that generate electricity from solar, wind power or anaerobic digesters.
- PSE’s HELP Program for Low Income Gas Bill Assistance

**Schools**

- Portable Classroom Controls Rebates (365-day programmable thermostats (upto $250 with an additional $50 each for occupancy sensor damper controls and occupancy sensor lighting controls))

**Electricity**

Power to Lynnwood is provided by the Snohomish Public Utility District (Sno-PUD). As shown in Figure 24 below, Sno-PUD’s largest power supplier is the Bonneville Power Administration (BPA). The power from BPA’s Sno-king station is distributed to six substations from where it is transformed down from 115kV to 12.5kV. It is anticipated that the existing 115kV regional distribution line will be at 70 percent capacity by 2011.

**Figure 18: Snohomish PUD Power Purchases (2006)**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BONNEVILLE POWER ADMINISTRATION</td>
<td>78%</td>
</tr>
<tr>
<td>SHORT-TERM MARKET PURCHASES &amp; Klickitat PUD Biogas</td>
<td>9%</td>
</tr>
<tr>
<td>LONG-TERM CONTRACT PURCHASES</td>
<td>5%</td>
</tr>
<tr>
<td>JACKSON PROJECT</td>
<td>5%</td>
</tr>
<tr>
<td>EVERETT COGENERATION</td>
<td>3%</td>
</tr>
</tbody>
</table>
Figure 19: Snohomish PUD Power Fuel Mix (2005)

<table>
<thead>
<tr>
<th>FUEL TYPE</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDRO-ELECTRIC GENERATION</td>
<td>80%</td>
</tr>
<tr>
<td>NUCLEAR GENERATION (BPA-SUPPLIED)</td>
<td>9%</td>
</tr>
<tr>
<td>COAL</td>
<td>8%</td>
</tr>
<tr>
<td>NATURAL GAS GENERATION</td>
<td>2%</td>
</tr>
<tr>
<td>OTHER COGENERATION</td>
<td>1%</td>
</tr>
</tbody>
</table>

Note: Based on data from the state of Washington as of 12/31/05 (year-end figures updated each Spring of the following year). Other generation includes biomass, landfill gas, petroleum, waste, and wind.

While the 2006 Comprehensive Plan for Lynnwood (pg Capital facilities and Utilities – 18) acknowledges that the land use projections for the city will require additional power supply, there is no information about how the Snohomish PUD, will provide this energy – from which source, at what cost, through which distribution line etc. This provides an opportunity for the City and PSE to work together to determine local and cost effective solutions to the imminent demand for additional electricity in the city.

Snohomish PUD ownership map shows 8-9 substations scattered about the city of Lynnwood and one major transmission line running along the old Interurban ROW. With the implementation of the City Center plan, another substation is planned in the vicinity of 200th. The newest PUD substation is at 164th and Manor Way.

Figure 20: Snohomish PUD Main Lines and Substations, Lynnwood

Source City of Lynnwood GIS, 2007

Municipal Capital Facilities

Street lighting

This category includes streetlights, traffic signals, crosswalk lights and other outdoor lights (such as for park lighting and so on). The city of Lynnwood has 2,190 street lights that consume about 1,693,973 kWh every year. Traffic signals were recently converted to LED lighting which is very energy efficient. As a result, traffic signals only consume about 294,798 kWh each year.

Permeability (Stormwater)

In many cities, stormwater treatment and pumping is a significant City expense. Often times, cities do not treat stormwater but allow it to run directly into local water bodies. In other cases, stormwater and sewer lines are combined such that during heavy storms the rainwater overloads the system, the pipes overflow, and untreated water (with sewage) is released into a waterbody. According to the EPA, along with stormwater, the city releases the following pollutants:

- natural—organic material such as leaves, grass clippings and sediment
- chemical—such as detergents, coolant, oil, grease, fertilizer and paint
- litter—such as plastic bags and cigarette butts.
Of the city’s total land area of 4,974 acres, 2,200 acres or 45% of the city’s land is impervious. For an average annual rainfall of 36”, the city releases 2,171,086,037 (2 bi.) gallons of stormwater into the region’s water bodies from its impervious surfaces. Should in the future any portion of this have to be pumped or treated, there will be a corresponding impact on the city’s energy portfolio.

Figure 21 shows how commercial development, while covering only 21% of the city’s surface contributes to 60% of the city’s impervious surface.

In Lynnwood almost nothing goes to the Sound, at least not directly. The city is primarily in the Lake Washington watershed. Surface water flows either into Swamp Creek (through a large surface detention facility), Scriber Creek (vault facility south of the downtown core) which drains into Swamp Creek, or into Hall Lake and Creek, which drains into Lake Ballinger and eventually into Lake Washington. In the western portion of the city, flows are somewhat more complex. A small amount of surface water is discharged into the Sound from a culvert running under the Waste Water Treatment plant.

Nothing is currently “processed” (beyond the level of mechanical “treatment” that occurs in sedimentation vaults). This situation will change with the new DOE manual and NPDES II requirements. The city is currently preparing a new storm water comprehensive plan and NPDES Phase II application.

The city center is expected to add several vaults, mechanical treatment, oil skimmers, and some composting filters. The details can be found at http://www.ci.lynnwood.wa.us/Docs/CCP-III.Impacts-G.Utilities.pdf.

### Figure 22: Impermeable Surfaces by Land Use

<table>
<thead>
<tr>
<th>TYPE</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDENTIAL (STRUCTURE AND PAVEMENT)</td>
<td>21,697,000 sq ft</td>
</tr>
<tr>
<td>COMMERCIAL (INCLUDING MULTIFAMILY)</td>
<td>17,823,000 sq ft</td>
</tr>
<tr>
<td>COMMERCIAL PAVEMENT</td>
<td>38,813,000 sq ft</td>
</tr>
<tr>
<td>ROAD SURFACE</td>
<td>18,411,000 sq ft</td>
</tr>
<tr>
<td>TOTAL</td>
<td>96,744,000 sq ft</td>
</tr>
</tbody>
</table>

Source: Lynnwood City GIS

**Water, Waste Water Treatment**

By some accounts, water treatment and distribution as well as wastewater treatment can make up anywhere between 40-60% of the municipality’s typical energy expenses. Providing these services is becoming more costly due to a growing urban population aggravated by increasing demand per capita.
Figure 23 shows the variation in wastewater electrical consumption. Infiltration, particularly during heavy storms, can cause wastewater treatment plants to generally record higher levels of use during winter months.

Through the Siemens review, a new blower motor that was installed at the wastewater treatment plant greatly reduced electrical demand. Another way to reduce the electrical load is by reducing demand – the amount of wastewater that is released into the system. Some cities are investigating ways to improve the efficiency of the system by using the waste heat released at the plant or reusing the sludge that is disposed of into the landfill and tapping the methane for incineration.

Waste water can also be reduced by minimizing the use of potable water. Water-efficient fixtures also reduce the amount of potable water consumed as does rainwater-harvesting for use in toilets, laundry and so on.

There are many reasons to reduce water usage per person: treatment facilities may have a longer life span, as well as able to serve a larger population; lower operating costs, and lower energy costs to the municipality. The energy expended in these systems include constructing and maintaining the infrastructure that brings water from the water source; pumping water from the water source, through the system, to the user; collecting and transporting wastewater to the sewage treatment plant; and treatment to acceptable standards.
MUNICIPAL FLEET AND VEHICLES

The fuel use inventory is for all City of Lynnwood vehicles includes all “rolling stock” but not any fixed asset fuel use (generators, etc.). In 2000, gasoline and diesel accounted for 21% of the city’s energy expenses. In 2006 this percentage had risen to nearly 30% of the city’s energy budget.

An issue with gathering this data is that most vehicles report usage in miles (1,431,952 total miles), but some also report in hours (13842 hours).
Energy Efficiency Incentives

Sno-PUD also offers several programs to reduce electricity demand and inefficiencies. These are listed below:

**Residential**
- Snohomish County PUD Low-Interest Loan Program for residential energy efficiency improvements (minimum $1,000 at 2.9% interest for up to 10 years payback)
- Snohomish County PUD Rebates for qualified Clothes Washers ($35) and Dish Washers ($75);
- Snohomish County PUD Discount coupons to customers that reduce the regular price for most CFLs to only $1.99 each at participating local retailers
- Old Refrigerator Recycle Program (1999 models or older; needs to be working condition and between 10-27 cubic feet in size; utilities will pay customers $35)

**Non-residential**
- Snohomish County PUD Financial Incentive Program to offset costs to increase efficiency of facilities ($30-200 for purchasing energy efficient refrigerators and freezers)
- Snohomish County PUD Rebate Program for custom energy efficiency measures ($0.14 kWh; annual 1st year project savings up to a maximum of 70% of total project costs)

**Schools**
Booneville Environmental Foundation (BEF) (not-for-profit organization) donation for equipment and partial installation of photovoltaic and monitoring systems (1.1 kW systems and funding up to 33% of larger renewable energy systems) for small scale solar systems (School owns and maintains solar system; provides access and solar data to a network in order to implement a informational or public outreach strategy)

**Electricity equipment/generation**
- Washington State Tax-Abatement for Solar Electric Photovoltaic (or their silicon components) Module Manufacturing and Wholesale Marketing (40% reduction of State’s Business and Occupation Tax)
- Washington State Sales Tax Exemption for equipment used to generate electricity (up to 200w) from wind, sun, or landfill gas, fuel cells and solar water heating systems. Also applies to labor and services related to equipment installation.
- BEF funding for renewable energy projects located in the Pacific Northwest – solar photovoltaic, solar thermal electric, wind, hydro, biomass and animal waste-to-energy ($2,000 and up for solar production – residential and small businesses do not qualify)
- Northwest Solar Co-operative and Our Wind Co-op Grants (not-for-profit organizations) for residential or small business energy generation
4. Energy Implications of Lynnwood’s 2006 Comprehensive Plan

While Lynnwood’s current comprehensive plan may not have explored energy-related issues per se, many tenets of good planning and Smart Growth create energy efficient communities. In closely examining the current plan, it became apparent that many of the goals and sub-goals listed will help Lynnwood become more energy efficient. At the same time, many goals and sub-goals do not go far enough to support the new programs and incentives that will be necessary to witness meaningful energy savings and carbon emissions. Strategies that support energy savings as well as recommendations for new strategies are discussed below.

It is recommended that Lynnwood’s Energy Element lists both new goals and objectives (recommended in a later section of this report), as well as the strategies from the current plan elements listed below. Similarly, once the new strategies listed below are vetted with City Staff, Planning Commission and City Council, then City Staff may consider revising the current plan using the suggested edits in the following pages.
<table>
<thead>
<tr>
<th>GOALS</th>
<th>SUB-GOALS</th>
<th>NO.</th>
<th>OBJECTIVE</th>
<th>ENERGY IMPLICATIONS OF GOAL</th>
<th>RECOMMENDED NEW STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Compatibility</td>
<td>LU-2</td>
<td>Appropriate mix of uses.</td>
<td>Close proximity between compatible uses along with adequate connectivity decreases need for vehicular travel and encourages alternative modes of transportation.</td>
<td>Revise zoning to allow compatible mixed use development in targeted areas. Promote green building practices. Develop incentives to promote certification of green buildings.</td>
</tr>
<tr>
<td>Density</td>
<td>Maintain an appropriate density of development.</td>
<td></td>
<td>Compact development decreases transportation costs and preserves natural resources.</td>
<td></td>
<td>Review zoning setbacks and other development regulations to cluster buildings and consolidate open space for stormwater mitigation and more urban trees.</td>
</tr>
<tr>
<td>Development Balance</td>
<td>Maintain balance between developed and natural land.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Land Use</td>
<td>LU-1.6c</td>
<td>Use compatibility between adjacent zones and uses</td>
<td>Clustering compatible uses results in shorter vehicle trips, infrastructure needs and makes for an efficient use of urban space.</td>
<td>Investigate district level energy strategies for areas with concentrated density or cluster of uses.</td>
<td>Promote energy technologies during infrastructure upgrades such as district solar power.</td>
</tr>
<tr>
<td>General Land Use</td>
<td>LU-1.6e</td>
<td>Adequate infrastructure capacity to serve proposed uses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Land Use</td>
<td>LU-2.4</td>
<td>Encourage greater housing and commercial development</td>
<td>Concentrating housing and employment reduces trips and infrastructure needs.</td>
<td>Provide density incentives and promote green building certification for new construction and renovation.</td>
<td></td>
</tr>
<tr>
<td>General Land Use</td>
<td>LU-2.6</td>
<td>Use guidelines to preserve and improve the image of the city.</td>
<td></td>
<td>Encourage xeriscape landscapes and deciduous tree planting for building shading. Guidelines should consider mitigation for properties that block solar exposure. Revise design guidelines to allow for PV systems and the use of materials with low-embodied energy.</td>
<td></td>
</tr>
<tr>
<td>GOALS</td>
<td>SUB-GOALS</td>
<td>NO.</td>
<td>OBJECTIVE</td>
<td>ENERGY IMPLICATIONS OF GOAL</td>
<td>RECOMMENDED NEW STRATEGIES</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------</td>
<td>-----</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Land Use</td>
<td>General Land Use</td>
<td>LU-2.7</td>
<td>Allow a diversity of housing types and densities in new developments.</td>
<td>New higher density housing can reduce energy consumption for heating and cooling up to 40%.</td>
<td>Use incentives to promote certified green buildings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LU-2.11</td>
<td>Subdivisions must provide adequate public facilities.</td>
<td>Safe and attractive pedestrian paths provide alternatives to vehicle trips.</td>
<td>Promote energy efficiency and design standards to encourage the provision of open space in new developments.</td>
</tr>
<tr>
<td>Residential Uses</td>
<td>LU-2.1</td>
<td>Encourage Infill Housing</td>
<td>Maximizing urban sites reduces the impetus for sprawl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-residential Uses</td>
<td>LU-3.2</td>
<td>Accessory uses allowed in commercial areas.</td>
<td>Compact development decreases transportation costs and preserves natural resources.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Uses</td>
<td>LU-5.1</td>
<td>Locate industrial uses close to major transportation facilities</td>
<td>Co-location of employment centers and transit support the increased use of transit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhood</td>
<td>LU-7.2</td>
<td>Accessory uses allowed in commercial areas.</td>
<td>Compact development decreases transportation costs and preserves natural resources.</td>
<td>Work with the development community to educate the public on the benefits of high density developments.</td>
<td></td>
</tr>
<tr>
<td>Urban Design</td>
<td>LU-8.2</td>
<td>Develop design guidelines that support the urban design plan.</td>
<td>An adequate urban design plan will promote passive sustainable practices.</td>
<td>Encourage energy efficiency design techniques (e.g. Site orientations, solar access, use of regional materials, native species landscaping etc.)</td>
<td></td>
</tr>
<tr>
<td>Land Use</td>
<td>Urban Design</td>
<td>LU-8.10</td>
<td>Use of guidelines to improve and increase the use of trees and landscaping.</td>
<td>Trees and other vegetation block solar radiation, provide shade and help reduce ambient air temperatures.</td>
<td>Work with city groups and schools to plant trees and other vegetation in developed areas.</td>
</tr>
<tr>
<td>GOALS</td>
<td>SUB-GOALS</td>
<td>NO.</td>
<td>OBJECTIVE</td>
<td>ENERGY IMPLICATIONS OF GOAL</td>
<td>RECOMMENDED NEW STRATEGIES</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------</td>
<td>-----</td>
<td>------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Transportation</td>
<td>Roadway System</td>
<td>T-1</td>
<td>Provide an efficient system of streets.</td>
<td>A well-connected grid network can reduce VMT by up to 60% when compared to a typical suburban development.</td>
<td>Work with developers to discourage use of cul-de-sacs and to connect to the surrounding grid network at more than one location within a development.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Signal System</td>
<td>T-6</td>
<td>Provide a safe and synchronized signal system</td>
<td>An optimal traffic signal system can result in gasoline savings of up to 19% and can reduce trip times while being designed to support walkability.</td>
<td>Encourage pedestrian protection at all intersections. Consider pedestrian movement in timing traffic signals.</td>
</tr>
<tr>
<td>Public Transit</td>
<td></td>
<td>T-11</td>
<td>Promote a diverse and efficient public transit system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T-12</td>
<td>Provide an efficient Park and Ride lot.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T-15</td>
<td>Integrate transit facilities with land development.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-motorized</td>
<td></td>
<td>T-16</td>
<td>Promote the use of non-motorized transportation systems.</td>
<td>Alternative modes of travel reduce the number of trips in Single Occupancy Vehicles or SOVs</td>
<td></td>
</tr>
<tr>
<td>Transportation Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T-17</td>
<td>Increase the construction of sidewalks throughout the City.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPREHENSIVE PLAN GOALS</td>
<td>SUB-GOALS</td>
<td>NO.</td>
<td>OBJECTIVE</td>
<td>ENERGY IMPLICATIONS OF GOAL</td>
<td>RECOMMENDED NEW STRATEGIES</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------</td>
<td>-------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Transportation</td>
<td>Environmental Factors</td>
<td>T-28</td>
<td>Promote the use of public trans.</td>
<td>Protecting existing neighborhoods reduce the need to invest energy in building new neighborhoods.</td>
<td>Provide incentives for retrofit of buildings integrating energy efficiency appliances and technologies such as radiant heating and heat pumps.</td>
</tr>
<tr>
<td>Housing</td>
<td>Neighborhood Preservation</td>
<td>H-1</td>
<td>Preserve and protect the quality of established neighborhoods.</td>
<td>A clear and efficient housing policy will attract private developers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H-2</td>
<td>Provide opportunities for market responsive housing development</td>
<td>Well-designed housing will counter the desire to purchase homes in remote locations in the region.</td>
<td>Creative designs should include strategies for a development's energy efficiency</td>
</tr>
<tr>
<td></td>
<td>Housing Opportunities</td>
<td>H-6</td>
<td>Encourage housing that is responsive to regional housing trends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parks &amp; Recreation</td>
<td>Park System</td>
<td>P-4</td>
<td>Plan and develop new parks and renovate existing parks.</td>
<td>Open space and vegetated areas reduce ambient air temperature and allow slow infiltration of rain water to recharge aquifers and/or clean the water that drains into local water bodies.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trail System</td>
<td>T-1</td>
<td>Create a regional non-motorized Transportation Plan</td>
<td>Promote bike use and recreational walking within city street network.</td>
<td>Develop slower trails that children and the elderly can safely use for biking and walking</td>
</tr>
<tr>
<td>Cultural and Historic Resources</td>
<td>Preservation, Protection and Re-use</td>
<td>HR-4</td>
<td>Promote rehabilitation of historic resources.</td>
<td>Renovating existing development with energy efficient appliances can result in 10 to 35% energy savings.</td>
<td>Promote existing incentives and include incentives for energy efficient appliances.</td>
</tr>
<tr>
<td>GOALS</td>
<td>SUB-GOAL</td>
<td>NO.</td>
<td>OBJECTIVE</td>
<td>ENERGY IMPLICATIONS OF GOAL</td>
<td>RECOMMENDED NEW STRATEGIES</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------</td>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Environmental Resources</td>
<td>Conservation of Resources and Recycling</td>
<td>ER-2</td>
<td>Promote conservation, reuse and recycling.</td>
<td>Recycling reduces landfill material.</td>
<td>Work with civic groups to educate the public on the benefits of recycling.</td>
</tr>
<tr>
<td>Environmental Resources</td>
<td>Water Resources</td>
<td>ER-5</td>
<td>Enhance pervious surface and vegetative cover in the City.</td>
<td>Impervious surfaces increase stormwater run-off</td>
<td>Promote green roofs, rain gardens, green roadway design etc.</td>
</tr>
<tr>
<td>Environmental Resources</td>
<td>Urban Forestry</td>
<td>ER-7</td>
<td>Promote and increase urban forest tree cover.</td>
<td>Urban forests lower the ambient temperature of a city's summer heat islands by an average temperature of 15˚ F.</td>
<td>Revise development standards to encourage energy efficient landscaping.</td>
</tr>
<tr>
<td>Environmental Resources</td>
<td>View Protection and Light Pollution</td>
<td>ER-9</td>
<td>Promote natural scenic views and dark night skies.</td>
<td>Night sky lighting can reduce energy consumption by significant amounts</td>
<td></td>
</tr>
<tr>
<td>Capital Facilities and Utilities</td>
<td>Water System</td>
<td>WS-1</td>
<td>Monitor the water system to improve and expand the system as needed.</td>
<td>Energy efficient system upgrades can save money.</td>
<td>Provide incentives and educate the public about the benefits of reducing water use.</td>
</tr>
</tbody>
</table>
5. Geo-political Implications of Lynnwood’s Energy Use

Geographic Locations of Energy Sources

The fuel that powers Lynnwood businesses and homes is sourced from many geographic locations. Other than Washington generated hydro-electric power, Lynnwood is dependant on Canada and Mexico for its crude oil and primarily on Canada for its natural gas. However, a series of issues may be affecting this current situation and local Utilities may have to go out even further to seek new energy sources. This increases the vulnerability of areas such as the Puget Sound Region, including Lynnwood to geo-political issues, the global economy and volatile energy prices. The following is a brief description of the current situation of the four major carbon fuels used in the city: natural gas, propane and crude oil; and electricity.

Natural Gas

Puget Sound Energy’s natural gas comes from a variety of regions, the largest of which is the Western Canadian Sedimentary Basin in British Columbia and Alberta, Canada. A little more than half the demand originates within the continental United States, with the remainder from Canada. See Figures 26 and 27.

4 Northwest Gas Association Outlook Update 2006
According to the Northwest Gas Association, over the next five years, natural gas consumption (as measured by energy content, or decatherms - Dth) in the Northwest is expected to grow an average of 2.1 percent per year, with a cumulative projected growth rate of 8.1 percent. Most of this growth reflects increased demand anticipated from residential and commercial customers. This situation is amplified by a more aggressive increase in peak load than its base load.

<table>
<thead>
<tr>
<th>Region</th>
<th>Average Day Winter Supply Volumes (MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRITISH COLUMBIA</td>
<td>105,000</td>
</tr>
<tr>
<td>A.E.CO.</td>
<td>60,000</td>
</tr>
<tr>
<td>ROCKIES</td>
<td>120,000</td>
</tr>
<tr>
<td>JACKSON PRAIRIE</td>
<td>55,000</td>
</tr>
<tr>
<td>CLAY BASIN</td>
<td>45,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>385,000</strong></td>
</tr>
</tbody>
</table>
Figure 27: Natural Gas Supply in the Pacific Northwest
While the number of natural gas customers continues to grow in the Pacific Northwest, the use per customer is lower than in the late ’90s. Recent warmer weather patterns have contributed to the phenomenon, but consumers have also responded to higher natural gas prices with a variety of conservation techniques including better weatherization, more efficient appliances and equipment, and energy-conscious use practices. The most efficient use of natural gas is for space and water heating or for cooking, rather than converted to electricity.

The Energy Information Association predicts that while the demand for natural gas will continue to rise for another decade or so, after which it will stabilize, there will be gradual decline in domestic supply. At the same time, they anticipate that Canada’s exports will drop. Therefore they anticipate the need to meet the gap through other supplies.

The strategy is to import natural gas in a compressed form called Liquefied Natural Gas (LNG) from other parts of the world. LNG offers advantages over other fuel types: there are vast reserves, a ready local market and no need for additional pipes. The global market also anticipates that as production increases there will be drop in LNG prices. There are challenges in this method that include local acceptance; permitting for storage facilities and increasing worldwide competition. In the Pacific Northwest, while natural gas is mostly used for industrial purposes over other sectors, it is anticipated that in the next several years, natural gas usage in the residential sector will outstrip all others. See Figure 30.

Figure 28: Projected US Supply/Demand Balance
(EIA Annual Energy Outlook 2006)
Figure 29: Service Areas of Gas Utilities in the Pacific Northwest, 2007

Source: Dan Kirschner, Northwest Gas Association
While the industrial sector has been the largest consumer of natural gas, the demand from the residential sector continues to rise; perhaps to match the industrial sector’s 30% consumption rate by 2011.

The forecast for 2010-2011 in fact shows that the residential sector consuming 30% of supplies, and the industrial sector consumption falling from 33% in 2005 to 29% in 2010-2011.
Figure 31: Pacific Northwest Natural Gas Demand Forecast (2010-2011)

Figure 32: US Natural Gas Wellhead Price

The plan is to begin to import LNG into a port. Several potential locations have been identified across the Northwest (see Figure 34).

Figure 33: Potential LNG Terminals in the Pacific Northwest

Electricity

Snohomish PUD provides electricity to the city of Lynnwood. It gets its electricity primarily from hydroelectric power supplied by the Bonneville Power Administration. The PUD’s other green energy sources include: two Snohomish County co-generation projects fueled
by wood-waste; a biogas facility that generates power from landfill methane in Klickitat County; and a PUD-owned hydroelectric project in the Sultan area. The utility also is researching tidal energy in the Puget Sound and considering purchasing energy from a Monroe biogas facility that would draw energy from decomposing cow manure.

The PUD’s IRP does not mention any immediate need for new generating resources: “The District’s portfolio includes sufficient existing firm resources to serve the expected yearly average requirements of its retail electric customers without the need to add any new generating resources in the near term. However, the District’s existing portfolio has seasonal load resource imbalances and sources of risk (e.g., variability in hydroelectric generation) that the utility must actively manage.” Demand for new generation resources is not anticipated till 2013 or 2017.

An integrated portfolio analysis for the District’s 2004 IRP shows that by promoting conservation at or potentially above an amount of five average megawatts (aMW) per year is cost-effective. If the District succeeds in new conservation at an accelerated rate of 8 aMW per year during 2009-2013, the expected need to add new generating resources is deferred further to 2017.

For its 2004 IRP, the District broadened its analysis of conservation resources to include environmental and other benefits not previously reflected in its long-term resource plans. The PUD has been very active in providing conservation and energy efficiency services and programs within its service area since 1982 and has achieved over 70 aMW of conservation since then. The PUD’s programs typically address residential, commercial and industrial sectors as well as regional market transformation, standards and codes.

Similar to other Northwest utilities, the District’s existing portfolio of resources does not match the seasonal shape of its customers’ retail electric needs. For instance, the District has more firm resources than are required to serve its customers’ needs during the spring and summer months. Conversely, the District’s existing firm resources are not sufficient to meet customer needs in all winter months. As a result, the District currently must engage in energy trading and hedging activities to dispose of power surpluses and fill power deficits in its resource portfolio.

The Jackson Hydroelectric Project (JHP), located on the Sultan River north of the City of Sultan, is owned and operated by the District in partnership with the City of Everett as co-licensees (FERC No. 2157). The District receives 100% of the power output and the City secures raw water delivered to Lake Chaplain for its water supply. The JHP has been on-line since 1984. The FERC license was issued in 1961 for a period of 50 years.

The Cogeneration Project is located at Kimberly Clark Corporation’s (KC) Everett, Washington facility. The Project is owned by the District and operated and maintained by KC. The District receives 100% of the power output while KC secures use of the steam for its mill processes. The Cogeneration Project has been on-line since December 1996.
The chart illustrates the annual conservation acquisitions as well as cumulative acquisitions including adjustments for measure degradation.

Snokomish County Public Utility District recently announced it has signed a contract to purchase wind energy from the new White Creek Wind Project, located in south central Washington, along the Columbia River Gorge. The utility will receive 10 percent of the project’s output, about 7 average-megawatts, starting in January 2008.

Nationwide, wind is one of the fastest growing energy sources; generating capacity grew by 27 percent in 2006. Wind capacity in this region is exploding, from just 25 megawatts in 1998 to a projected 3,800 megawatts by 2009. Last year alone, Washington state added 428 megawatts of wind power, trailing only Texas in new installations. One megawatt of wind power can supply the needs of 225 to 300 homes, on average, each day.

The Bonneville Power Administration and other major Northwest utilities find “no fundamental technical barriers” to generating 6,000 megawatts of wind power for the regional grid. That would produce clean electricity for a total of 1.3 million to 1.8 million homes -- and increase the use of wind power which is now 3 percent of total regional electricity production, to 8 percent. The use of the Columbia for both hydro and wind power has a number of symbiotic benefits.

The wind blows in pretty much the same places where hydro dams were built by the federal government and private utilities between 1940 and 1970. Also, as wind turbines produce electricity, the big dams can be eased off. This allows greater conservation of water. Moreover, the wind blows hardest and most reliably in those parts of eastern Washington and eastern Oregon where there is an abundance of high-voltage transmission lines that run west to the population centers of Seattle and Portland. Major transmission lines that connect those dams to the West Coast grid have considerable unused capacity -- although new lines will need to be strung in coming years as energy generated from wind power increases.

Land owners and county governments have generally embraced wind power, primarily due to its economic opportunity. A farmer can expect $2,000 to $4,000 per year by allowing a wind turbine to stand on his/her property. In Klickitat County, the planned construction of at least four large wind farms is expected to yield about $5 million a year in property taxes.

Propane

Liquid Petroleum Gas (or its most popular form, propane) is largely used for residential purposes in the city of Lynnwood. Propane for residential use is sold by unregulated distributors. Sales are taxed at both state and local levels. “The market for LPG in Washington seems to be fairly segmented. Western Washington distributors purchase the bulk of their product wholesale from the large refineries in Ferndale and Anacortes. Eastern Washington distributors, on the other hand, rely primarily on rail shipments from Alberta, and supplement that with additional purchases from refineries in western Washington, Montana and Utah. Since LPG can be economically
transported over long distances via rail, however, wholesale prices do not vary much across the state, though events in other regions of the country can and do affect prices in the Northwest.” (Source: CTED, 1994)

Crude Oil and Petroleum Sources

There are approximately 36 gas stations in Lynnwood city limits. These are Chevron, Texaco, 7-Eleven, Exxon, BP, ARCO, AmPm, or Shell Stations. While the study was unable to determine the exact geographic sources for these fuels, a study by the Energy Information Administration (April 2007) shows the preliminary monthly data on the origins of crude oil imports into the US.

The EIA Study shows that three countries export more than 1.40 million barrels per day to the United States. Canada remained the largest exporter of total petroleum in April, exporting 2.475 million barrels per day to the United States, which was an increase from March (2.305 thousand barrels per day). The second largest exporter of total petroleum was Mexico with 1.572 million barrels per day.

Including those countries, a total of four countries exported over 1.00 million barrels of petroleum per day of crude oil to the United States (see table below). The top ten exporting countries accounted for approximately 88 percent of all U.S. crude oil imports. The top sources of US crude oil imports for April were Canada (1.909 million barrels per day), Mexico (1.460 million barrels per day), Saudi Arabia (1.458 million barrels per day), Venezuela (1.182 million barrels per day), and Nigeria (0.891 million barrels per day). The rest of the top ten sources, in order, were Iraq (0.562 million barrels per day), Algeria (0.530 million barrels per day), Angola (0.514 million barrels per day), Russia (0.269 million barrels per day), and Brazil (0.175 million barrels per day). Total crude oil imports averaged 10.181 million barrels per day in April, which is a decrease of 0.167 million barrels per day from March 2007.
### Figure 36: Crude Oil Imports (Top 15 Countries) (Thousand Barrels per Day)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>APR-07</th>
<th>MAR-07</th>
<th>YTD 2007</th>
<th>APR-06</th>
<th>JAN - APR 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANADA</td>
<td>1,909</td>
<td>1,780</td>
<td>1,846</td>
<td>1,710</td>
<td>1,726</td>
</tr>
<tr>
<td>MEXICO</td>
<td>1,460</td>
<td>1,621</td>
<td>1,471</td>
<td>1,601</td>
<td>1,692</td>
</tr>
<tr>
<td>SAUDI ARABIA</td>
<td>1,458</td>
<td>1,216</td>
<td>1,358</td>
<td>1,582</td>
<td>1,413</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>1,182</td>
<td>1,036</td>
<td>1,070</td>
<td>1,171</td>
<td>1,190</td>
</tr>
<tr>
<td>NIGERIA</td>
<td>891</td>
<td>1,290</td>
<td>1,089</td>
<td>1,022</td>
<td>1,149</td>
</tr>
<tr>
<td>IRAQ</td>
<td>562</td>
<td>523</td>
<td>488</td>
<td>531</td>
<td>498</td>
</tr>
<tr>
<td>ALGERIA</td>
<td>530</td>
<td>501</td>
<td>495</td>
<td>256</td>
<td>235</td>
</tr>
<tr>
<td>ANGOLA</td>
<td>514</td>
<td>696</td>
<td>556</td>
<td>389</td>
<td>446</td>
</tr>
<tr>
<td>RUSSIA</td>
<td>269</td>
<td>193</td>
<td>137</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>175</td>
<td>209</td>
<td>174</td>
<td>111</td>
<td>114</td>
</tr>
<tr>
<td>ECUADOR</td>
<td>159</td>
<td>191</td>
<td>200</td>
<td>312</td>
<td>289</td>
</tr>
<tr>
<td>CONGO (BRAZZAVILLE)</td>
<td>138</td>
<td>79</td>
<td>78</td>
<td>33</td>
<td>16</td>
</tr>
<tr>
<td>KUWAIT</td>
<td>126</td>
<td>288</td>
<td>187</td>
<td>225</td>
<td>139</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>119</td>
<td>77</td>
<td>97</td>
<td>169</td>
<td>108</td>
</tr>
<tr>
<td>GABON</td>
<td>92</td>
<td>48</td>
<td>60</td>
<td>33</td>
<td>53</td>
</tr>
</tbody>
</table>
Figure 37: Total Imports of Petroleum (Top 15 Countries) (Thousand Barrels per Day)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>APR-07</th>
<th>MAR-07</th>
<th>YTD 2007</th>
<th>APR-06</th>
<th>JAN - APR 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANADA</td>
<td>2,475</td>
<td>2,305</td>
<td>2,424</td>
<td>2,238</td>
<td>2,266</td>
</tr>
<tr>
<td>MEXICO</td>
<td>1,572</td>
<td>1,749</td>
<td>1,601</td>
<td>1,750</td>
<td>1,805</td>
</tr>
<tr>
<td>SAUDI ARABIA</td>
<td>1,485</td>
<td>1,244</td>
<td>1,378</td>
<td>1,595</td>
<td>1,443</td>
</tr>
<tr>
<td>VENEZUELA</td>
<td>1,142</td>
<td>1,285</td>
<td>1,311</td>
<td>1,393</td>
<td>1,485</td>
</tr>
<tr>
<td>NIGERIA</td>
<td>948</td>
<td>1,346</td>
<td>1,135</td>
<td>1,098</td>
<td>1,211</td>
</tr>
<tr>
<td>ALGERIA</td>
<td>798</td>
<td>727</td>
<td>718</td>
<td>543</td>
<td>528</td>
</tr>
<tr>
<td>IRAQ</td>
<td>562</td>
<td>523</td>
<td>488</td>
<td>531</td>
<td>498</td>
</tr>
<tr>
<td>RUSSIA</td>
<td>547</td>
<td>455</td>
<td>400</td>
<td>218</td>
<td>239</td>
</tr>
<tr>
<td>ANGOLA</td>
<td>526</td>
<td>708</td>
<td>571</td>
<td>419</td>
<td>463</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>386</td>
<td>292</td>
<td>285</td>
<td>315</td>
<td>252</td>
</tr>
<tr>
<td>VIRGIN ISLANDS</td>
<td>322</td>
<td>349</td>
<td>353</td>
<td>239</td>
<td>283</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>246</td>
<td>234</td>
<td>222</td>
<td>169</td>
<td>167</td>
</tr>
<tr>
<td>NORWAY</td>
<td>198</td>
<td>164</td>
<td>150</td>
<td>206</td>
<td>205</td>
</tr>
<tr>
<td>KOREA, SOUTH</td>
<td>184</td>
<td>164</td>
<td>136</td>
<td>106</td>
<td>65</td>
</tr>
<tr>
<td>ECUADOR</td>
<td>159</td>
<td>191</td>
<td>202</td>
<td>319</td>
<td>295</td>
</tr>
</tbody>
</table>


Note: The data in the tables above exclude oil imports into the U.S. territories.

Conclusion

In a 1993 report of the BPA, the following estimates were made for energy demand per land use. While there has been a general increase in mechanization and travel demands since 1993, more current estimates are not available.

Given the targeted increase of retail and commercial development, Sno-PUD could witness a more rapid increase in energy demand than earlier projected. As the chart below shows,
despite an increase in gas usage, there is still a greater demand for electricity over gas connections. This trend could continue with increased wind power generation and continued volatility of gas prices.

**Figure 38: Annual Energy Demand per Land Use**

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>KWH/GSF/YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family Residential</td>
<td>5.7</td>
</tr>
<tr>
<td>Multi-family Residential</td>
<td>3.6</td>
</tr>
<tr>
<td>Retail</td>
<td>19</td>
</tr>
<tr>
<td>Office</td>
<td>23</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Varies</td>
</tr>
</tbody>
</table>

*Source: BPA, 1993*

**Figure 39: Pacific Northwest Energy Consumption**

*Source: EIA courtesy Dan Kirschner, Northwest Gas Association, 2006*
Figure 40 shows that while the demand for energy by industrial sector fell rapidly in the early 2000s, it is gradually increasing again while the residential and commercial sectors largely remain constant.

A report by the US Climate Change Science Program called, “Effects of Climate Change on Energy Production and Use in the United States, claims that, “The research evidence is relatively clear that climate warming will mean reductions in total U.S. heating requirements and increases in total cooling requirements for buildings. These changes will vary by region and by season, but they will affect household and business energy costs and their demands on energy supply institutions. In general, the changes imply increased demands for electricity, which supplies virtually all cooling energy services but only some heating services. Other effects on energy consumption are less clear.”

Climate change could affect energy production and supply (a) if extreme weather events become more intense, (b) where regions dependent on water supplies for hydropower and/or thermal power plant cooling face reductions in water supplies, (c) where temperature increases decrease overall thermoelectric power generation efficiencies, and (d) where changed conditions affect facility siting decisions. Most effects are likely to be modest except for possible regional effects of extreme weather events and water shortages.
6. Lynnwood’s Carbon Footprint

The approach to the carbon footprint corresponds to the guidance provided by the Intergovernmental Panel on Climate Change (IPCC), with the limitation that not all the desired Lynnwood-specific data was available. Where data was lacking it was provided by the most representative public data available. The inventory represents not only the greenhouse gases emitted in the City, but all the emissions implied by energy use in the City. This means that the inventory includes the emissions from fossil fuel extraction, transportation and combustion, whether they occurred in Lynnwood or not. The electricity emissions are fully corrected for line losses as well as all the emissions that occur before delivery to the customer. All carbon emissions are expressed in metric tones of carbon dioxide equivalents, calculated using IPCC emission factors for the 100 year planning horizon.

The energy inventory and carbon footprint do not include the implied energy in the goods and services that are consumed in Lynnwood. For example, the energy used to grow food, or to manufacture appliances and electronics are not included here.

To the greatest extent possible, we have estimated the emissions and energy use based on data made available to and by the City. The primary data sources were Snohomish County Public Utility District, Puget Sound Energy, the Puget Sound Regional Council’s traffic modeling program and the US Census Bureau. Ancillary data were derived from the US Energy Information Agency and from the draft Washington State Greenhouse Gas Inventory.

A. Transportation

Direct estimates of transportation fuel usage in the City were not available. Instead, the
energy use and emissions for the transportation sector energy use was estimated from the transportation model of Puget Sound Regional Council. The model included the daily trips that were made by Lynnwood residents. It did not include public transport or the trips made by non-Lynnwood residents to the mall, nor did it include the transport of goods to and from commercial locations in the City unless they originated with Lynnwood businesses (i.e. if the Lynnwood businesses owned the vehicles in question). No correction of this data was made to adjust for weekday versus weekend variation or to estimate the missing data. Due to these missing data the model substantially underestimates the energy and greenhouse gas emissions from the transportation sector in the City.

Vehicle miles traveled were converted to energy use and to greenhouse gas emissions using the GREET model developed by the US Department of Energy Argonne National Laboratory vii. The CO2 equivalents were calculated using the IPCC’s factors for the 100-year planning horizon.

Using the Puget Sound Regional Council’s transportation estimates, the transportation sector is the greatest source of energy use (46%) and of greenhouse gas emissions (76%) in Lynnwood, and in this sector, the overwhelming majority of the emissions are derived from passenger vehicles, either cars or pickup trucks (light duty trucks). Passenger transportation represents 96% of the vehicles miles traveled and 93% of the carbon emissions from the transportation sector. This is not surprising considering that the transport model did not include much of the commercial transportation in the City.

<table>
<thead>
<tr>
<th>LYNWOOD TRAVEL EMISSIONS, 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>PASSENGER CARS</td>
</tr>
<tr>
<td>LIGHT DUTY TRUCKS</td>
</tr>
<tr>
<td>MEDIUM DUTY TRUCKS</td>
</tr>
<tr>
<td>HEAVY DUTY TRUCKS</td>
</tr>
<tr>
<td>TOTAL DAILY</td>
</tr>
<tr>
<td>ANNUAL EMISSIONS</td>
</tr>
</tbody>
</table>

The per-capita gasoline usage in Lynnwood as estimated from the transportation model was 316 gallons per year. This is 25 percent less than the Washington State average of 424 gallons per year. The difference between the Washington State average usage and the calculated Lynnwood usage may represent the missing data from the transportation model, but other factors unique to the City may also play a part in the difference. At 76% of estimated carbon emissions, the proportion of greenhouse gas emissions from transportation is higher for Lynnwood than for the rest of Washington State, viii where only 52% of greenhouse gases come from transportation.

![Lynnwood Transport Greenhouse Gases](image)

At this time it is not clear how much of the difference between the City and the State is due primarily to the absent Lynnwood commercial transportation data or to the difference between
Lynnwood’s economy and that of the rest of the state. What is clear is that the estimate provided here is an underestimate of both the Lynnwood transportation energy consumption and the greenhouse gas emissions from the transportation sector in Lynnwood. This means that the transportation sector likely dominates the Lynnwood energy and greenhouse gas inventories even more than is suggested here.

Essentially all the transportation sector depends on petroleum. The cost of petroleum products is rising five to eleven percent per year\textsuperscript{9}, inflation adjusted. It makes good financial sense to find ways around the dependence on petroleum products.

In Lynnwood, the largest use of transportation is non home-based, but is between business, public or commercial locations. Reducing this transportation will require regional solutions. However, the commute to work school and local shopping is still substantial and offers opportunities for policy to reduce transportation.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>SOV</th>
<th>HOV 2</th>
<th>HOV 3+</th>
<th>Light Trucks</th>
<th>Medium Trucks</th>
<th>Heavy Trucks</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home-Based Work</td>
<td>142,257</td>
<td>6,146</td>
<td>697</td>
<td></td>
<td></td>
<td></td>
<td>149,100</td>
<td>20.0%</td>
</tr>
<tr>
<td>College</td>
<td>3,559</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,847</td>
<td>0.5%</td>
</tr>
<tr>
<td>Home-Based NonWork</td>
<td>130,925</td>
<td>32,180</td>
<td>13,022</td>
<td></td>
<td></td>
<td></td>
<td>176,127</td>
<td>23.6%</td>
</tr>
<tr>
<td>Home-Based School</td>
<td>412</td>
<td>971</td>
<td>491</td>
<td></td>
<td></td>
<td></td>
<td>1,574</td>
<td>0.2%</td>
</tr>
<tr>
<td>Non Home-Based</td>
<td>215,330</td>
<td>53,784</td>
<td>20,528</td>
<td></td>
<td></td>
<td></td>
<td>289,642</td>
<td>38.9%</td>
</tr>
<tr>
<td>Trucks</td>
<td></td>
<td></td>
<td></td>
<td>92,810</td>
<td>23,862</td>
<td>8,433</td>
<td>125,105</td>
<td>16.8%</td>
</tr>
<tr>
<td>Total</td>
<td>492,483</td>
<td>93,069</td>
<td>34,738</td>
<td>92,810</td>
<td>23,862</td>
<td>8,433</td>
<td>745,395</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Electricity

Electricity use is the second most significant use of energy in the City, representing 29% of the total energy use, and 19% of the total carbon emissions. The Pacific Northwest is blessed with a large hydropower resource, and the Snohomish County Public Utility District (PUD) is even more dependent on hydro than the region as a whole\textsuperscript{10}. As a result the total carbon emissions due to electricity are very low, only 103 grams of CO\textsubscript{2} equivalents per kilowatt-hour. By comparison, the US average electric grid produces 1,580 grams of CO\textsubscript{2} equivalents per kilowatt-hour.

Data from the PUD was available only at the zipcode level. The City borders do not conform to the zipcode areas, so the residential results were allocated using the relative populations of the City and the zipcodes for the 2000 census results. Because of the presence of Alderwood Mall within the City limits, we allocated 80% of the commercial electricity consumption in the zipcodes to the City\textsuperscript{11}. The City owns a water treatment plant that is not within the City boundaries or the two City zip codes. The energy use for the treatment plant is not included in this inventory.

The table below shows where electricity is being used in Lynnwood, and how much carbon is emitted as a result.
Commercial use dominates the electricity inventory for the City, accounting for an estimated two-thirds of the use. (Note however that this is an estimated value).

The figure above shows the distribution of energy consumption in US commercial buildings. Without more exact breakdown of use in the city, this report presumes a similar pattern of commercial building electricity use in Lynnwood. The biggest opportunity for decreasing energy consumption in commercial buildings is in the lighting, which accounts for almost a quarter of the total energy use. Fluorescent lightbulbs (e.g. Compact fluorescent bulbs or CFLs) use about one-third to one-quarter of the energy of incandescent lights. Depending on the proportion of incandescent lights currently in use, over 15 percent of the energy use in commercial buildings could be eliminated. Over the past few years, the technology for heat pumps has improved radically, due to new Department of Energy requirements. Space heating and cooling energy requirements could be decreased by about 50% simply through the installation of new technology. Assistance for a full program of energy management in commercial buildings is available free of charge through EPA’s Energy Star Program.

The extensive unshaded flat roofs of the commercial sector are also excellent locations for solar power installations. Although essentially all of the energy production in this region is during the summer months (May to October), solar power is the most extensive renewable resource, by a very large margin. The net metering laws and other incentives on the State level should encourage building owners to install solar power systems.

The average household in Lynnwood used 8456 kWh per household in 2006. This is 2.5 times higher than the US average of 3327 kWh/year, but less than the 12,500 kWh Washington State average. It reflects the high use of electricity for heating in Lynnwood. About 62% of households heated with...
electricity. The available data did not permit the break out of the heating component of electricity consumption. The electricity consumption reported here includes that portion used for heating.

Per capita consumption of electricity was low in Lynnwood, relative to the averages for the State of Washington. This is due in part to the lack of industrial base in Lynnwood, and to the high prevalence of multi-family housing in the City, but not all the difference is explained by these factors.

Figure 41: Comparison of Per Capita Electricity Consumption

<table>
<thead>
<tr>
<th>RESIDENTIAL TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA, 2005 5,353 13,446</td>
</tr>
<tr>
<td>LYNNWOOD, 2006 3,255 6,932</td>
</tr>
<tr>
<td>LYNNWOOD/WA 0.61 0.52</td>
</tr>
</tbody>
</table>

**Heating with Fossil Fuels**

Besides electricity, natural gas, heating oil and LP gas are used in Lynnwood. A few homes are also heated with wood. This sector represented 25% of the total energy use in Lynnwood in 2006. Almost all (95%) of the heating is done by either natural gas or electricity. We were not able to obtain the figures for the use of energy by the alternative heating sources, so we assumed that the households using them were using the same amount of energy per residence as those using natural gas. We also assumed that the industrial and commercial locations used only natural gas for heating. This may introduce some error to the estimate.

![Western Region Energy Use per Household](image)

The average household used 638 therms of energy per year. This 350 therms from fossil fuels and used for space and water heating. This is not significantly different from the household energy consumption for households across the West where in 2001, a single-family detached house used 876 therms and a two-to-four family building used 443 therms per household.
If Lynnwood is to decrease its total energy use and its carbon footprint, it will have to take more aggressive measures than those that have been taken over the last decades in the region.

This is not an impossible task. For example, England has a target that requires all new residences to be carbon neutral by 2016\textsuperscript{xiv}. Net zero energy houses have already been built in England and in Washington State, and the Department of Energy has a “Building America” program to support these efforts\textsuperscript{xv}. This sector of energy use represents only five percent of the total carbon footprint.

<table>
<thead>
<tr>
<th>HEATING THERMS CONSUMED IN 2006</th>
<th>HEATING OIL</th>
<th>LP GAS</th>
<th>NATURAL GAS</th>
<th>TONNES CO(_2)E</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE FAMILY</td>
<td>306,832</td>
<td>40,799</td>
<td>3,886,395</td>
<td>5,574</td>
</tr>
<tr>
<td>MULTI-FAMILY</td>
<td>31,972</td>
<td>10,458</td>
<td>275,509</td>
<td>563</td>
</tr>
<tr>
<td>TOTAL RESIDENTIAL</td>
<td>338,804</td>
<td>51,257</td>
<td>4,186,649</td>
<td>6,152</td>
</tr>
<tr>
<td>COMMERCIAL</td>
<td>4,950,435</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td></td>
<td>4,950,435</td>
<td>2,866</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>677,607</td>
<td>102,514</td>
<td>9,390,523</td>
<td>9,165</td>
</tr>
</tbody>
</table>

While conserving fossil fuel energy in households and commercial applications will have little effect on the carbon footprint of the City, it will have a large effect on the overall energy sustainability of the City. The hydro power resource in the Pacific Northwest is essentially fully utilized, and the prediction for climate change in this region is that the flows of the rivers in the region will decrease, thus decreasing the hydro power potential. The biggest resource for growth will be in conservation, a fact noted by the Snohomish County PUD’s Integrated Resource Plan.

The primary opportunities for fossil fuel conservation in homes are improved insulation and improved heating systems. The Building Performance Center\textsuperscript{xvi} in Bellingham is devoted to efforts to accomplish this goal and represents an important resource for the City.
Municipal Operations

The overall increases in costs in real terms correspond well to the national increases in the costs of the different energy sources (http://iere.org/documents/EnergyIndependentCommunities-10yearplan.pdf). It is clear from this graph that the energy source with the greatest potential for cost savings is electricity. Falling electrical costs is likely due at least in part to the efficiency efforts of the City. A more detailed analysis of the initiatives undertaken would help the City plan for further cost reductions.

Summary & Conclusions

Perhaps the largest lesson of this study is the difficulty in obtaining energy use data disaggregated to the City level. For example, we used models of vehicle miles traveled to estimate energy use because there is no agency that gathers information about the sales of petroleum products at the City level, and the City has limited authority to ask for this information from resident vendors. The electricity data was only available at the zipcode level, and this introduces error in the estimates, too.

For future energy and carbon footprint efforts, the City should consider attempting to gather the following data:

- Petroleum product sales within the City limits.
- The electricity use within the City, rather than the zipcodes.
- Energy use at the City’s properties outside the City.
- Estimates of the non-residential vehicle miles traveled, both personal and commercial.

A companion spreadsheet to this report has been prepared to allow easy calculation of the carbon footprint of the City based on updated information.

Looking only at energy-related emissions, the City of Lynnwood produced about 5.4 metric tonnes of CO₂ equivalents per capita in 2006. The average Washington State resident produced 15 metric tonnes of Green House Gases in 2005. About 38% of these Washington State emissions were from known sources not captured in this report, including commercial transport, agricultural emissions, marine and aviation fuels and fossil fuel industries such as natural gas extraction and pipelines. The remaining differences can probably be accounted for by the cleaner electric power mix, the high usage of electric heating, and the higher frequency of multi-family housing in the City.

Despite the incompleteness of the energy inventory, it is clear is that the transportation sector dominates the energy inventory and carbon footprints of the City. At a minimum, about half of the energy use and three-quarters of the carbon emissions come from the transportation sector.
Hydro and nuclear power are essentially carbon-free, thus 13 percent of the national and 26 percent of the Lynnwood energy use is essentially carbon-free. If the City wishes to decrease its carbon footprint, it should seek more sources of very low carbon energy resources. Because hydro power is essentially fully utilized, that means that conservation, wind, tidal, geothermal and solar power are options for the City.

The residential energy use calculated for Lynnwood agrees well with the western regional residential energy use figures. What is unique about the City is the very high reliance on electricity for heating, and this presents a significant opportunity for policy actions to support heat pumps rather than baseboard heating. In addition attention paid to insulation will lead to reduced energy costs for residents.
7. Vision for an Energy Efficient Lynnwood

"Lynnwood is the model of smart growth and energy efficiency through its early energy planning efforts. Funds have been redirected from energy inefficient and/or non-renewable fuel based technologies to decentralized, clean and efficient technologies. The resulting savings at the individual level are reinvested back into residents’ education and financial solvency; at the municipal level the resulting savings are redistributed to improve local parks and other public facilities. With abundant clean air and improved street and building lighting, Lynnwood residents walk or bike more – exhibiting better physical fitness and a stronger sense of community."

The above may constitute a vision for how Lynnwood is experienced and operates as an energy efficient community. As a member of ICLEI, the City could also decide to tie the vision to popular GHG targets being proclaimed and adopted by cities across the world. The final vision and targets for the city will need to be vetted through a public outreach program and approved by the Planning Commission and City Council. Some of the more popular targets endorsed by a variety of government bodies and multi-governmental organizations are listed below.

**Kyoto Protocol**

According to a press release from the United Nations Environment Programme:

"The Kyoto Protocol is an agreement under which industrialised countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be
expected by 2010 without the Protocol, this limitation represents a 29% cut). The goal is to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. National limitations range from 8% reductions for the European Union and some others, to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland.[22]

It is a cap and trade system that establishes a national cap on emissions.

**State Of Washington: Executive Order 07-02 (Washington Climate Change Challenge)**

Through this Executive Order, Christine O. Gregoire, Governor of the state of Washington declared the state’s commitment to address climate change by:

*Establishing the following greenhouse gas emissions reduction and clean energy economy goals for Washington State:*

- By 2020, reduce greenhouse gas emissions in the state of Washington to 1990 levels, a reduction of 10 million metric tons below 2004 emissions;
- By 2035, reduce greenhouse gas emissions in the state of Washington to 25% below 1990 levels, a reduction of 30 million metric tons below 2004;
- By 2050, the state of Washington will do its part to reach global climate stabilization levels by reducing emissions to 50% below 1990 levels or 70% below our expected emissions that year, an absolute reduction in emissions of nearly 50 million metric tons below 2004;
- By 2020, increase the number of clean energy sector jobs to 25,000 from the 8,400 jobs we had in 2004; and
- By 2020, reduce expenditures by 20% on fuel imported into the state by developing Washington resources and supporting efficient energy use.

Implementing the significant policy actions taken in 2005 and 2006 to reduce greenhouse gas emissions. These actions will move Washington State to at least 60% of the 2020 goal and grow the clean energy economy by:

- Working to ensure cars sold in Washington meet stringent emission standards beginning with 2009 models;
- Retrofitting the most polluting diesel engines in school buses and local government vehicles;
- Working with farmers, entrepreneurs, fuel distributors and retailers to assure that biofuel feedstocks are grown in Washington; that refiners, blenders and distributors of biofuels create family wage jobs in Washington; and that the public can purchase fuel blends that reduce our dependence on imported fuel;
- Constructing high performance green buildings;
- Maintaining the highest levels of efficiency in our state’s energy code and regularly updating and enhancing those standards;
- Examining compliance with appliance efficiency standards and updating and enhancing those standards;
- Implementing the requirements of the Energy Independence Act by adopting rules that help utilities to succeed in meeting their renewable energy targets;
- Pursuing new water resources in Eastern Washington, including water conservation projects, developing new storage and new creative water management alternatives; and
- Reducing energy use by state agencies by achieving the goals established in Executive Order 05- 01, Establishing Sustainability and Efficiency Goals for State Operations.
Oregon Strategy for Greenhouse Gas Reductions

The Governor’s Advisory Group on Global Warming submitted its final recommendations to Governor Kulongoski to reduce Oregon’s greenhouse gas emissions at its meeting on December 17, 2004.

The Advisory Group proposed the following goals:

- By 2010, arrest the growth of Oregon’s greenhouse gas emissions (including, but not limited to CO2) and begin to reduce them, making measurable progress toward meeting the existing benchmark for CO2 if not exceeding 1990 levels.
- By 2020, achieve a 10-percent reduction below 1990 greenhouse gas levels.
- By 2050, achieve a “climate stabilization” emissions level at least 75 percent below 1990 levels.


California Global Warming Solutions Act (AB 32)

AB 32 requires the California Air Resources Board (CARB) to develop regulations and market mechanisms that will ultimately reduce California's greenhouse gas emissions by 25 percent by 2020. Mandatory caps will begin in 2012 for significant sources and ratchet down to meet the 2020 goals.

Specifically, AB 32 requires CARB to:

- Adopt mandatory reporting rules for significant sources of greenhouse gases by January 1, 2009.
- Adopt a plan by January 1, 2009 indicating how emission reductions will be achieved from significant greenhouse gas sources via regulations, market mechanisms and other actions.
- Adopt regulations by January 1, 2011 to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas, including provisions for using both market mechanisms and alternative compliance mechanisms.
- Convene an Environmental Justice Advisory Committee and an Economic and Technology Advancement Advisory Committee to advise CARB.
- Ensure public notice and opportunity for comment for all CARB actions.
- Prior to imposing any mandates or authorizing market mechanisms, CARB must evaluate several factors, including but not limited to impacts on California's economy, the environment and public health; equity between regulated entities; electricity reliability, conformance with other environmental laws and ensure that the rules do not disproportionately impact low-income communities.

City of Seattle, United States Mayors Climate Protection Agreement

On February 16, 2005 the Kyoto Protocol, the international agreement to address climate disruption became law for the 141 countries that have ratified it to date. On that day, Seattle Mayor Greg Nickels launched this initiative to advance the goals of the Kyoto Protocol through leadership and action by at least 141 American cities.
Under the Agreement, participating cities commit to take following three actions:

- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol -- 7% reduction from 1990 levels by 2012; and
- Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system

In addition to building a coalition of at least 141 cities to sign onto the US Mayors Climate Protection Agreement, Mayor Nickels, along with the other participating mayors, led a successful effort to win endorsement of the Agreement by the U.S. Conference of Mayors, through passage of a resolution at their June 2005 meeting.

As of June 25, 2007, 592 mayors have signed onto the agreement.

**City of San Francisco**

In 2002 the city passed a resolution committing the city to an emissions reduction goal that goes beyond the Kyoto Protocol objectives. The resulting Climate Action Plan focuses the city's efforts on transportation, energy efficiency, renewable energy, and solid waste management as the key areas that will have the greatest impact on climate change.

- Renewable energy programs that promote power production from solar, wind, biomass, ocean wave, and bay tidal current sources will eliminate an estimated 550,000 tons of CO2
- A city fleet with more than 700 clean-air vehicles; one of the largest municipal alternative fuel vehicle fleets in the nation
- A mass transit fleet with 57 percent zero-emission vehicles; a goal of a completely zero-emission fleet by 2020
- Installation of LED (Light Emitting Diodes) traffic signals across the city to reduce electricity use by an estimated 7.7 million kilowatt-hours that will save the city $1.2 million per year
- An expanded recycling program combined with methane capture at city-operated landfills to reduce emissions by about 300,000 tons of CO2

**San Francisco Climate Action Plan: Greenhouse Gas Emissions - Reduction Target**

San Francisco’s reduction target is 20% below 1990 levels by 2012. This is about 2.5 million tons below 2000 levels.

With “business as usual,” greenhouse gas emissions are predicted to rise to 10.8 million tons per year in 2012. The 20% reduction target would reduce San Francisco’s overall GHG emissions to 7.2 million tons per year by 2012.

**City of Chicago**

Chicago Climate Exchange (CCX) is the world’s first and North America’s only legally binding rules-based greenhouse gas emissions allowance trading system, as well as the world’s only global system for emissions trading based on all six greenhouse gases.

Reductions achieved through CCX are the only reductions in North America being achieved through a legally binding compliance regime, providing independent third party verification provided by NASD and price transparency.
CCX emitting Members make a voluntary but legally binding commitment to meet annual greenhouse gas (GHG) emission reduction targets. Those who reduce below the targets have surplus allowances to sell or bank; those who emit above the targets comply by purchasing CCX Carbon Financial Instrument™ (CFI™) contracts.

Figure 42: CCX Emission Targets

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MEMBERS OF PHASE I AND PHASE II</th>
<th>MEMBERS OF PHASE II ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>1% below Baseline</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>2% below Baseline</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>3% below Baseline</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>4% below Baseline</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>4.25% below Baseline</td>
<td>1.5% below Baseline</td>
</tr>
<tr>
<td>2008</td>
<td>4.5% below Baseline</td>
<td>3% below Baseline</td>
</tr>
<tr>
<td>2009</td>
<td>5% below Baseline</td>
<td>4.5% below Baseline</td>
</tr>
<tr>
<td>2010</td>
<td>6% below Baseline</td>
<td>6% below Baseline</td>
</tr>
</tbody>
</table>

Note: Baseline is the average of annual emissions from 1998-2001.

Counties and Municipalities members of CCX:
- City of Aspen
- City of Berkeley
- City of Boulder
- City of Chicago
- City of Oakland
- City of Melbourne, Australia
- City of Portland
- King County, Washington
- Sacramento County, California
8. Goals and Strategies

Lynnwood’s energy inventory, carbon footprint calculation and physical form review indicate that strategic interventions by the city will be necessary if it wants to reduce its dependence on carbon-based non-renewable fuels. This section makes some suggestions for goals, strategies and performance measures/indicators that the City might want to consider during development of its Energy Element. This discussion refers to general as well as tailored strategies for a clean energy economy in Lynnwood.

Planning for a clean and efficient energy infrastructure will require a concerted, coordinated and deliberate effort. A focused program of this nature is typically built around a compelling vision or goal. An earlier section describes the many popular goals for energy conservation and greenhouse gas emission reductions that organizations and other governments have adopted. The city of Lynnwood may chose to endorse any of those goals and targets, or it might want to develop its own. Either way, the adopted declaration will direct the city’s final goals and targets towards energy efficiency and lower carbon footprint.

Without an organizing principle or goal directing the proposed strategies below, this discussion is not a reflection of the city’s priorities. It also stays away from suggesting targets and rates of change.

However, for the City to pursue an alternate approach to its energy generation and to change fuel demand patterns, traditional approaches and perspective of these issues will need to be reviewed, and most likely revamped.

Need for a Shift in Thinking

For Lynnwood to change its energy landscape towards more efficient and clean outcomes there will need to be a change in the prevalent mindset. Four arguments for a shift in outlook are listed below.
**Imminent Peak Oil**

The public and policy makers will need to recognize that the 20th Century presumption of abundant and practically free energy has been replaced by a 21st Century reality of ever decreasing supply of oil and domestic gas; compounded by an increasingly volatile energy pricing market. Together, these have contributed to major international geo-political conflicts.

**Less is More**

Given the above, and other factors challenging the notion of ample energy, Lynnwood businesses and residents will need to appreciate that less energy is better. In other words, it should be assumed that reducing energy demand will not necessarily affect one’s quality of life, rather, it is an important step towards greater disposable income and affordability, and most likely an overall higher quality of life.

**Uncertain Future**

Lynnwood, like the rest of Washington will be forced to deal with the repercussions of climate change and its impact on the current energy delivery infrastructure. Many of these climate change impacts could affect the current energy portfolio: rivers could dry up during summer months affecting summer peak capacities for hydropower; warmer summers could further exacerbate summer cooling loads; wetter winter months could increase infiltration and loads at local waste water plants; forest fires or increased flooding could damage regional power lines; higher wind loads could shut down wind farms or topple power lines; and so on.

With the repercussions of climate change still fairly speculative, cities and Utilities would be well-served by:

- Diversifying their energy sources and generation plants;
- Identifying potential for local and distributed generation; and
- Having a number of back-up plans and alternative strategies.

**Technological Innovation Certainty**

What is absolutely certain is that in the future we will witness tremendous innovation in the fields of energy. It is likely that technologies and machines will be invented that are currently unimaginable.

Also inevitable is that a city’s energy system will begin to reflect its complexities, opportunities, diversity and coherence. Yet only those cities that are prepared, have anticipated change, and have proven resilient to change can thrive in this unknown future.

**Lynnwood’s Characteristics as they Affect Its Energy Demand**

Lynnwood’s current energy portfolio and carbon emissions are directly influenced by its physical layout. Changes over time in any or all of the characteristics below will affect the city’s carbon emissions and energy demand.

Lynnwood is:

- Predominantly low-density single family residential;
- Served by regional franchises along SR-99 for its consumer goods. It has no neighborhood retail centers or retail nodes conveniently accessed by walking or bicycles;
- Populated by extensive big box regional retail development;
- Changing its retail based strip-mall economy in the City Center to a high-density mixed use (office and retail) district;
- Insufficiently occupied by natural areas and trees;
• Well connected through a transit network, however transit ridership is fairly low;
• Dependant on remote sources of power;
• Distinguished predominantly by a car-based culture
• Heavily paved and stormwater runs off into a natural lake

Each of the above characteristics is addressed in the recommended strategies for their role in the city’s future energy performance. As discussed in further detail below, some of these characteristics should be revisited while others should be taken advantage of.

Chapter Organization

In this section we offer goals, strategies and indicators for measuring the city’s progress towards carbon neutrality and energy efficiency. To simplify this discussion, it is categorized by the four most pertinent actions prompted by Lynnwood’s Carbon Footprint review:

• Reduce Petroleum Use
• Generate Locally
• Minimize Energy Demand
• Energy Aware Management and Operations

To measure the progress towards each goal, it is tied to an outcome indicator. These indicators measure whether the intended results of each goal are being realized. Typically, should the City decide to pursue any of these indicators as is or modified, they would tie each indicator to a performance target. In that case, each indicator would then be assessed on a periodic basis against the set target. Actions towards the set goal can then be assessed and corrected, if necessary, based on desired rate of progress.

Each of the above goals is supported by a series of strategies that describe the actions the city could take to achieve the goal. Each strategy would be supported by a number of specific actions that the City would need to undertake. While detailing each strategy is beyond the scope of this report, each strategy with actionable steps below is tied to output indicators that would direct the appropriate actions. These output indicators measure the progress of select actions identified as a part of a strategy.

Energy Goal 1: Reduce Petroleum Use

For the city to significantly reduce its carbon emissions, it will have to better integrate land use and transit; and tackle its transportation infrastructure for better serving commuters, customers accessing Lynnwood retail and offices, as well as residents’ daily errands. Below are some possible indicators for assessing the city’s progress in that direction.

Outcome Indicators

• Gasoline / Diesel Consumption; (average gallons/vehicle/year) (separate for cars and freight)
• Green Commuters; Percentage of Residents Commuting to School or Work who took means other than Single Occupancy Vehicles (%)
• Total Number of Miles Residents Walked in the City (Average miles/year/adult)

Strategy: Reduce Need for Driving

Output Indicators

• Compact mixed use walkable areas of Minimum Density of 12dus/acre (Square Miles/resident),
• Street Surface Area that is designed for safe slow travel (25mph or less) by walkers, bikes and slow cars (%),
• Percentage of Worker Hours Telecommuting or on Staggered or other Schedules (%),
• Percentage of Residents within ¼ mile of a Transit Stop
- Ratio of District Parking to Dedicated Off-street Parking
- Percentage of sidewalks upgraded to safe walking standards (%)
- Pedestrian crosswalks per linear mile of roadway (Number)
- Subdivision connections for pedestrian and bike travel (% of total)

**Strategy: Encourage Different (Electric, hybrid) Cars**

Output Indicator
- Registered Electric, Hybrid or other alternative private vehicles in the city (number)

**Strategy: Different Fuel (Ethanol, BioFuel)**

Output Indicator
- Total Volume of Ethanol Available Per Day (gallons) in the city
- Total Volume of Bio Fuel Available Per Day (gallons) in the city

**Goal 2: Reduce Dependence on Carbon-based Centralized Power Generation**

Lynnwood has the capacity to generate much of its energy needs locally. This can be achieved through new technologies such as rooftop solar panel arrays or a new bio-waste plant; or it could be through district energy systems based on geo-thermal or waste heat from waste water treatment plant, or distributed generation systems using combined heat and power systems. Generating energy and heat close to its end users significantly reduces the amount of energy lost in transmission from remote generators. Some district energy applications could be the proposed City Center, in the Mall, College campus or around the Waste Water Treatment Plant.

Outcome Indicators
- Energy Generated Locally versus that purchased from outside city limits (%)
- Amount of City Investment into Utilities’ Green Power Purchasing Programs (% of total electrical energy use)

**Strategy: Investigate and encourage (incentives, code revisions) local private generation of energy through funds, incentives or low-interest revolving loan funds.**

Output Indicators
- Local Solar Thermal and Electric Generation (sqft and/or kwhr)
- Area served by District or Distributed Energy**xviii** (sqft) (geo-thermal; waste heat; Co-generation Systems)

**Strategy: Work with local Utilities and integrate into their IRPs an approximation of “local” or city-owned generation of energy**

Output Indicators
- Cost of disposing a ton of local waste and compost to estimate of embedded energy in a ton of the waste stream (Ratio)
- Estimated unit price of thermal energy through district geo-thermal or solar energy generation ($/kwhr)

**Goal 3: Minimize Energy Demand**

The most promising approach to reducing the city’s carbon footprint is by minimizing the need for energy. Washington State Utilities have aggressive incentives for reducing energy demand through conservation measures. Cities can contribute to greater conservation through distribution of education material, incentives for clean technology and energy efficiency, upgraded codes for passive solar building and greater energy performance, and bulk purchasing for reducing cost to local buyers of technology.

Outcome Indicators
- Percentage of new buildings certified under Energy Star, LEED or Built Green programs.
- Change in energy use per resident (kwhr/person)
- Change in energy use by land use (kwhr/person/land use)

Output Indicators
- Educational Brochures distributed (% of Building Permit Applications)
- Zoning code compatibility for key energy concerns (solar access, on site and street tree placement, permeable pavement, native landscaping, toxin-free lawns, outdoor lighting etc.) (indicator – progress)
- Building code upgrade for energy efficiency (insulation, Compact Fluorescent Lightbulbs, storm windows/doors, double skin curtain walls, overhangs, daylighting standards, dimmers, motions sensitive or photo sensitive lighting, light shelves, Energy Star appliances etc) (indicator – progress)
- Use of alternative energy efficient Cooling/Heating technologies (heat pump, radiant energy, on demand solar thermal energy, zoned heating etc) (kwhr saved)
- Urban Trees Program (number of CO2 efficient trees planted/year, narrow shaded streets)
- Parks Space (acres/resident and acres/daytime population)
- Number of energy audits and publication of performance in appraised value of building (% of total by land use)

Goal 4: Energy Aware Management and Operations

City hall can initiate energy-aware planning and behavior by leading by example. There are many dollars to be saved through energy-smart investments into city buildings and facilities. Energy aware purchasing can also help reduce the overall embedded lifecycle costs of city purchases for supplies, fuel, furniture, and so on.

Outcome Indicators
- Ratio of energy from carbon sources to that from renewable sources (City Services and facilities; Citywide)

Strategy: Reduce Water Use (rainwater harvesting, low flow fixtures, permeable pavements, retention basins, bio-swales, stormwater plan; water recycling programs at fire stations)

Output Indicators
- Water treated for citywide consumption (gallons/year)
- Water use per employee at city buildings and facilities (gallons/person)
- Residential Water use (gallons/person)
- Commercial Water use (gallons/sqft)

Strategy: Increase amount of waste recycled in the city

Output Indicator

Strategy: Increase Energy Efficiency in City Facilities and Utilities

Output Indicator
- City energy expenses for facilities operation per year per area ($/year/sqft) (Buildings, Fire Station, Pool etc)
- City energy expenses for municipal utilities per year per developed area ($/year/sqft) (Streetlights, Outdoor Lighting, Wastewater Treatment Plant, Water Treatment etc)
- Percentage of traffic signals that have undergone synchronization
- Number of energy efficient and night sky protected street lights as well as private outdoor lights (% of total)

Strategy: Introduce Energy Smart Purchasing in City Hall

Action: Participate in a Carbon Exchange Program (Indicator - % of carbon emitted that is traded on the Exchange)
- Action: Work with State to procure energy efficient city vehicles and transit vehicles (Indicator – gas consumption/mile)
- Action: Sign up for AWC Sustainable Purchasing Program (% of supplies purchased through this program)
- Action: Create a Green Tag Purchasing Program for city energy use (% of city energy purchased through this program)

In the United States the federal government has several incentive programs to promote the use of renewable energy technologies. These are primarily financial incentives, and are described briefly in the following pages.
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>AUTHORITY</th>
<th>NAME</th>
<th>SECTORS</th>
<th>TYPE OF INCENTIVE</th>
<th>SUMMARY</th>
<th>WEBSITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Depreciation</td>
<td>IRS</td>
<td>Energy Efficient Commercial Buildings Tax Deduction</td>
<td>Commercial, Construction</td>
<td>Tax Abatement</td>
<td>A tax deduction of $1.80 per square foot is available to owners of new or existing buildings who install (1) interior lighting; (2) building envelope, or (3) heating, cooling, ventilation, or hot water systems that reduce the building’s total energy and power cost by 50% or more in comparison to a building meeting minimum requirements set by ASHRAE Standard 90.1-2001. Energy savings must be calculated using qualified computer software approved by the IRS.</td>
<td><a href="http://www.irs.gov/newsroom/article/0">http://www.irs.gov/newsroom/article/0</a>, id=158395,00.html?dpd=GreenBuildingOurProgramsPublicPolicyInitiativesDevelopmentIncentives/default.aspx</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modified Accelerated Cost-Recovery System (MACRS)</td>
<td>Commercial, Industrial</td>
<td>Depreciation</td>
<td>Under the Modified Accelerated Cost-Recovery System (MACRS), businesses can recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. For solar, fuel cells, microturbines, solar hybrid lighting technologies, wind and geothermal property placed in service after 1986, the current MACRS property class is five years</td>
<td>26 USC § 168 (2005)</td>
</tr>
<tr>
<td>Corporate Exemption</td>
<td>IRS</td>
<td>Residential Energy Conservation Subsidy Exclusion (Corporate)</td>
<td>Residential, Multi-Family Residential</td>
<td>Tax Subsidy</td>
<td>Energy conservation subsidies provided by public utilities, either directly or indirectly, are nontaxable. Includes installations or modifications that are primarily designed to reduce consumption of electricity or natural gas, or improve the management of energy demand. The amount of the subsidy is 100%</td>
<td><a href="http://www.irs.gov/publications/p525/index.html">http://www.irs.gov/publications/p525/index.html</a></td>
</tr>
<tr>
<td>CATEGORY</td>
<td>AUTHORITY</td>
<td>NAME</td>
<td>SECTORS</td>
<td>TYPE OF INCENTIVE</td>
<td>SUMMARY</td>
<td>WEBSITE</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------</td>
<td>-------------------------------------------</td>
<td>--------------------------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Corporate Tax Credit</td>
<td>IRS</td>
<td>Business Energy Tax Credit</td>
<td>Commercial, Industrial</td>
<td>Tax Credit</td>
<td>For equipment (January 1, 2006 - December 31, 2008), the credit is 30% for solar, solar hybrid lighting, and fuel cells, and 10% for micro turbines. The geothermal credit remains at 10%. Maximum incentive of $500 per 0.5 kW for fuel cells; $200 per kW for micro turbines; no maximum specified for other technologies</td>
<td>26 USC § 48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy Efficient Appliance Tax Credit for Manufacturers</td>
<td>Appliance Manufacturers</td>
<td>Tax Credit</td>
<td>Credits available to manufacturers of Dishwashers. A credit based on an energy savings calculation is available for models that meet the 2007 Energy Star® criteria. Clothes washers - $100 for models that meet the 2007 Energy Star® criteria. Refrigerators $75 for models that save at least 15% relative to 2001 federal standards (available only in 2006). $125 for models that save at least 20% relative to 2001 federal standards. $175 for models that save 25% or more relative to 2001 federal standards. Each manufacturer is limited to a total of $75 million for all credits under this provision. Of that cap, no more than $20 million can be claimed for the lowest tier of qualifying refrigerators.</td>
<td>26 USC § 45M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Energy-Efficient Home Tax Credit for Builders</td>
<td>Construction</td>
<td>Tax Credit</td>
<td>The Energy Policy Act of 2005 established tax credits of up to $2,000 for builders of all new energy-efficient homes, including manufactured homes constructed in accordance with the Federal Manufactured Homes Construction and Safety Standards.</td>
<td><a href="http://www.irs.gov/newsroom/article/0,,id=154658,00.html">http://www.irs.gov/newsroom/article/0,,id=154658,00.html</a></td>
</tr>
<tr>
<td>CATEGORY</td>
<td>AUTHORITY</td>
<td>NAME</td>
<td>SECTORS</td>
<td>TYPE OF INCENTIVE</td>
<td>SUMMARY</td>
<td>WEBSITE</td>
</tr>
<tr>
<td>----------</td>
<td>-----------</td>
<td>------</td>
<td>---------</td>
<td>------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Corporate Tax Credit</td>
<td>IRS</td>
<td>Renewable Electricity Production Tax Credit</td>
<td>Commercial, Industrial</td>
<td>Tax Credit</td>
<td>The REPC provides a tax credit of 1.5 cents/kWh, adjusted annually for inflation, for wind, closed-loop biomass and geothermal. Currently, the REPC for these technologies is 1.9 cents/kWh. Electricity from open-loop biomass, small irrigation hydroelectric, landfill gas, municipal solid waste resources, and hydropower receive half that rate -- currently 1.0 cent/kWh. The duration of the credit is 10 years.</td>
<td><a href="http://www.irs.gov/pub/irs-pdf/f8835.pdf">http://www.irs.gov/pub/irs-pdf/f8835.pdf</a></td>
</tr>
<tr>
<td>Federal Grant Program</td>
<td>U.S. Department of Energy</td>
<td>Tribal Energy Program Grant</td>
<td>Tribal Government</td>
<td>Grant</td>
<td>Provides financial and technical assistance to tribes for feasibility studies and shares the cost of implementing sustainable renewable energy installations on tribal lands. The amount of the grant varies.</td>
<td><a href="http://www.eere.energy.gov/tribalenergy/financial.html">http://www.eere.energy.gov/tribalenergy/financial.html</a></td>
</tr>
<tr>
<td>Federal Loan Program</td>
<td>U.S. Department of Agriculture</td>
<td>USDA Renewable Energy Systems and Energy Efficiency Improvements Program</td>
<td>Commercial Agricultural</td>
<td>Grant</td>
<td>The maximum grant award is 25% of eligible project costs up to $500,000 for renewable energy projects and up to $2,500,000 for energy efficiency improvements.</td>
<td></td>
</tr>
<tr>
<td>Federal Loan Program</td>
<td>Federal Housing Authority</td>
<td>Energy Efficient Mortgage</td>
<td>Residential</td>
<td>Loan</td>
<td>The FHA allows lenders to add up to 100% of energy efficient improvements to an existing mortgage loan by insuring a loan of up to 5% of a home’s appraised value or $4,000, whichever is greater, not to exceed $8,000.</td>
<td><a href="http://www.fha.com/lending_limits.cf">www.fha.com/lending_limits.cf</a> m</td>
</tr>
<tr>
<td>Category</td>
<td>Authority</td>
<td>Name</td>
<td>Sectors</td>
<td>Type of Incentive</td>
<td>Summary</td>
<td>Website</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------</td>
<td>-----------------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Federal Loan Program</td>
<td>Department of Veterans Affairs</td>
<td>Energy Efficient Mortgage</td>
<td>Residential</td>
<td>Loan</td>
<td>Homebuyers can borrow up to $3,000 if only documentation of improvement costs or contractor bids is submitted, or up to $6,000 if the projected energy savings are greater than the increase in mortgage payments.</td>
<td><a href="http://www.homeloans.va.gov/elig2.htm">www.homeloans.va.gov/elig2.htm</a></td>
</tr>
<tr>
<td>U.S. Department of Agriculture</td>
<td>USDA</td>
<td>Renewable Energy Systems</td>
<td>Commercial, Agricultural</td>
<td>Loan</td>
<td>Under the guaranteed loan option, funds up to 50% of eligible project costs (with a maximum project cost of $10 million) are available.</td>
<td></td>
</tr>
<tr>
<td>Private Loan Program</td>
<td>Environmental Protection Agency</td>
<td>ENERGY STAR® Energy Efficient Mortgages</td>
<td>Residential</td>
<td>Loan</td>
<td>These mortgages, unlike those insured by the FHA and VA, are not guaranteed by a particular federal agency. The Environmental Protection Agency’s ENERGY STAR program lists 49 private lenders who offer homebuyer assistance, home energy rating assistance, special financing, and other assistance to applicants buying homes with the ENERGY STAR rating.</td>
<td><a href="http://www.energystar.gov">http://www.energystar.gov</a></td>
</tr>
<tr>
<td>Personal Tax Credit</td>
<td>IRS</td>
<td>Residential Energy Efficiency Tax Credit</td>
<td>Residential</td>
<td>Tax Credit</td>
<td>Owners of existing homes can receive tax credits of up to 10% of the cost of upgrading the efficiency of the building's envelope. Credits for windows are not to exceed $200, and the total amount of credits for building envelope measures and other qualified energy property outlined below must not exceed $500.</td>
<td><a href="http://www.irs.gov/newsroom/article/0">http://www.irs.gov/newsroom/article/0</a>, id=154657,00.html</td>
</tr>
<tr>
<td>Program Type</td>
<td>Owner</td>
<td>Description</td>
<td>Website Link</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Tax Credit</td>
<td>IRS</td>
<td>Residential Solar and Fuel Cell Tax A 30% tax credit up to $2,000 for the purchase and installation of residential solar electric and solar water heating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production Incentive</td>
<td>U.S. Department of Energy</td>
<td>Renewable Energy Production Incentive (REPI) Financial incentive payments for electricity produced and sold by new qualifying renewable energy generation facilities. Qualifying facilities are eligible for annual incentive payments of 1.5 cents per kilowatt-hour (1993 dollars and indexed for inflation) for the first ten-year period of their operation</td>
<td><a href="http://www.eere.energy.gov/wip/program/repi.html">http://www.eere.energy.gov/wip/program/repi.html</a></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Block Grant</td>
<td>U.S. Department of Health and Human Services</td>
<td>Low Income Home Energy Assistance Program (LIHEAP) Financial incentive payments for electricity produced and sold by new qualifying renewable energy generation facilities. Qualifying facilities are eligible for annual incentive payments of 1.5 cents per kilowatt-hour (1993 dollars and indexed for inflation) for the first ten-year period of their operation</td>
<td><a href="http://www.liheap.seat.org/profiles/WA.htm">http://www.liheap.seat.org/profiles/WA.htm</a></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. State Funding Opportunities

Washington State has adopted a number of policies to advance energy efficiency and lower greenhouse gases.

**Buildings**

**i. Washington State Energy Code for Buildings**

Washington State has developed building codes to ensure that buildings are energy efficient.

Residential Code: State-developed and implemented code. Recent updates are effective July 1, 2005; these exceed 2003 IECC standards for most homes and are mandatory statewide.

**ii. Commercial Code:**

State-developed code that meets or exceeds ASHRAE/IESNA 90.1-2004; recent updates are effective July 1, 2005.

Washington Class A cities may choose to exceed the state code. Seattle, for example has implemented a code that exceeds ASHRAE/IESNA 90.1-1999 by 20%.

**iii. Green Building and Energy Reduction Standards for State Agencies**

On January 5, 2005, Washington’s governor signed Executive Order 05-01, directing state agencies to adopt green building practices in the construction of all new buildings and in the renovation of existing buildings for which the cost of the project amounts to at least 60% of the building’s appraised value.

Building projects of over 25,000 square feet entering the pre-design phase from 2005 to 2007 must either meet the Leadership in Energy and Environmental Design (LEED) “Silver” Standard, be certified by the Department of General Administration (GA) to meet state standards for forest products as defined by the Washington Forest Practices Act, or be sustainable forest-certified by a credible third party.
Public schools, institutions of higher learning, elected officials, commissions, and others are invited to participate in implementing energy efficiency measures as well. In addition to energy efficiency in state buildings, this order also sets requirements for fuel efficiency in state vehicle fleets and reduction in lifecycle impacts of paper use in state agencies.

Effective July 24, 2005, Senate Bill 5509 promotes high performance public buildings in the state of Washington. This bill requires major facility projects for all state agencies, institutions of higher education, and other entities receiving state funding to meet at least the LEED “Silver” Standard in design, construction, and maintenance, to the extent appropriate. In public school districts receiving state funding, projects that have not already received project approval from the superintendent of instruction are required to meet at least the LEED “Silver” Standard or Washington sustainable school design protocol to the extent appropriate by July 1, 2006 for volunteering school districts; July 1, 2007 for class one school districts; or July 1, 2008 for class two school districts. Under this bill, major facility projects must include building commissioning as a cost-saving element of the construction process.

iv. Appliances

Washington enacted appliance efficiency legislation in 2005, creating minimum efficiency standards for twelve products, six of which were immediately preempted by federal law. The standards now apply to the following products sold or installed in Washington: (Dates listed in parenthesis signify the effective date.) See RCW § 19.260.010, et seq. (2006)

- Automatic commercial ice makers* (2008)
- Commercial refrigerators and freezers* (2007)
- Metal halide lamp fixtures (2008)
- Single-voltage external power supplies (2008)
- State-regulated incandescent reflector lamps (BRs, ERs, and R20s) (2007)
  
  * will be implemented for some time until federal standards take place.

Renewable Technologies

i. Renewable Fuel Standards

On March 30 2006, Governor Christine Gregoire signed into law ESSB 6508, establishing one of the most aggressive alternative fuels requirement in the nation. The bill amends and adds new sections to the Motor Fuel Quality Act (19.112 RCW) to require that diesel and gasoline sold in the state contain minimum percentages of biodiesel and denatured ethanol. It becomes effective on July 1, 2006.

ESSB 6508 also contains provisions requiring the Governor to suspend the RFS mandate by executive order if content goals are achieved by November 30, 2008. These goals are for Washington’s diesel fuel supply and gasoline fuel supply to contain at least 10 percent biodiesel and 20 percent ethanol, respectively, made predominantly from Washington feedstock. If these goals are not achieved by November 30, 2008, the Director of Agriculture is to monitor fuel supplies until they are met.

The RFS mandate requires that at least 2 percent of the state’s total annual diesel fuel sales will be biodiesel by the earlier of November 30, 2008, or upon determination by the Director of Agriculture that enough feedstock is being grown in the state to satisfy the requirement.

Only Minnesota has adopted a similar biodiesel mandate, though California, Ohio, Hawaii, and Montana have passed legislation requiring that state governmental agencies use biodiesel.
ii. **Energy Freedom Program RCW 15.110.020**

Governor Christine Gregoire approved in 2006 the “Energy Freedom Fund”, a law that “provides necessary capital to support the production of biodiesel, ethanol and other forms of green energy.” The state legislature committed $25 million in low interest loans and grants as a part of the fund.

In 2006, $6.75 million in low-interest loans were awarded to Washington bioenergy projects. Seven bioenergy projects in Washington would receive a total of $6.75 million in low-interest loans through the state’s Energy Freedom Loan program. Successful applicants have shown an ability to reduce dependence on imported energy sources and promote environmental quality. The selected projects demonstrated long-term financial viability, job creation and benefits to the economy.

**Source Link:**

iii. **Biofuels Production Contracts**

Conservation districts and public development authorities are authorized to enter into crop purchase contracts to produce, sell, and distribute biodiesel produced from Washington feedstocks, cellulose ethanol, and cellulosic ethanol blend fuels. Additionally, municipal utilities and public utility districts are authorized to produce and distribute biodiesel, ethanol, and ethanol blend fuels, as well as enter into crop purchase contracts for the purpose of producing biodiesel produced from Washington feedstocks, cellulose ethanol, and cellulosic ethanol blend fuels for use in internal operations of the utility and for sale or distribution. (Reference House Bill 1303, 2007, and Revised Code of Washington 35.21, 35.92, 54.04, 89.08)

iv. **Solar Technology Incentives**

Substitute Senate Bill (SSB) 5101, Chapter 300, (2005) provides a tax incentive to support certain renewable energy sources. Individuals, businesses, and local governments that are not in the light and power business or gas distribution business will be able to apply to their light and power provider for payments up to $2,000 for the generation of electricity by a qualified renewable energy system. Light and power businesses participating in the program will be able to offset amounts paid to customers by taking a credit against their public utility tax liability.

**Utility Requirements**

i. **Mandatory Utility Green Power Option**

On May 8, 2001, the Governor of Washington signed EHB 2247, which requires each electric utility that serves more than 25,000 (including investor-owned and consumer-owned utilities) to offer customers the option to purchase power generated from renewable sources - defined as produced by wind, solar, geothermal, landfill gas, wave or tidal action, wastewater treatment gas, some biomass and "qualified hydropower" that is fish-friendly.

Beginning January 1, 2002, each electric utility in Washington must provide (four times a year) a voluntary option to its electricity customers to purchase renewable energy resources. The details of each utility's options must be approved and annual reports submitted from October 1, 2002 to October 1, 2012. A report summarizing the utility reports will be provided each year to the legislature.

ii. **Fuel Mix Disclosure**

Beginning in May 2001, retail electricity suppliers in Washington must provide a disclosure label of fuel mix in a standard format to their retail customers at least semiannually. The disclosure label must be provided to new customers at the time service is established.
iii. Initiative 937

On November 7, 2006 Washington became the second state to pass a renewable energy standard by ballot initiative. Initiative 937 calls for electric utilities that serve more than 25,000 customers in the state of Washington to obtain 15% of their electricity from new renewable resources by 2020 and to undertake cost-effective energy conservation.

“Renewable resources” in this initiative include:

- water;
- wind;
- solar energy;
- geothermal energy;
- landfill gas;
- wave, ocean, or tidal power;
- gas from sewage treatment facilities;
- biodiesel fuel (must meet specified standards); and
- biomass energy based on animal waste or solid organic fuels from wood, forest, or field residues, or dedicated energy crops.

iv. Interconnection Standards

The Washington Utilities and Transportation Commission (WUTC) adopted final interconnection rules in March 2006 for all distributed-generation (DG) systems up to 25 kilowatts (kW) in capacity. The adoption of standards was inspired by the state’s renewable-energy production incentives, which took effect July 1, 2005, and by Section 1254 of the federal Energy Policy Act of 2005, which requires all states to consider adopting an interconnection standard based on Institute of Electrical and Electronics Engineers (IEEE) Standard 1547. Although the rules apply only to investor-owned utilities, the UTC has indicated that all Washington utilities likely will adopt the commission’s rules.

v. Net Metering Rules

Washington’s net-metering law applies to systems up to 100 kilowatts (kW) in capacity that generate electricity using solar, wind, hydro, biogas from animal waste, or combined heat and power technologies (including fuel cells).

Net metering is available on a first-come, first-served basis until the cumulative generating capacity of net-metered systems equals 0.25% of a utility’s peak demand during 1996. This limit will increase to 0.5% on January 1, 2014. At least one-half of the utility’s 1996 peak demand available for net-metered systems is reserved for systems generating electricity using renewables.

Vehicles

i. Electric Vehicle (EV) Recharging at State Buildings

Recognizing that it is in the state’s interest and to the benefit of the public to encourage the use of EVs to reduce emissions and improve air quality, publicly and privately owned plug-in EVs may be recharged at state office locations where the vehicles are used for state business, commuter vehicles, or conducting business with the state. (Reference House Bill 1303, 2007)

ii. Alternative Fuel Use Requirement

Effective June 1, 2015, all state and local government agencies are required to satisfy 100% of their fuel usage for operating publicly owned vehicles by using biofuels or electricity. To allow the motor vehicle fuel needs of state and local government to be satisfied by Washington-produced biofuels, the Department of General Administration and local governments may contract in advance and execute contracts with public or private producers and suppliers for the purchase of appropriate biofuels. (Reference House Bill 1303, 2007)
iii. Low Emission Vehicle Standards and Sales Requirements

Washington has adopted the California motor vehicle emission standards in Title 13 of the California Code of Regulations, effective January 1, 2005, with the exception of California’s zero emission vehicle program. The Washington Department of Ecology will adopt rules to implement these emission standards for passenger cars, light-duty trucks, and medium-duty passenger vehicles.

iv. Clean School Bus Funding

Until July 1, 2020, 85% of the money from the segregated sub account of the state treasury’s air pollution control account must be distributed to air pollution control authorities. Of the money received by an air pollution control authority or the state Department of Licensing, 85% must be used for the Clean School Bus Program, to retrofit school buses with exhaust emission control devices or to provide funding for refueling infrastructure needed to allow school bus fleets access to use alternative, cleaner fuels.

State Facilities Operations

i. Executive Order 05-01: Establishing Sustainability and Efficiency Goals for State Operations

Gary Locke, Governor of the State of Washington, declared that state agencies shall adopt targets and take action to use sustainable practices.

Agencies incorporate green building practices in all new construction projects, and in major remodels that cost over 60% of the facility’s assessed value.

Agencies take all reasonable actions to achieve a target of a 20% reduction in petroleum use in the operation of state vehicles and privately owned vehicles used for state business by September 1, 2009.

Agencies take all reasonable actions to reduce the lifecycle impacts of paper products, and achieve the following goals by September 1, 2009:

- Reduce the use of office paper by 30%, based on data reported in 2003 agency Sustainability Plans.
- Increase the percentage of environmentally preferable paper (EPP) purchased to at least 50%. Environmentally preferable paper is defined as 100% recycled content paper with a minimum of 50% post consumer waste.
- Recycle 100% of used office paper.
- Significantly reduce the environmental impacts of janitorial paper products through increased use of post consumer recycled products.

Green Highway Partnership: Bringing Together Transportation and the Environment

Combining safe and efficient transportation systems with environmental stewardship and sustainability is the goal of the recently launched Green Highways Partnership (GHP). The partnership builds on the success of the Green Highway Forum, held in November 2005 and is sponsored by FHWA, AASHTO, and EPA.

Based on discussions at the forum and a follow-up planning retreat held in March 2006, the GHP has formed three teams to focus on environmental stewardship, storm water management, and recycling. The teams include members from FHWA, EPA, AASHTO, and industry associations. The three teams will initially collect data and best practices. For example, the recycling team will compile data on the transportation sector’s reuse of industrial byproducts such as recycled concrete and asphalt, foundry sands, and fly ash. The team will then identify best practices for recycling and reuse, as well as areas where recycling practices can be improved. The team will also develop fact sheets,
case studies, and a tool kit to highlight effective recycling use in transportation projects, and hold workshops for States. "Disseminating this information will enable persons involved in the design, planning, construction, operations, and maintenance of roadways to understand the value and environmental benefit of using materials that would otherwise be disposed of," says Harrington.

The GHP will initially work with partners in the Mid-Atlantic region.

**Global Warming Mitigation Initiative – West Coast**

Governors of Washington, Oregon, and California approved a series of recommendations for action to combat global warming, as detailed in the West Coast Governors’ Global Warming Initiative. In conclusion, Washington, Oregon, and California must act individually and regionally to reduce greenhouse gas emissions. The initiatives include the establishment of new targets for reduction of average annual state fleet greenhouse gas emissions and collaboration on the purchase of hybrid electric vehicles. Areas highlighted in the West Coast Report on Global Warming for achieving greenhouse gas reductions include expanding the markets for energy efficiency, renewable resources, and alternative fuels. In Washington, state agencies must give priority to the purchase and use of hybrid electric and other fuel efficient, low-emission vehicles (those that achieve at least 30 miles per gallon and meet U.S. Environmental Protection Agency Tier 2 emission standards).
11. Suggested Additional Incentive Programs

As discussed earlier in the report, PSE and SNO-PUD offer a number of programs and incentives for energy conservation and renewables. In addition to those listed above, we have identified many programs that are in place in other jurisdictions in the State. Some of these are related to land use and density incentives while others are grants for small to moderate size developments. Most of these are offered by PUDs and operated at the County level. The City of Lynnwood could collaborate with Snohomish County PUD to gauge whether any of the programs below could be offered in Snohomish County.
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TYPE OF INCENTIVE</th>
<th>NAME</th>
<th>SECTORS</th>
<th>SUMMARY</th>
<th>WEBSITE</th>
<th>JURISDICTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Building Incentive</td>
<td>Density Bonus</td>
<td>Density Bonus for Green Buildings</td>
<td>Commercial, Residential</td>
<td>Commercial and residential buildings in those portions of downtown which achieve a minimum LEED* certification at the Silver level can be built to greater heights and/or greater maximum floor areas.</td>
<td><a href="http://www.seattle.gov/dpd/GreenBuilding/OurProgram/PublicPolicyInitiatives/DevelopmentIncentives/default.asp">http://www.seattle.gov/dpd/GreenBuilding/OurProgram/PublicPolicyInitiatives/DevelopmentIncentives/default.asp</a></td>
<td>Seattle</td>
</tr>
<tr>
<td>Local Grant Program</td>
<td>Grant</td>
<td>Green Building Grant Program</td>
<td>Commercial, Nonprofit, Multi-Family Residential, Institutional</td>
<td>Eligible projects can receive a grant in the amount of $15,000 for achieving a certification level of LEED Silver, $20,000 for LEED Gold, or $25,000 for LEED Platinum.</td>
<td><a href="http://www.greentools.us">http://www.greentools.us</a></td>
<td>King County</td>
</tr>
<tr>
<td></td>
<td>Grant</td>
<td>Built Green Grant Program</td>
<td>Residential, Installer/ Contractor</td>
<td>Grants for single-family residential and community development projects to help offset the cost of certifying and designing innovative green projects throughout Seattle and King County. Amount of $2,500 - $15,000, varies by Built Green certification level and development type</td>
<td><a href="http://www.builtgreen.net/incentive.html">http://www.builtgreen.net/incentive.html</a></td>
<td>Seattle / King County</td>
</tr>
<tr>
<td>CATEGORY</td>
<td>TYPE OF INCENTIVE</td>
<td>NAME</td>
<td>SECTORS</td>
<td>SUMMARY</td>
<td>WEBSITE</td>
<td>JURISDICTION</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>Production Incentive</td>
<td>Incentive payment</td>
<td>Sustainable Natural Alternative Power Producers Program</td>
<td>Commercial, Industrial, Residential, Schools, Local Government, State Government,</td>
<td>The Sustainable Natural Alternative Power (SNAP) program encourages customers to install alternative power generators and connect them to the District's electrical distribution system by offering an incentive payment based on the system's production. The energy producer sells 100 percent of the power generated, and therefore, the electricity produced is not used on site.</td>
<td><a href="http://www.chelanpud.org/snap.html">http://www.chelanpud.org/snap.html</a></td>
<td>All Chelan County PUD Customers</td>
</tr>
<tr>
<td>Production Incentive</td>
<td>Right Purchase</td>
<td>Northwest Solar Cooperative - Green Tag Purchase</td>
<td>Commercial, Residential, Nonprofit, Schools, Local Government, State Government, Agricultural, Institutional</td>
<td>The Northwest Solar Cooperative* (NWSC) offers to purchase the rights to the environmental attributes or “Green Tags” derived from grid-connected solar PV- or wind-generated electricity at a rate of $0.05/kWh through December 31, 2009.</td>
<td><a href="http://www.cascadesolar.com/greentags.htm">http://www.cascadesolar.com/greentags.htm</a></td>
<td>Pacific Northwest (OR, WA, ID, MT)</td>
</tr>
<tr>
<td>Production Incentive</td>
<td>Incentive payment</td>
<td>Sustainable Natural Alternative Power Program</td>
<td>Commercial, Industrial, Residential, Schools, Local Government, State Government, Agricultural,</td>
<td>Modeled after the successful Chelan County Public Utility District program, the amount paid by the utility to its renewable energy producers depends on the total amount contributed by OKPUD purchasers through their green pricing program (maximum payment is $1.00/kWh).</td>
<td><a href="http://www.okanoganpud.org/consSNAP.htm">http://www.okanoganpud.org/consSNAP.htm</a></td>
<td>Okanogan County PUD</td>
</tr>
<tr>
<td>CATEGORY</td>
<td>TYPE OF INCENTIVE</td>
<td>NAME</td>
<td>SECTORS</td>
<td>SUMMARY</td>
<td>WEBSITE</td>
<td>JURISDICTION</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Production Incentive</td>
<td>Right Purchase</td>
<td>Orcas Power &amp; Light - Production Incentive</td>
<td>Commercial, Residential</td>
<td>To receive an incentive, members must sign an Agreement for Interconnection granting OPALCO rights to the system’s Green Tags. The member receives $1.50 per kWh for half of the estimated first-year production.</td>
<td><a href="http://www.opalco.com/">http://www.opalco.com/</a></td>
<td>San Juan Islands</td>
</tr>
<tr>
<td>Utility Grant Program</td>
<td>Grant</td>
<td>Chelan County PUD - ResourceSmart Program</td>
<td>Commercial, Industrial</td>
<td>Helps industrial and commercial customers install energy-efficiency improvements by paying for a portion (up to 75 percent) of the up-front cost to replace, retrofit or install new equipment.</td>
<td><a href="http://www.chelanpud.org/resource-Smart.html">http://www.chelanpud.org/resource-Smart.html</a></td>
<td>Chelan County</td>
</tr>
<tr>
<td>Utility Loan Program</td>
<td>Loan</td>
<td>Clallam County PUD - Residential Solar &amp; Efficiency Loan Program</td>
<td>Commercial, Residential</td>
<td>Clallam County PUD offers residential and small commercial customers a low-interest loan program for energy efficient improvements and the purchase of photovoltaic and solar water heater systems.</td>
<td><a href="http://www.clallampud.net/conservation/loan-program.html">http://www.clallampud.net/conservation/loan-program.html</a></td>
<td>Clallam County PUD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clark Public Utilities - Solar Energy System Loan</td>
<td>Commercial, Residential</td>
<td>Financing available to its customers for the purchase and installation of residential solar equipment. Loans up to $6,000 are available for solar pool heaters and solar water</td>
<td><a href="http://www.clarkpubutilities.com/Residential/solarPrograms/solarLoa">http://www.clarkpubutilities.com/Residential/solarPrograms/solarLoa</a></td>
<td>Clark Public Utilities Customers</td>
</tr>
<tr>
<td>Utility Loan Program</td>
<td>Loan</td>
<td>Franklin County PUD - Energy Efficiency Loan Program</td>
<td>Residential, Multi-Family Residential</td>
<td>Low interest conservation and weatherization loans to customer homeowners for energy efficiency improvements.</td>
<td><a href="http://www.franklinpud.com/html/low_interest_loans.html">http://www.franklinpud.com/html/low_interest_loans.html</a></td>
<td>Franklin County PUD Customers</td>
</tr>
<tr>
<td>---------------------</td>
<td>------</td>
<td>---------------------------------------------------</td>
<td>--------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td>Loan</td>
<td>Franklin County PUD - Solar Energy System Loan</td>
<td>Residential, Multi-Family Residential</td>
<td>Residential loan program to customers making energy efficiency improvements. Loan amounts range from $400 to $7,000 for a single-family residence and up to $10,000 for a multi-family building. The interest rate is 3% Annual Percentage Rate</td>
<td><a href="http://www.franklinpud.com/html/low_interest_loans.html">http://www.franklinpud.com/html/low_interest_loans.html</a></td>
<td>Franklin County PUD Customers</td>
</tr>
<tr>
<td></td>
<td>Loan</td>
<td>Grays Harbor PUD - Solar Water Heater Loan</td>
<td>Residential</td>
<td>Low-interest loans to customers for energy efficiency projects. The interest rates for these loans are subsidized by the PUD.</td>
<td><a href="http://www.ghpud.org/index.php?option=com_content&amp;view=article&amp;id=114&amp;Itemid=141">http://www.ghpud.org/index.php?option=com_content&amp;view=article&amp;id=114&amp;Itemid=141</a></td>
<td>Grays Harbor PUD Customers</td>
</tr>
<tr>
<td></td>
<td>Rebate</td>
<td>Avista Utilities - LEED (NC or EB) Certification Incentive Program</td>
<td>Commercial, Schools, Institutional</td>
<td>Avista Utilities’ customers that achieve a minimum of 4 points for optimized energy performance and comply with all LEED whole building modeling requirements are eligible for a $1.25 per conditioned square foot rebate</td>
<td><a href="http://www.avistautilities.com/saving/conservation/LEED_commercial">http://www.avistautilities.com/saving/conservation/LEED_commercial</a></td>
<td>Avista Utilities Customers</td>
</tr>
<tr>
<td></td>
<td>Rebate</td>
<td>Avista Utilities Power</td>
<td>Commercial</td>
<td>Incentives to commercial customers who initiate a power management program for</td>
<td><a href="http://www.avistautilities.com/savprojects">http://www.avistautilities.com/savprojects</a></td>
<td>Avista Utilities Customers</td>
</tr>
<tr>
<td>City Operations</td>
<td>Fleet Management</td>
<td>Seattle Green Fleet Action Plan</td>
<td>City Vehicles</td>
<td>&quot;The 'Clean Green Fleet Action Plan' aims to increase the use of alternative fuels, reduce fleet fuel use, reduce vehicle emissions, and improve the fuel efficiency of the City of Seattle's fleet. Seattle’s long-term intent is to have a fleet that is 100% clean and green, through the use of clean fuels and vehicles that have the highest fuel efficiency and the lowest emissions and meet the needs of Seattle’s operations. The specific measures called for in the plan include a 5% reduction in annual fleet fuel use by 2005 as compared to 1999.&quot;</td>
<td><a href="http://www.seattle.gov/environment/Documents/CleanGreenFleetAP.pdf">http://www.seattle.gov/environment/Documents/CleanGreenFleetAP.pdf</a></td>
<td></td>
</tr>
<tr>
<td>Design Standards</td>
<td>LEED Certification</td>
<td>Sustainable Building Policy</td>
<td>City funded projects</td>
<td>Seattle’s Sustainable Building Policy calls for new City funded projects and renovations with over 5,000 square feet of occupied space to achieve a Silver Rating using the US Green Building Council’s (USGBC) LEED Rating System</td>
<td><a href="http://www.cityofseattle.net/dpd/GreenBuilding/CapitalProjects/SeattlesPolicy/default.asp">http://www.cityofseattle.net/dpd/GreenBuilding/CapitalProjects/SeattlesPolicy/default.asp</a></td>
<td></td>
</tr>
<tr>
<td>Site Generation</td>
<td>Grays Harbor PUD - Net Metering</td>
<td>Grays Harbor PUD created a formal net-metering program in early 2002. It differs slightly from what is required by Washington state law in that Grays Harbor PUD reimburses customers for net excess generation (NEG) at the end of each year, at 50% of the utility’s retail rate. State law allows utilities to require customers to grant NEG to the utility, without reimbursement, at the end of a 12-month billing cycle.</td>
<td><a href="http://www.clarkpublicutilities.com/AboutUs/newsRoom/Archives/2002news/Archives/9-25-02news">http://www.clarkpublicutilities.com/AboutUs/newsRoom/Archives/2002news/Archives/9-25-02news</a></td>
<td>Gray’s Harbor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Grays Harbor PUD has voluntarily gone beyond the state requirement in order to further encourage customers to install renewable generation.

<table>
<thead>
<tr>
<th>City Services</th>
<th>Renewable Portfolio Measure</th>
<th>Clark County - Green Power Purchasing</th>
<th>Public Facilities</th>
<th>Clark County</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In September 2002, Clark County announced that it will purchase 10 percent of its electricity requirements for all county buildings and facilities from renewable energy as part of the Clark Public Utilities' Green Lights program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------</td>
<td>------------------------</td>
<td>----------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Earth Day Resolution 30144 passed unanimously by the Seattle City Council in 2000, directs the city's municipal utility, City Light, to meet demand growth with no net increases in greenhouse gas emissions by: (a) using cost-effective energy efficiency and renewable resources to meet as much load as possible, and (b) mitigating or offsetting greenhouse gas emissions associated with any fossil fuels used to meet load growth.</td>
<td></td>
<td></td>
<td></td>
<td>Seattle</td>
</tr>
</tbody>
</table>
12. Appendix

Summary of draft Sno-PUD IRP

The purpose of an Integrated Resource Plan (IRP) is to establish an investment plan that ensures enough resources are available, at reasonable cost, to meet future customer needs. Achieving this objective requires consideration of all possible options and a plan that is adaptable to changing circumstances. Energy-efficiency, demand response programs, distributed generation, renewable power supplies, and purchased power contracts are all among the potential alternatives for Snohomish County PUD.

While the specifics of the final 2008 IRP are still under development, enough is known at this time to provide a preliminary picture of the PUD’s anticipated plan. It is clear that conservation and renewable energy resources will play a pivotal role in the new plan. Analyses of conservation and power supply options will be complete by late fall so that a power portfolio can be selected.

The PUD intends to pursue a mix of technologies and power resources to meet both its customers’ needs and the new state renewable portfolio standards (RPS), which become active January 1, 2012. The two-fold RPS calls for all qualifying utilities in Washington state to:

- Pursue all available conservation that is cost-effective, reliable, and feasible.
- Provide at least 3% eligible renewable energy by 2012, 9% by 2016 and 15% by 2020.

The PUD will seek eligible renewables consisting largely of wind; however, solar, tidal, biomass, geothermal and other environmentally friendly energy resources will be investigated as well. In July 2007, the PUD issued a Request for Proposals from renewable resource developers. Responses that appear attractive from a cost and technical perspective will be included in the final IRP.
Strategy & Guidelines

The 2008 Interim IRP is shaped by three Commission policy guidelines:

- Work regionally and nationally to protect the PUD’s existing resources and ensure access to new resource opportunities.
- Pursue all cost-effective energy conservation programs and look for ways to accelerate acquisition where possible and economical.
- To meet future loads not served by conservation, pursue a power supply portfolio composed of purchased power contracts, generating assets the PUD owns and, if attractive, BPA Tier 2 options. To the extent possible, this portfolio should be composed of resources that are in the PUD’s service area and that are renewable or environmentally benign.

Action Plan

To support the Commission policy guidelines, PUD staff has developed the following eight-point action plan to be accomplished over the next five years.

- Identify and implement all cost-effective energy-efficiency and demand-side management programs.
- Investigate new demand-side management opportunities and methods for accelerating acquisition of savings.
- Actively pursue contracts for and/or ownership of new renewable resources to meet load growth.
- Investigate tidal, geothermal, and pumped storage options and chart plans for moving forward with the development of promising projects. Monitor other emerging technologies for economic potential and PUD application.
- Evaluate the potential for distributed generation resources — both customer-owned and PUD-owned — within the PUD’s service territory. Establish programs that encourage the development of those options that are achievable and economic.
- Work with BPA to establish a 2011-2028 power supply contract that maximizes the benefits of the federal power system to the PUD.
- Participate in regional transmission forums to ensure adequate transmission capacity is available to deliver BPA and other generating resources to PUD loads.
- Continue the ongoing development of staff knowledge, tools, analysis frameworks, and databases used to evaluate both supply and demand-side resource options.
13. Glossary

**Biofuel**

A fuel produced from dry organic matter or combustible oils produced by plants. Examples of biofuel include alcohol (from fermented sugar), black liquor from the paper manufacturing process, wood and soybean oil.


**Biodiesel**

Biofuel is a gaseous, liquid or solid fuel that contains energy derived from a biological source. For example, rapeseed oil or fish liver oil can be used in place of diesel fuel in modified engines. A commercial application is the use of modified rapeseed oil, which as rapeseed methyl ester (RME) can be used in modified diesel engines, and is sometimes named biodiesel.


**Btu: British thermal unit**

Is a unit of energy used in the United States of America, particularly in the power, steam generation and heating and air conditioning industries. Although it is still used 'unofficially' in metric English-speaking countries (such as Canada, the United Kingdom, and sometimes in New
Zealand), it is increasingly an outmoded and outdated unit of measure. Elsewhere (and always in scientific use) the BTU has been replaced by the SI unit of energy, the joule (J).

In North America, the term "BTU" is used to describe the heat value (energy content) of fuels, and also to describe the power of heating and cooling systems, such as furnaces, stoves, barbecue grills, and air conditioners. When used as a unit of power, BTU per hour (BTU/h) is understood, though this is often confusingly abbreviated to just "BTU".

Conversions:

One BTU is approximately:

- The energy produced by burning one wooden match
- 1,054—1,060 joules
- 252—253 cal (calories, small)
- 0.252—0.253 kcal (kilocalories)
- 778—782 ft·lbf (foot-pounds-force)


**CFL: Compact Fluorescent Lamp**

Type of fluorescent lamp designed to replace an incandescent lamp. Many CFLs can fit in the existing incandescent light fixtures.

Compared to incandescent lamps of the same luminous flux, CFLs use less energy and have a longer rated life. In the United States, a CFL can save over US$30 in electricity costs over the lamp’s lifetime compared to an incandescent lamp and save 2000 times their own weight in greenhouse gases[1]. The purchase price of a CFL is higher than that of an incandescent lamp of the same luminous output, but this cost is recovered in energy savings and replacement costs over the bulb’s lifetime.


**CO₂: Carbon Dioxide Equivalent**

A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP).

Source: European Environment Agency Glossary
http://glossary.eea.europa.eu/EEAGlossary/C/carbon_dioxide_equivalent

**Embodied Energy**
Refers to the quantity of energy required to manufacture, and supply to the point of use, a product, material or service. Traditionally considered, embodied energy is an accounting methodology which aims to find the sum total of the energy necessary - from the raw material extraction, to transport, manufacturing, assembly, installation as well as the capital and other costs of a specific material - to produce a service or product and finally its disassembly, deconstruction and/or decomposition.


**Embedded Energy**

Also called “Embodied Energy”. See above definition.

**EPA: Environmental Protection Agency**

Name of several governmental agencies, charged with environmental responsibilities. It includes:

Australia

- Victoria — Environment Protection Authority (Victoria)
- Queensland — Environmental Protection Agency (Queensland)
- New South Wales — New South Wales Department of Environment and Climate Change (formerly called the “Environment Protection Authority”)
- Western Australia — Environmental Protection Authority of Western Australia

United Kingdom

- Scotland — Scottish Environment Protection Agency

The Republic of Ireland

- Ireland — Environmental Protection Agency (Ireland)

United States

- Federal — United States Environmental Protection Agency
- California — California Environmental Protection Agency
- Illinois — Illinois Environmental Protection Agency
- Ohio — Ohio Environmental Protection Agency

**GREET: Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation**

Software model developed with the sponsorship from the U.S. Department of Energy by Argonne National Laboratory. This model evaluates energy and emission impacts of advanced vehicle technologies and new transportation fuels, the fuel cycle from wells to wheels and the vehicle cycle through material recovery and vehicle disposal need to be considered.

**Heat Rate for Fuel Source**
A measurement used in the energy industry to calculate how efficiently a generator uses heat energy. It is expressed as the number of BTUs of heat required to produce a kilowatt-hour of energy. Operators of generating facilities can make reasonably accurate estimates of the amount of heat energy a given quantity of any type of fuel, so when this is compared to the actual energy produced by the generator, the resulting figure tells how efficiently the generator converts that fuel into electrical energy.


Source: Argonne National Laboratory http://www.transportation.anl.gov/software/GREET/

IPCC: Intergovernmental Panel on Climate Change

Scientific body tasked to evaluate the risk of climate change caused by human activity. The panel was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations.

kWh: Kilowatt-hour

It is most commonly used on household electricity meters in the form of the kilowatt-hour (kW·h or kWh), which is 1,000 watt-hours. 1 watt-hour is equivalent to 3,600 joules (1 J/s x 3600 s), the joule being the canonical SI unit of energy. Thus a kilowatt-hour is 3,600,000 joules or 3.6 megajoules.


PUD: Public Utility District

Entity that provides, electricity, natural gas, sewer, waste collection, wholesale telecommunications, water, etc., to the residents of that district.

Liquid Natural Gas

Is natural gas that has been converted to liquid form for ease of storage or transport. LNG is about 1/614th the volume of natural gas at standard temperature and pressure (STP), making it much more cost-efficient to transport over long distances where pipelines do not exist.


Net Energy by Fuel Source

Refers to a surplus condition in the difference between the energy required to harvest an energy source and the energy provided by that same source. A net energy gain is achieved by expending less energy acquiring a source of energy than is contained in the source to be consumed. That is,
\[ \text{NEG} = \text{Energy}_{\text{Consumable}} - \text{Energy}_{\text{Expended}} \]

That definition becomes far more complicated when considering different sources of energy, the way energy is used and acquired, and the different methods that are used to store or transport the energy.


**Telecommute**

Is a work arrangement in which employees enjoy limited flexibility in working location and hours. In other words, the daily commute to a central place of work is replaced by telecommunication links.

14. List of Tables

Figure 1: Total Air Pollutant (1999) and CO2 Emissions (2001) by Source (millions of tons)........................................................................................................................................... 7
Figure 2: Land Use Plan, Lynnwood 2006.............................................................................................................. 12
Figure 3: Proposed Changes in Land Use (1999-2026)......................................................................................... 13
Figure 4: Means of Transportation To Work For Workers 16 Years and Over, Lynnwood, WA...................................................................................................................................................... 15
Figure 5: Road Mileage, Lynnwood (2006) ........................................................................................................ 15
Figure 6: Tentative Light Rail Alignment and Stations, Lynnwood ................................................................. 17
Figure 7: Comprehensive Plan Bike Plan (2006) .................................................................................................. 18
Figure 8: Community Transit Routes, Lynnwood ............................................................................................ 19
Figure 9: Regional Bus Rapid Transit System, Puget Sound .............................................................................. 20
Figure 10: Local Government Spending Per Capita (United States, 1950-2000)............................................. 21
Figure 11: City of Lynnwood’s Energy Related Expenses................................................................................... 22
Figure 12: Annual Electricity Consumption for City of Lynnwood Facilities .................................................. 22
Figure 13: Electricity Use by Lynnwood Public Building..................................................................................... 22
Figure 14: Electrical Energy Retrofits and Estimated Annual Savings, City of Lynnwood ................................................................. 23
Figure 15: Variation in Annual Energy Use for the Major Public Buildings, Lynnwood ............................................................... 24
Figure 16: Natural Gas Use in Lynnwood Public Buildings ................................................................. 25
Figure 17: High Pressure PSE Gas Main Lines, City of Lynnwood ................................................................. 26
Figure 18: Snohomish PUD Power Purchases (2006) .............................................................................. 27
Figure 19: Snohomish PUD Power Fuel Mix (2005) .............................................................................. 28
Figure 20: Snohomish PUD Main Lines and Substations, Lynnwood ................................................................. 28
Figure 21: Stormwater Basins, Lynnwood ......................................................................................... 29
Figure 22: Impermeable Surfaces by Land Use .............................................................................. 29
Figure 23: Sno-PUD’s Energy Consumption for Lynnwood’s Wastewater Treatment Plant .............................................................................. 30
Figure 24: Electrical End Use of Wastewater and Water Treatment Plants, City of Lynnwood .............................................................................. 31
Figure 25: 2006 Fleet Fuel Patterns, City of Lynnwood .............................................................................. 31
Figure 26: Regional Sources for Natural Gas, Northwest .............................................................................. 42
Figure 27: Natural Gas Supply in the Pacific Northwest .............................................................................. 43
Figure 28: Projected US Supply/Demand Balance .............................................................................. 44
Figure 29: Service Areas of Gas Utilities in the Pacific Northwest, 2007 ................................................................. 45
Figure 30: Cumulative PNW Gas Deliveries ......................................................................................... 46
Figure 31: Pacific Northwest Natural Gas Demand Forecast (2010-2011) ......................................................................................... 47
Figure 32: US Natural Gas Wellhead Price ......................................................................................... 47
Figure 33: Potential LNG Terminals in the Pacific Northwest ......................................................................................... 47
Figure 34: Annual Energy by Customer Class ......................................................................................... 48
Figure 35: PUD Annual Average MW Conservation Savings ......................................................................................... 49
Figure 36: Crude Oil Imports (Top 15 Countries)(Thousand Barrels per Day) ................................................................. 51
Figure 37: Total Imports of Petroleum (Top 15 Countries) (Thousand Barrels per Day) ................................................................. 53
Figure 38: Annual Energy Demand per Land Use ......................................................................................... 54
Figure 39: Pacific Northwest Energy Consumption ......................................................................................... 54
Figure 40: Washington State Energy Consumption Estimates (by sector in Trillion BTUs) ......................................................................................... 55
Figure 41: Comparison of Per Capita Electricity Consumption ............................................. 60
Figure 42: CCX Emission Targets .................................................................................... 68
15. End Notes

i Typically, this would include also manufacturing and agriculture. However, these sectors are not evident in Lynnwood.

ii The US Department of Energy Web site claims that Integrated Resource Planning was mandated by the Energy Policy Act of 1992. Section 114 of the Environmental Policy Act (EPAct) lays out the framework for an IRP, and the Western Area Power Administration Web site includes detailed instructions on how to prepare an IRP.

An IRP assesses both sides of the energy equation: what energy is used and what resources are available. The goal is to combine demand-side management (DSM) with existing energy supplies and new supplies such as distributed generation. The IRP can take into account energy efficiency and load-management programs, environmental and social factors, as well as economic costs and benefits, public participation, and the uncertainties and risks posed by different choices. It:

- Integrates DSM programs, fuel switching and system-loss reduction with supply expansion
- Integrates private producers, distributed generation and co-generation (CHP) with utility generation options
- Integrates environmental impacts and risks with cost analysis (including trading of emission credits)
- Integrates the public 'total resource' perspective with the utility perspective (subject to regulatory situation).
The process walks the planner through (1) assessing existing resources (e.g., power plants), forecasting future electric loads, and identifying objectives (e.g., reliable service, minimal environmental impacts, reasonable prices for consumers); (2) identifying options to deal with the discrepancy between expected loads and existing capacities; and (3) evaluating the economic, environmental, and societal conditions of those options. A typical IRP has six sections:

2. Resource Assessment (Cost Curves for Energy Supply + Savings)
3. Integrated Resource Analysis (Resources Ranked by Cost and Risk)
4. Policy Considerations (Effects on Environment and Regional Economy)
5. Final Resource Portfolio (Least Total Cost from "Societal Perspective")
6. Implementation Plan (Efficiency Programs + Supply Integration).

Possible options to be considered are listed below.

**Demand-Side Options:**

- Consumer Energy Efficiency — home weatherization, energy-efficient appliances, lighting, heating and air conditioning, water heating, duct repair, motors, refrigeration, energy-efficient construction, appliance timers and controls, thermal storage, and geothermal heat pumps
- Utility Energy Conservation — load management, high efficiency motors, and reduced transmission and distribution losses
- Rates — time-of-use, interruptible, and revenue decoupling
- Renewables — solar heating and cooling, photovoltaics, passive solar design, and daylighting.

**Supply-Side Options:**

- Conventional Power Plants — fossil-fuel, nuclear, extending the life of existing plants, hydro/pumped storage, repowering, and utility battery storage
- Non-Utility-Owned Generation — cogeneration, independent power producers, and distributed generation
- Purchases — requirement transactions, coordination transactions, and competitive bidding
- Renewables — biomass, geothermal, solar thermal, photovoltaics, and wind.

iii By some accounts, the EIA estimates that natural gas consumption for energy generation could be in the range of nearly 23% of total natural gas use

iv Greenhouse gases include carbon dioxide, nitrous oxide and methane principally, and minor gases such as hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. Based on emission levels and potential weighted impact on global warming, carbon dioxide emissions are of the greatest concern since it represents 85% of total US GHG emissions (as measured in 2002). Methane and nitrous oxide account for 14% while the other gases represent the balance.

v According to Environment Canada website (http://www.ec.gc.ca/pdb/ghg/about/gases_e.cfm) “the anthropogenic emissions of CO₂ are known to be small (~2%) of total global emissions, but they are perceived to account for most of the observed accumulated CO₂ in the atmosphere. The primary
anthropogenic sources of CO₂ are fossil-fuel combustion (including both stationary and mobile sources),
deforestation (resulting in permanent land use change), and industrial processes such as cement
production. Deforestation, land use and subsequent soil oxidation have been estimated to account for
about 23% of human-made CO₂ emissions. The primary natural sources include: respiration by plants
and animals, decaying organic matter and fermentation, volcanoes, forest/grass fires and oceans. On a net
basis, natural carbon balancing processes such as photosynthesis and the oceanic reservoir remove most
CO₂. Over the 45 years leading to 1996, global emissions of carbon dioxide grew from about 6.4 Gt to
23.9 Gt, almost a fourfold increase. Excess global methane emissions resulting from human activities, are
considered to have caused an increase of about 145% in atmospheric concentrations since the mid-1700s.
The current annual rate of accumulation is estimated to range between 40 and 60 Mt CH₄ yr⁻¹ (~14 - 21
ppbv), or approximately 10% of total worldwide methane emissions. The anthropogenic CH₄ emissions,
amounting to ~360 Mt per year, are primarily the result of activities such as livestock and rice
cultivation, biomass burning, natural gas delivery systems, landfills and coal mining. Although several
uncertainties exist in the actual contributions and relative importance of these sources, emission
reductions of about 8% are thought to be required to stabilize methane concentrations at current levels. It
has been estimated that approximately one third of global atmospheric nitrous oxide is of human origin,
resulting primarily from the application of nitrogenous fertilizers and the combustion of fossil fuels and
wood. The atmospheric concentration of nitrous oxide has grown by about 15% since the mid-1700s.
Total annual emissions from all sources are estimated to be within the range of 10 to 17.5 Mt N₂O,
expressed as N. Soil and water denitrification under anaerobic conditions is the primary natural source of
N₂O.

xv http://www.transportation.anl.gov/software/GREET/
xvi DRAFT Washington State Climate Advisory Team Greenhouse Gas Inventory and Reference Case
Projections, 1990-2020
xvii Institute for Environmental Research and Education. Pacific Northwest Energy Independent
Communities, A 10-Year Plan. http://iere.org/documents/EnergyIndependentCommunities-
10yearplan.pdf
xviii Snohomish County PUD. http://www.snopud.com/energy/pwrsource.ashx?p=1878#fuelmix ;
http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=WA
xix Keith Maw, Personal Communication
xx www.energystar.gov
xxiv http://www.bpc.oppco.org/
xxvi Distributed generation generates electricity from many small energy sources. It has also been called
on-site generation, dispersed generation, embedded generation, decentralized generation, decentralized
energy or distributed energy. Currently, industrial countries generate most of their electricity in large centralized facilities, such as coal power plants, nuclear reactors, hydropower or gas powered plant.

These plants have excellent economies of scale, but usually transmit electricity long distances. Coal plants do so to prevent pollution of the cities. Nuclear reactors are thought too unsafe to be in a city. Dam sites are often both unsafe, and intentionally far from cities. The coal and nuclear plants are often considered too far away for their waste heat to be used for heating buildings. Low pollution is a crucial advantage of combined cycle plants that burn natural gas. The low pollution permits the plants to be near enough to a city to be used for district heating and cooling. Distributed generation is another approach. It reduces the amount of energy lost in transmitting electricity because the electricity is generated very near where it is used, perhaps even in the same building. This also reduces the size and number of power lines that must be constructed. Typical distributed power sources have low maintenance, low pollution and high efficiencies. In the past, these traits required dedicated operating engineers, and large, complex plants to pay their salaries and reduce pollution. However, modern embedded systems can provide these traits with automated operation and clean fuels, such as sunlight, wind and natural gas. This reduces the size of power plant that can show a profit.

The usual problem with distributed generators are their high costs. The one exception is probably microhydropower. A well-designed plant has nearly zero maintenance costs, and generates useful power indefinitely. One favored source is solar panels on the roofs of buildings. These have high construction costs ($2.50/W, 2007). This is about fiftyfold higher than coal power plants ($0.047/W, 2007) and 40-fold higher than nuclear plants ($0.06/W, 2007). Most solar cells also have waste disposal issues, since solar cells often contain heavy-metal electronic wastes. The plus side is that unlike coal and hydropower, there are no pollution, mining safety or operating safety issues. Another favored source is small wind turbines. These have low maintenance, and low pollution. Construction costs and total safety are also manyfold ($0.80/W, 2007) more per watt than large power plants, except in very windy areas. Wind towers and generators have substantial insurable liabilities caused by high winds, but good operating safety.

Distributed cogeneration sources use natural gas-fired microturbines or reciprocating engines to turn generators. The hot exhaust is then used for space or water heating, or to drive an absorptive chiller for air-conditioning. The clean fuel has only low pollution. Designs currently have uneven reliability, with some makes having excellent maintenance costs, and others being unacceptable. Cogenerators are also more expensive per watt than central generators. They find favor because most buildings already burn fuels, and the cogeneration can extract more value from the fuel. Some larger installations utilize combined cycle generation. Usually this consists of a gas turbine whose exhaust boils water for a steam turbine in a Rankine cycle. The condenser of the steam cycle provides the heat for space heating or an absorptive chiller. Combined cycle plants with cogeneration have the highest known thermal efficiencies, often exceeding 85%. (Source: Wikipedia.com)