Department of Commerce
Innovation is in our nature.

2012 Washington State Energy Strategy

With Forecasts 2012-2035

Issues and Analysis for the Washington State Legislature and Governor

December 2011

Rogers Weed, Director

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This document was authored by the **Washington Department of Commerce, State Energy Office**; Tony Usibelli, Energy Office Director; and staff.

Glenn Blackmon	topic specialist (efficiency financing)
Angela Burrell	analysis
Gustavo Collantes	topic specialist (transportation)
Roel Hammerschlag	project management
Keibun Mori	analysis
Jennifer Motteler	administrative support
Peter Moulton	interagency coordination
Darleen Muhly	cartography
Chuck Murray	topic specialist (buildings efficiency)
Greg Nothstein	analysis
Meg O'Leary	Advisory Committee coordination
Carolee Sharp	administrative support
Rebecca Stillings	communications

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Washington State Department of Commerce
Energy Office
1011 Plum Street SE
P.O. Box 43173
Olympia, WA 98504-3173
commerce.wa.gov/energy

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Appendices are available at www.commerce.wa.gov/energystrategy

Abbreviations and Definitions

AEO Annual Energy Outlook
The primary energy forecast document of the EIA.

ARRA American Recovery and Reinvestment Act
The federal "stimulus bill" passed in 2009, Public Law 111-5.

BPA Bonneville Power Administration
A federal agency charged with managing the generation of electric power supplied to the Pacific Northwest.

Btu British thermal unit
A unit of energy. For scale: 1,000 Btu will bring a three-quart pot of water to boiling.

CAFE Corporate Average Fuel Economy
A standard requiring minimum average fuel efficiencies for the portfolio of vehicle models manufactured by any one corporation.

CHP Combined Heat and Power
Energy generation systems in which a single source of heat simultaneously powers a (usually industrial) process and generates electricity.

DE Distributed Energy
The concepts of distributed generation, combined heat and power, and district heating combined.

DG Distributed Generation
Decentralized electricity generation.

DOE United States Department of Energy

EIA Energy Information Administration
A division of the U.S. Department of Energy.

EV Electric Vehicle
Any vehicle that includes an electric motor drive of the wheels.

FERC Federal Energy Regulatory Commission

GHG Greenhouse Gas
Any gaseous emission associated with global warming, including but not limited to carbon dioxide and methane.

GMA Growth Management Act
State policy governing comprehensive land use planning.

GSP Gross State Product
A measure of the size of a state's economy. The sum of all payments between all sectors.

LDV Light Duty Vehicle
A car, pickup, or SUV.

mmBtu Million Btu
One million Btu (a unit of energy). For scale: an average household consumes about 30 mmBtu per year.

$MMTCO_2e$ Million Metric Tons of Carbon Dioxide Equivalent
One million $MTCO_2e$ (a unit of greenhouse gas emissions).

mpg Miles per Gallon

$MTCO_2e$ Metric Ton of Carbon Dioxide Equivalent
A unit of greenhouse gas emissions.

PAYD Pay-As-You-Drive
An insurance product with a variable premium based on the quantity of driving.

PEV Plug-in Electric Vehicle
An electric vehicle that is not a hybrid electric vehicle – the only fuel for a PEV is electricity drawn from a charging station.

PSRC Puget Sound Regional Council
A regional planning organization serving King, Pierce, Snohomish and Kitsap counties.

RCW Revised Code of Washington
RCW is the document that continuously compiles all of Washington's state law as it is legislated (not to be confused with Washington Administrative Code, or WAC, which contains rules developed by state agencies in order to comply with the laws described in the RCW).

RFS Renewable Fuels Standard
A standard requiring a minimum fraction of liquid fuels to be generated from renewable feedstocks.

SEPA State Environmental Policy Act
Washington law that requires state and local agencies to consider the likely environmental consequences of a proposal before approving or denying the proposal.

SOV Single Occupancy Vehicle
A car carrying only its driver.

TBtu Trillion Btu
One trillion Btu (a unit of energy). For scale: the entire Washington energy budget is about 1,500 TBtu per year.

UTC Washington Utilities and Transportation Commission

UW University of Washington

VMT Vehicle Miles Traveled

WEMS Washington Energy Modeling System
A planned architecture for integrated modeling of Washington's energy system.

WSDOT Washington State Department of Transportation

WSU Washington State University

Executive Summary

The Washington State Energy Strategy

Powerful solutions for economy, jobs and climate

A moment of opportunity

The 2012 Washington State Energy Strategy comes at a moment of opportunity, a time when our state's policy makers can look to the long-term priorities for energy, economic vitality and climate stability.

We have this opportunity because in the near term our state faces no great crisis in energy supply. There are exceptions, especially in volatile gasoline prices, but since 2008 the typical Washington family energy bill has been stable or even declining. Natural gas prices have fallen as new technologies have opened up substantial reserves in the U.S. and Canada. The public has embraced renewable energy and conservation, requiring that electric utilities include these resources in their portfolios. Even after decades of growth, we continue to lead the nation in low-cost industrial electricity rates, providing an enduring competitive advantage for industrial growth and employment.

Innovation and investment have expanded our range of options. Tens of billions of dollars in recent global investments in energy technologies are now paying dividends, to the point that wind and other renewable energy systems are challenging conventional power resources on cost. Consumers have greater choice among fuel-efficient vehicles, including hybrids and all-electric vehicles. Boeing delivered its first 787 airliner this fall, 20 percent more fuel-efficient than its predecessor, and Alaska Airlines is making 75 flights a week using a biofuel blend based on cooking oil. Consumers have options for high-efficiency lighting systems, heat pumps and water heaters that were just engineering concepts a few years ago.

The path ahead, however, is not obvious or simple. We still spend more than $20 billion per year on energy – more than 6 percent of the state's economy. Most of that money leaves the state to cover fossil fuel costs. Moreover, global events add volatility to crude oil prices, creating energy cost risks. The energy supply system has grown more complex over time. Wind farms and photovoltaic systems require coordination with the legacy power system. Our energy industry must meet the voter-mandated standards for renewable and conservation resources. It must recharge new electric vehicles and reliably energize internet server farms. It must supply a multi-fuel transportation system. Carbon footprints must be measured and reduced.

The economic recession heavily influences the priorities and strategies in the 2012 Energy Strategy. Washington's economy was thumped hard in 2008, and the experts say full recovery is still years away. Energy prices are a potential drag on that recovery. At the same time electric rates in Cowlitz County increased 18 percent this fall, and millions of other customers felt the effect of an 8 percent wholesale price increase by the Bonneville Power Administration. The downturn dampened projected growth in energy demand and greenhouse gas emissions, but that is not how we intend to save energy.

We aim to grow the economy by creating clean energy jobs through greater energy efficiency and renewable energy. This is the path of the 2010 Clean Energy Leadership Council. We have a growing regional expertise in integrating wind into the electric grid and turning our abundant biomass into energy, which can serve as a foundation for job growth.

Our approach to a comprehensive energy strategy is also motivated by concern about climate change. Policy makers and the public have recognized the effect of climate change on our lives, and Washington is committed to reducing its contribution to the global problem. In just the short time since the Legislature authorized the 2012 Energy Strategy in 2010, evidence has accumulated of damage to health, safety and economic well-being caused by climate change. Just as energy production and consumption drive climate effects, environmental concerns must drive energy policy.

As decision-makers set a direction for the state's energy future, the choices are complex and sometimes contradictory, but the desired outcomes are clear. We seek a set of energy policies that will supply the muscle behind our state's economy, maintain affordable energy prices for our families and businesses and protect our global environment from the adverse effects of fossil fuels.

In short, we want an energy strategy that promotes clean job growth, competitive prices and lower greenhouse gas emissions.

The path ahead

Energy affects virtually every aspect of daily life; as the Legislature said in initiating this work, energy "drives the entire modern economy." From universities to espresso stands, wheat farms to ferries, everybody has an energy bill and is affected by energy availability and cost. With energy so pervasive in our lives, there is practically no end to the range of possible policies to include in a strategy. From this wide array several common themes emerged, perhaps none more strongly than the emphasis on energy efficiency. We can reduce our consumption of energy, particularly fossil fuels, and still improve our economic well-being if we increase our efficiency. This is a long-standing public policy in Washington, beginning with the first, voluntary building energy efficiency code in 1977, and it runs throughout the 2012 Energy Strategy.

The Energy Strategy also reflects the state's commitment to remain a leader in energy efficiency, sustainability and innovation and to build a clean energy economy. Our expertise in seemingly unrelated sectors, such as information technology and material sciences, can advance our competitive advantage in electric vehicles, bioenergy and smart grid systems. The importance of well-informed consumer choice is another common theme within this energy strategy. We are, by economic necessity, in a time of smaller government. Tax revenues for new government programs are scarce, but much can be accomplished by ensuring that individual consumers of energy have information and tools to make wise energy choices. Market-based policies that rely on individual choice include setting prices to reflect environmental effects and promoting assessment and disclosure of building energy performance. The strategy also calls for standards that reflect desired outcomes. Efficiency standards have been very effective in improving the performance of our vehicles and our buildings, and consistent use of standards provides a sound base for competition.

For the 2012 Energy Strategy we considered many ideas but chose one major area of emphasis – transportation – and two significant other topics, buildings efficiency and distributed energy. These areas of emphasis represent our greatest potential to transform energy use in ways that promote jobs, fair prices, and climate stability:

- A more efficient and coordinated system of transportation.
- A broader approach to energy efficiency in buildings.
- A more diverse supply portfolio through distributed energy.

Transportation

Increase transportation efficiency while reducing carbon emissions

Moving people and goods

The emphasis of this energy strategy on transportation issues reflects the dominant and growing burden that energy for transportation places on our economy, our household budgets and our environment. This is not meant to suggest that transportation problems are exclusively an energy issue. The gridlocked Puget Sound traffic map is a mobility problem for transportation planners and an emissions problem for environmental planners. It, and the rest of the transportation system, is also an energy problem, since more than half of the state's energy expenditures go to move people and goods within the state. Beginning with the first Washington State Energy Strategy in 1993, policy makers recognized the key role of transportation in energy planning, and we continue this emphasis here.

Transportation is not just the state's largest energy use sector but also its least efficient sector. Buses, cars, trucks and aircraft are more efficient than they used to be, yet they still turn more of their fuel into heat and fumes than into useful movement. Motor fuels also have a bigger carbon footprint than natural gas, emitting 30 percent more carbon per unit of useful energy. Finally, petroleum is also the most economically and politically volatile of all energy resources; we reduce risk to our economy and families when we reduce our reliance on petroleum.

To make progress in the transportation sector, the energy strategy recommends a policy package based on multiple approaches to improve our use of energy to move people and goods. The strategy would encourage more efficient vehicles, improve the fuels used in transportation and reduce the number of trips and driving miles required by families and businesses.

Improved vehicles and fuels

Electric vehicles are a reality and our state's policy approach can make a meaningful difference in how quickly they are adopted by consumers and businesses. Encouraging public charging stations, for example, is key to consumer support of electric vehicles. These policy recommendations build on the Legislature's 2009 decision to create an alternative fuel corridor pilot project and to exempt charging stations from public utility regulation. The state Plug-in Electric Vehicle Task Force is helping develop this corridor. More work lies ahead in deploying a

robust charging network, and success will bring the need to integrate a significant new electricity demand into our power grid.

Other recommended policies support increasing the efficiency of diesel fuel use by improving truck aerodynamics and using low-friction engine lubricants. These approaches apply existing technologies and can improve public health along with our economy and climate.

In addition, policy changes can champion new technologies that improve the fuel itself by making it burn cleaner and more efficiently or by manufacturing it from renewable resources. For example, the strategy recommends a near-term policy to require using more biodiesel in motor fuels mixes. In the longer term, the state should examine ways to reduce carbon in the fuel cycle. This latter effort would look at the entire process of acquiring and using fuels, rather than just focusing on the content of fuels at the pump.

More efficient travel

A comprehensive understanding of energy efficiency in transportation requires that we look not just at the efficiency of the vehicles and fuels but also at the efficiency of travel itself. An unnecessary trip in a high-efficiency car is still a waste of energy and money. Potential policies range from immediate actions such as encouraging carpooling to long-term decisions about how best to plan and organize cities for travel and energy efficiency.

Public programs to manage and reduce commute trips should be expanded. Washington already has a successful commute trip reduction program that works through employers to encourage car pools and public transportation use, as well as telecommuting and compressed work schedules. Commute trip reduction programs are a proven strategy in our state to reduce work trip vehicle miles traveled. To increase savings, programs must expand to include smaller employers and non-commute trips. The state Department of Transportation has already demonstrated the value of this approach through its Growth and Transportation Efficiency Center (GTEC) program.

The strategy identifies smart growth as the long-term key to more efficient travel. Communities that are compact and transit-oriented will need less transportation and consume fewer energy resources. The energy strategy recommends smart growth approaches that would:

- Promote housing and employment density in urban areas.
- Provide parking incentives and management.
- Encourage bicycle and pedestrian accessibility.
- Increase urban brownfield redevelopment.
- Develop integrated multimodal transportation systems.

Better pricing of trips

Each time a consumer or worker makes a decision about when, how or whether to make a trip, that decision has the potential to impose congestion and pollution costs on fellow citizens. The

strategy recommends a close look at how travel pricing can be used to influence those millions of individual travel decisions. A near-term possibility is to pilot the conversion of fixed transportation charges to expenses that vary with the number of trips taken or miles driven. Potential examples include an electric vehicle mileage charge or mileage-based auto insurance. Longer-term approaches to consider include implementing direct charges on road use and carbon emissions, possibly including a revenue-neutral tax on carbon, offset by reductions in other state taxes.

Near-Term Recommendations for Transportation

vehicles and fuels	travel efficiency	pricing
3.4.1 electric vehicle support Expand and support infrastructure behind the use and production of electric vehicles. *p.31* 3.4.2 renewable fuels standard Require five percent biodiesel content at the diesel pump. *p.31* 3.4.3 diesel engine fuel efficiency improvements Research new state programs or federal partnerships to promote demonstrated technologies while leading with improvements to the state's ferry fleet. *p.38*	3.4.4 Commute Trip Reduction program expansion Renew funding for the Growth and Transportation Efficiency Center subprogram. *p.40* 3.4.5 smart growth and transportation planning Cooperate with local governments to promote high-efficiency travel through compact development patterns in urban growth areas. *p.45* 3.4.6 transportation systems management Expand application of demonstrated transportation systems management techniques. *p.51* 3.4.7 Regional Mobility Grants Assess the project type most likely to benefit from new regional mobility grants, including quantifying energy impacts. *p.55*	3.4.8 electric vehicle mileage pricing pilot Design, and eventually deploy, a mileage-pricing program for electric vehicles. *p.57* 3.4.9 car sharing and mileage based insurance Enable mechanisms that more strongly connect travel cost to distance. *p.58*

Long-Term Policy Options for Transportation

vehicles and fuels	travel efficiency	pricing
3.5.1 revenue neutral feebate *p.62* 3.5.2 low carbon fuel standard *p.69* 3.5.3 advanced aviation fuels *p.72* 3.5.4 improvements to railroads *p.74*	3.5.5 comprehensive trip reduction program *p.76* 3.5.6 energy efficient transportation choices *p.81*	3.5.7 emerging pricing methods *p.85* 6 carbon pricing *p.141*

Buildings

Create a strong foundation of energy efficiency

Energy savings and jobs

The buildings component of the energy strategy is, like a building itself, built upon a strong foundation – three decades of effort to get more efficiency from the energy used to heat, cool, illuminate and power our homes and businesses. This effort began with the state's electric utilities, guided by the analysis and direction of the Northwest Power and Conservation Council, and includes the state's natural gas distribution utilities. The strategy seeks to extend those gains to additional energy sectors and customers.

The energy savings that result from more efficient houses and offices are just one reason for pursuing this strategy. Another important reason is the effect on jobs in the construction industry. Employment in this sector fell by one-third with the collapse of the housing bubble in 2008, and new construction activity is not likely to return to 2008 levels anytime soon. Energy retrofit work now could restore some of those jobs while putting more disposable income in the pockets of families, businesses and government agencies. The policy recommendations for buildings seek to

- make it easier for property owners to identify the most effective energy improvements,
- enable financing of those improvements using the energy costs savings from the improvement itself; and
- build consumer confidence in the quality and value of energy efficiency projects.

The strategy also recognizes the need to sustain the state's successful low-income weatherization efforts. The poor pay a higher share of their income in energy costs, and the state receives federal funds to help low-income households pay their utility bills and upgrade the energy performance of their homes. Washington expects to see a significant drop in federal support in 2012, and the energy strategy calls on policy makers to find new ways to fill that gap.

Valuing energy performance

Property owners will be more willing to improve their buildings if they can be confident that prospective tenants and buyers will recognize the value of those improvements. We recommend mechanisms to increase disclosure and valuation of energy performance. Even a simple annual energy statement could help customers monitor performance, focus attention and encourage action. Another policy would improve coordination among utility, government and private sector participants in the energy efficiency building retrofit industry, with a focus on marketing and quality assurance for building energy efficiency contractors.

The disclosure strategy would build on a requirement adopted by the Legislature in 2009. The legislation now applies to non-residential buildings larger than 10,000 square feet. Owners must disclose the building's energy performance to prospective tenants, buyers and lenders. An expanded approach would make energy performance information more broadly available, making it easier to compare buildings and find the most efficient locations. Research shows that businesses are willing to pay higher rents for energy efficient space.

We recommend a more modest start to disclosure of residential energy performance. Utilities would provide residential customers with an annual statement of their energy consumption and costs, along with information on the benefits of retrofits.

The strategy also proposes a greater effort to build consumer confidence in residential energy retrofit services. This voluntary approach would include consistent marketing of energy efficiency services and stronger quality assurance of contractors' services.

Financing improvements

The energy strategy also calls for alternatives to conventional bank financing of residential and commercial energy efficiency projects. Cost-effective efficiency improvements pay for themselves over time through savings on heating and cooling costs, but many property owners lack the capital to make the initial investment. Conventional financing also suffered with the loss of home equity caused by the downturn in real estate prices. Even when owners have the capital, they may not see a positive return before they would move to another house.

The strategy recommends an approach that ties efficiency financing to the utility service rather than to the individual borrower. This meter-based financing recovers the investment through a utility service charge applied to current and future customers, enabling everyone who benefits from a property improvement to share in the repayment of that investment.

The meter-based approach would rely on utilities to collect payments for efficiency upgrades, but it does not require their investment capital. One possibility is to create an investment fund through the state Housing Finance Commission as part of its sustainable energy program. Meter-based financing could even reduce the cost of energy efficiency for utility customers, since it would allow the direct program participants to pay more of their own retrofit costs.

A second approach to financing energy efficiency upgrades would focus on the inventory of distressed properties in the state. The policy would provide a small tax credit to developers who purchase a property, make energy efficiency upgrades and resell it.

Low-income and rental properties

The energy strategy recognizes that low-income and rental properties are not likely to get energy efficiency upgrades simply by providing information and access to investment capital. Government and utility funding drives low-income weatherization. Commerce's program has helped weatherize 125,000 low-income homes since 1987, reducing energy costs for families that typically pay 25 percent of their income for heat and light. Federal funds increased weatherization activity in recent years but are likely to shrink dramatically in 2012.

The state has almost 1 million rental housing units, many of which house families of moderate income. More than half of these homes were built in the 1970s or earlier, and neither landlords nor tenants have a strong incentive to invest in energy efficiency. The strategy recommends elevating the priority of low-income weatherization programs for utility incentives and tax credit financing. To achieve greater energy efficiency in rental properties, we offer a new requirement to include basic insulation and weather-stripping measures when rental property is sold.

Near-Term Recommendations for Buildings

performance and transparency	funding and financing	low income and rental housing
4.4.1 non-residential disclosure Develop state law based on Seattle's successful commercial buildings energy disclosure ordinance. *p.100*	4.4.4 meter-based financing Develop programs and law allowing energy efficiency loan payments to be tied to the affected utility meter rather than the original lessee. *p.109*	4.4.6 minimum standards for rental housing Require rental housing to include minimum weatherization measures when ownership changes. *p.114*
4.4.2 residential disclosure Require disclosure of annual energy bill at time of property sale or lease. *p.103*	4.4.5 energy efficient property conversions Offer a real estate excise tax credit for property conversions that improve energy efficiency. *p.112*	4.4.7 sustaining investment in low-income weatherization programs Fast-track the identification of candidates to replace disappearing low-income weatherization programs. *p.116*
4.4.3 marketing and quality assurance Develop statewide standards for marketing and quality assurance of residential energy efficiency retrofits. *p.107*		4.4.8 prevailing wage class for weatherization Create a state prevailing wage class matching the federal class, to minimize administrative burden for weatherization providers. *p.117*

Distributed Energy

Increase use of alternative and renewable energy resources

Energy supply

The third emphasis area for the 2012 Energy Strategy focuses on energy supply, specifically the growing interest in energy production using smaller, alternative energy resources instead of large utility-owned plants. These distributed energy resources come in many forms, including solar, wind, manure and waste industrial heat. Manufacturing plants can increase efficiency by installing combined heat and power (cogeneration) projects. Cities and neighborhoods could heat and cool their buildings with district energy systems. Agricultural and forest products can fuel small power plants. Thousands of small-scale solar projects are being installed on homes, businesses and government buildings. Many owners of distributed energy systems value the independence provided by the system as well as the energy that is produced.

Distributed energy resources can align with the goals to increase jobs in new clean energy industries and to reduce negative climate impacts by displacing fossil fuels. Realizing this potential will require that we improve our ability to integrate alternative resources into the state's overall energy supply system and address concerns about any adverse effects of these systems.

Permits and standards

Distributed energy projects raise interconnection and land-use concerns for utilities and neighbors. Integrating production and distribution of power from facilities whose output varies with seasons and weather – such as hydroelectric, solar or wind projects – can present challenges for the region's power managers.

Consistent and straightforward permitting processes and standards can protect legitimate land-use interests while ensuring that good projects move quickly to development. Planning and standards for integrating alternative resources into the energy distribution system will be necessary to prevent conflicts, waste and system overloads. The Washington Utilities and Transportation Commission will be a key partner in the streamlining effort.

Effective incentives

State policy encourages distributed energy projects through various mechanisms, including several tax incentives and extra weighting under the state's Energy Independence Act (Initiative 937), which created a renewable portfolio standard for most electric utilities.

The state tax incentives are based on good intentions but tend to be complex and not well coordinated with each other. The strategy recommends examining the state's distributed energy incentives to assess their effectiveness and their financial impacts on the state's tax revenues

The renewable portfolio standard

The Energy Independence Act can provide a powerful mechanism encouraging cogeneration and non-utility generation from renewable resources. Stakeholders have raised several issues since voters enacted the law in 2006. Since these are being addressed separately by the Legislature, the energy strategy makes no recommendations on any changes to the statute. However, the strategy process has identified several areas of uncertainty about how the law should apply to distributed energy projects. Clarification of these issues could encourage development of distributed energy systems.

Near-Term Recommendations for Distributed Energy

facilitating development of DE
5.3.1 interconnection standards Modify interconnection rules for generators up to 2 MW based on recent research outcomes. *p.128* 5.3.2 net metering policies Scale net metering limits to customer size and distribution system capacity; allow customers to carry forward annual generation credits. *p.130* 5.3.3 streamlined permitting for distributed energy Leverage existing and experimental policy mechanisms to reduce the administrative burden associated with installing and operating distributed energy. *p.132*

Long-Term Policy Options for Distributed Energy

facilitating development of DE	financial incentives
5.4.1 DE-compliant power purchase agreements p.*134* 5.4.2 distributed energy in I-937 p.*136* 5.3.3 streamlined permitting for distributed energy p.*132*	5.4.3 rationalize DE incentives *p.138* 6 carbon pricing *p.141*

Energy Planning For the Future

Build a balanced energy strategy with rigorous analysis and extensive stakeholder work

Planning process

The 2012 Energy Strategy is based on legislative guidance, rigorous analysis and extensive stakeholder involvement. In authorizing the energy strategy process, the 2010 Legislature called for a balanced approach to the three goals of clean energy jobs, fair energy prices and a stable climate. It identified nine guiding principles, including a concern for low-income families, the state's commitment to meet both state and federal greenhouse gas reduction standards and recognition that the state needs a strong energy infrastructure.

Commerce developed the 2012 Energy Strategy with the dedicated support of a 26-member advisory committee. Leaders from Washington state business, labor, environmental groups, developers and government contributed their time, expertise and perspectives. A panel of technical experts guided the quantitative work. In 2010 Commerce and the advisory groups produced the 2011 Energy Strategy Update, which outlined the analytical and stakeholder processes and identified 17 near-term initiatives. We have made progress on many of those recommended initiatives, and several received additional analysis and guidance in this 2012 Energy Strategy.

The roots of the 2012 Energy Strategy extend well before the current process authorized in 2010. Its base is the state's history of careful, public-oriented energy planning and analysis. Washington has more than three decades of experience in this area, much of it in the electricity sector. Our priorities likewise have a history. The state's last comparable state energy strategy in 1993, foreshadows the current strategy's emphasis on transportation, energy efficiency, and environmental values. The analytical and policy elements of both the 1993 and 2012 strategies reflect complementary policy efforts at the state departments of Transportation and Ecology, demonstrating the close and enduring links among energy, climate policy and transportation issues.

The depth of prior work enabled Commerce and its advisory committee to focus attention on major policy themes: transportation, building efficiency and distributed energy. We developed a long list of potential initiatives that could influence the future performance of Washington's energy system. In organizing and setting priorities, we looked for these characteristics:

- Does the policy provide a significant opportunity to address the legislative goals of fair energy prices, clean energy jobs and greenhouse gas reductions?
- Does the policy appear to be ripe for action, addressing an issue with active stakeholder and policymaker interest?
- Does the policy cover an area needing more attention? Has it been overlooked by past studies?

The team also chose a mix of both near- and long-term strategies. The near-term strategies represent policies that are already well developed or at least ready for beta testing. Nevertheless, it is equally important that policy makers and stakeholders begin work soon on

the initiatives identified as long-term options. We set our policy objectives looking at the far horizon, because the toughest issues of how to supply needed energy and preserve the environment are fundamental, long-term questions that cannot be asked and answered once.

Implementation

The 2012 Washington State Energy Strategy outlines a set of policies that can move the state significantly closer to its goals of clean job growth, fair energy prices and reduced greenhouse gas emissions. Implementation of the strategy will require the support of many stakeholders, including local governments, utilities, the state departments of Agriculture, Commerce, Ecology, Revenue and Transportation, the State Auditor, Insurance Commissioner, and Utilities and Transportation Commission.

Many of the strategy's initiatives do not require legislative action. Indeed, the strategy does not make specific legislative recommendations. However, because of the complexity of the issues involved, most of the initiatives will require more detailed stakeholder work prior to implementation or legislative action. The 2012 State Energy Strategy compares the long-term options and outlines the next steps for action.

We would emphasize again the continuing nature of good energy policy development. This strategy is informed by many past efforts, and it should not be viewed as the last word. The strategy represents a way of thinking about our energy problems as well as a set of recommendations for change. The problems will evolve, but the modeling framework used in this project will help us adapt. This strategy represents one punctuation mark in an ongoing conversation about our state's energy, economic and environmental future.

Ultimately, we recognize that it is impossible to predict or forecast perfectly Washington's energy future, but we can do our best to anticipate, analyze and drive change in directions that benefit our state's long-term prosperity.

Chapter 1 – Context

1.1 Background

Energy heats and cools homes and other buildings, powers Washington's industries, fuels the transportation of people and goods, and runs the countless tools and appliances on which Washingtonians depend every day. Energy costs account for 6 percent of Washington's economy,[1] a combination of electricity, heat, natural gas, propane, liquid fuels, coal, wood and more. Meanwhile, the state's portfolio of energy sources and fuels is changing; energy independence, climate stabilization, safety concerns and a dwindling supply of cheap crude oil are all driving a global interest in developing clean energy resources to eventually displace fossil fuels.

In the spring of 2010, the Washington State Legislature called for an integrated approach to maintaining competitive energy prices, while engaging in a meaningful way in the clean energy economy.[2] The state's Department of Commerce (Commerce) was given responsibility for producing the 2012 Washington State Energy Strategy (2012 Energy Strategy) by December 1, 2011 - the document you are now reading.

This is the first comprehensive Washington State Energy Strategy released since 1993. Since then, two updates have been released: a 2003 electricity strategy update that reviewed the implications of price volatility of that time, and a 2011 Energy Strategy Update that was a preparatory step toward this comprehensive 2012 Energy Strategy. The 2010 legislation directed that the Energy Strategy be released on a regular basis from this point forward; Commerce will publish the Energy Strategy every four years with every other edition of the existing Biennial Energy Report, beginning with the 2015 Biennial Report due in December 2014.

1.2 Goals and Principles

The legislation declares that a successful Energy Strategy will balance three goals[3] in order to:

1. Maintain competitive energy prices that are fair and reasonable for consumers and businesses and support Washington's continued economic success;
2. Increase competitiveness by fostering a clean energy economy and jobs through business and workforce development; and

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[1] Direct expenditures on energy products constitute 6 percent of Washington's gross state product (GSP).

[2] E2SHB 2658, now codified within Revised Code of Washington (RCW) 43.21F governing the duties of the Washington State Energy Office. Section 404 of E2SHB 2658, establishing the process Commerce was to follow for the revision to the State Energy Strategy, was vetoed by the Governor due to concerns regarding language about the separation of powers between the executive and legislative branches of government. The Governor then issued Directive 10-07 to the Department of Commerce, instructing Commerce to honor the update process and schedule originally intended in Section 404.

[3] RCW 43.21F.010 (4)

3. Meet the state's obligations to reduce greenhouse gas emissions. *This goal refers to a 2008 state law[4] that established the goal of reducing statewide greenhouse gas emissions to 1990 levels by 2020, to 25 percent below 1990 levels by 2035, and to 50 percent below by 2050.*

These three goals have served as the primary guidelines for work done on the 2012 Energy Strategy the past 18 months.

In addition to the three goals, the legislation provides nine guiding principles:[5]

1. Pursue all cost-effective energy efficiency and conservation as the state's preferred energy resource, consistent with state law;
2. Ensure that the state's energy system meets the health, welfare, and economic needs of its citizens with particular emphasis on meeting the needs of low-income and vulnerable populations;
3. Maintain and enhance economic competitiveness by ensuring an affordable and reliable supply of energy resources and by supporting clean energy technology innovation, access to clean energy markets worldwide, and clean energy business and workforce development;
4. Reduce dependence on fossil fuel energy sources through improved efficiency and development of cleaner energy sources, such as bioenergy, low carbon energy sources and natural gas, and leveraging the indigenous resources of the state for the production of clean energy;
5. Improve efficiency of transportation energy use through advances in vehicle technology, increased system efficiencies, development of electricity, biofuels and other clean fuels, and regional transportation planning to improve transportation choices;
6. Meet the state's statutory greenhouse gas limits and environmental requirements as the state develops and uses energy resources;
7. Build on the advantage provided by the state's clean, regional electrical grid by expanding and integrating additional carbon-free and carbon-neutral generation, and improving the transmission capacity serving the state;
8. Make state government a model for energy efficiency, use of clean and renewable energy, and greenhouse gas-neutral operations; and
9. Maintain and enhance the state's existing energy infrastructure.

These principles outline Washington's values in defining a healthy energy system. In assembling the policy recommendations in this 2012 Energy Strategy, Commerce constantly strived to adhere to these principles, assuring that the final set of recommendations addresses all of them.

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[4] E2SHB 2815 (2008) Sec. 3(1) (a), encoded as RCW 70.235.020 *Greenhouse gas emissions reductions — Reporting requirements*.

[5] RCW 43.21F.088 – *State energy strategy – Principles – Implementation*.

1.3 Getting Public and Expert Input

Commerce developed the 2012 Energy Strategy with the assistance of two advisory bodies, both required by the enabling legislation. The Advisory Committee was a 26-member, multi-sector stakeholder group representing all major interests known to be affected by energy policy: various types of utilities, industrial energy users, clean energy businesses, labor, environmental interests, elected officials, municipal planners and several other key interest areas. The Advisory Committee met five times in 2010 to produce the 2010 Update, and then seven more times in 2011 to finalize this 2012 Energy Strategy.

The Advisory Committee worked in conjunction with a smaller Technical Experts Panel that provided advice and quantitative analysis of proposed policies. The Technical Experts Panel included representatives from the University of Washington (UW), Washington State University (WSU), the Northwest Power and Conservation Council, the Puget Sound Regional Council, and Pacific Northwest National Laboratory, as well as staff from the forecasting division of the state's Office of Financial Management (OFM). The members of the Technical Experts Panel provided access to the resources of their respective institutions, and hence met less frequently as a body, instead supplying data and opinions according to their institutional expertise.

Advisory Committee

Rogers Weed, Committee Co-chair
Department of Commerce

Sharon Nelson, Committee Co-chair
National Commission on Energy Policy / Itron

Ben Bagherpour, SEH America

David Benson, Stoel Rives

Terry Brewer, Grant County PUD

Shari Brown, Weyerhaeuser

Mike Davis / Angela Becker-Dippmann,
Pacific Northwest National Laboratory

Senator Jerome Delvin, Washington State Senate

Bob Drewel, Puget Sound Regional Council

Dave Finet, Bellingham Opportunity Council

KC Golden, Climate Solutions

Don Guillot, IBEW Local 77

Kimberly Harris, Puget Sound Energy

Nancy Hirsh, NW Energy Coalition

Tom Karier,
Northwest Power and Conservation Council

William Kidd, BP America

Steve Klein, Snohomish County PUD

Bob Link, AREVA NP Inc.

Rick LeFaivre, OVP Venture Partners

Representative John McCoy,
Washington State House of Representatives

Kris Mikkelsen, Inland Power and Light Company

Steve Rigdon, Yakama Power

Senator Phil Rockefeller, Washington State Senate

Commissioner Dave Sauter, Klickitat County

Representative Shelly Short,
Washington State House of Representatives

Councilmember Larry Smith, City of Vancouver

Technical Experts Panel

Northwest Power and Conservation Council
Howard Schwartz

Pacific Northwest National Laboratory
Marc Cummings, Dennis Stiles

Puget Sound Regional Council
Matthew Kitchen

University of Washington
Mark Hallenbeck, Daniel Schwartz

Washington State Department of Commerce
Greg Nothstein, Roel Hammerschlag

Washington State Office of Financial Management
Ta-Win Lin

Washington State University
Todd Currier, Chad Kruger

A decision was made in January 2011 to focus the 2012 Energy Strategy efforts on the transportation sector (this decision is described below in more detail). In order to provide sufficient opportunities for transportation sector stakeholders not represented on the Advisory Committee to have input on the 2012 Energy Strategy, the Washington State Department of Transportation (WSDOT) informally convened a third body of stakeholders to advise on transportation-related strategies. Input from this body was solicited primarily by email and telephone during the months of June - September 2011, but also included an organized meeting on August 19, 2011.

In addition to the advisory bodies, Commerce invited public comments via open input sessions at each of the Advisory Committee meetings, through the state Energy Strategy website and through public meetings. The public comment period ran October 7 through October 23, 2011. During that time, two public meetings were held, one October 12, 2011, in Tacoma and the other October 20, 2011, in Spokane. Comments were also accepted via email and postal mail. The comments and Commerce's responses are posted on the state Energy Strategy website.

1.4 Washington's Energy Landscape

Like any other region, Washington is richly endowed in some energy resources and poorly in others.

Electricity

One resource in particular colors Washington's energy system like no other: water. Washington's mountainous terrain and ample precipitation combine to produce perfect conditions for accumulating snowpack and glaciation during the winters, providing high altitude, running water year-round to power a system of electric generating dams.

The Bonneville Power Administration (BPA), a federal agency, markets wholesale power in the Pacific Northwest. Power marketed by BPA is generated by 31 federal hydroelectric projects owned and operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation, Energy Northwest's nuclear plant, and a few smaller resources. BPA also owns and operates a large fraction of the state's electric transmission system (Figure 1-1).

Figure 1-1: High-voltage electric transmission lines owned by the Bonneville Power Administration. The low-voltage distribution systems typically associated with specific utilities are not shown. Also not shown are a number of high-voltage lines owned by utilities. (Data source: Bonneville Power Administration)

Washington's only coal-fired power plant, in Centralia, will be retired by 2025 in a negotiated agreement between its owner, TransAlta Corporation, and the state of Washington. A large and growing fleet of wind turbines, about a dozen natural gas-fired generating plants, a few sizeable biomass-fired generators related to the wood products industry, and small, distributed generation resources complete the state's system. For the most complete and up-to-date inventory of Washington generators, the reader is encouraged to explore the on-line, interactive map stewarded by the Northwest Power and Conservation Council.[6]

Natural Gas

The fuel for the natural gas-fired electric generators is delivered through a pipeline system that brings gas[7] to Washington from Canada and Wyoming (Figure 1-2). The trunk pipelines crossing Washington consist primarily of Williams Partners LP's Northwest Pipeline system; Gas Transmission Northwest LLC's trunk line crosses the southeast corner of the state as well. Washington has no indigenous natural gas resource. Recent advances in natural gas extraction technology enable the economically viable extraction of very large volumes of shale gas from both Wyoming and Canada, so the existing pipeline system can be expected to remain in service and perhaps even expand in the near future.

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[6] http://www.nwcouncil.org/maps/power/Default.asp

[7] In energy policy discussions "gas" always means natural gas (methane). The liquid fuel used for cars is referred to as "gasoline" in this document.

The gas transmission system doubles as an energy storage system, insofar as varying gas pressure in the pipes can absorb or supply moderate swings in gas demand. Larger swings in demand are handled by storage facilities; in Washington, the most notable of these is the Jackson Prairie Underground Natural Gas Storage Facility, co-owned by Williams Northwest Pipeline, Avista Utilities and Puget Sound Energy. Jackson Prairie is the United States' 14th largest gas storage facility and can deliver roughly one-fourth of the entire Northwest region's gas demand during cold weather events for multiple days in a row.

Figure 1-2: Natural gas transmission and distribution systems. (data source: Washington Utilities and Transportation Commission)

In addition to being a fuel supply for utilities from which to generate electricity, gas is burned directly in homes and businesses to supply space heat, to power industrial facilities with boiler systems or direct heat; and to fuel district heating systems. It is also an important potential bridge fuel in the transportation sector: compressed natural gas filling stations hike up the pipeline gas pressure to 3600 pounds per square inch, reducing its volume sufficiently so that it can be stored onboard advanced vehicles.

Petroleum Products

Another network of pipelines moves petroleum products across the state. While natural gas is a single, uniform product that can be traded and transported via interconnecting pipeline systems, multiple refined petroleum products, such as gasoline, kerosene, fuel and oil, are delivered through the non-interconnecting pipeline systems appearing in Figure 1-3. The largest system, serving the Puget Sound region, is owned and operated by Olympic Pipeline; two additional systems owned by Chevron and Exxon Mobil deliver refined petroleum products to eastern

Washington. Petroleum pipelines typically "batch" multiple products through the same pipeline, delivering them in sequence, as demand requires.

Figure 1-3: Petroleum pipelines. Large amounts of petroleum are transported by truck, barge and rail, so the pipelines represent only a portion of the petroleum distribution system. (Data source: Washington Utilities and Transportation Commission)

Washington hosts five petroleum refineries, making the state a net exporter of refined petroleum products. These refineries receive the vast majority of their input crude oil by tanker or barge, with a small amount of Canadian crude arriving through Kinder Morgan's Trans Mountain Pipeline system. As with natural gas, Washington has no substantive natural endowment of crude oil, so it is entirely dependent on imports from other states and countries to supply the refineries.

A minority of refinery products are non-energy products, such as asphalt, lubricants and chemical feedstocks, but the bulk are the familiar energy products gasoline, diesel fuel, jet fuel, marine fuels and heating oil. They are delivered to airports, marine terminals and filling stations through a combination of the pipeline systems, barges and trucks. Gasoline and diesel fuel make up more than two-thirds of the refinery output, and are used by cars and trucks using the state's road infrastructure (Figure 1-4).

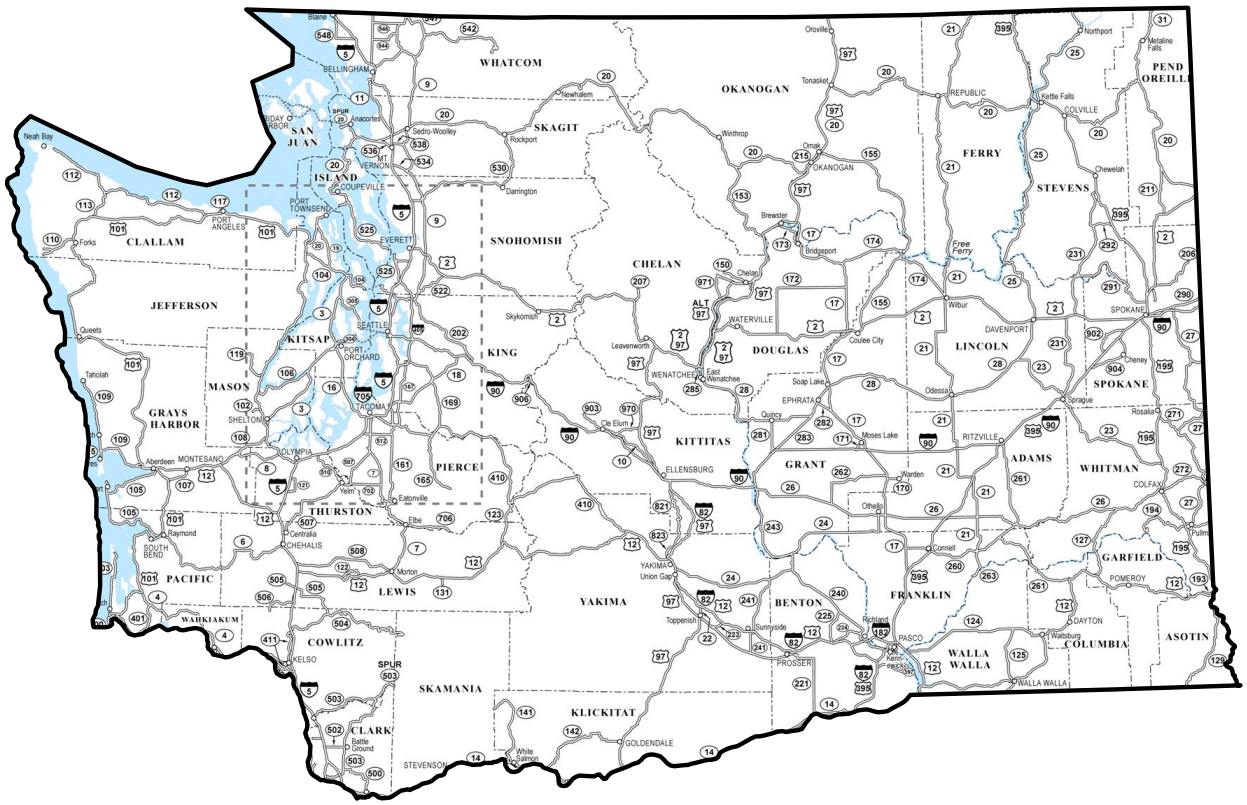

Figure 1-4: Federal and state highway system. (Source: Washington State Department of Transportation)

One of the considerations behind the 2012 Energy Strategy, described in more detail below, is the prospect of increasing the number of electric vehicles using the highway system. Moreover, the third goal of the 2012 Energy Strategy (*meet the state's obligations to reduce greenhouse gas emissions*) implies a general shift away from fossil fuels, therefore surveys of alternative energy resources available to Washington are an integral part of a complete Energy Strategy.

Wind

Washington has already made significant strides toward harvesting one of its indigenous resources - wind (Figure 1-5). In particular, central and southeast Washington have an abundant supply of this resource. Wind energy developers have already deployed some 2,300 megawatts (MW) of capacity in the state, making Washington's fleet of turbines the fourth largest in the nation.[8]

[8] From EIA and Northwest Power and Conservation Council data (**W0009**).

Figure 1-5: Wind potential in Washington (data source: TrueWind Solutions / National Renewable Energy Laboratory)

However, wind is a variable resource, so 2,500 MW of capacity will generate, in a typical year, slightly less than 1,000 *average* megawatts (MWa). This is still 10 percent of the value of Washington's total annual electricity consumption of 10,000 MWa, a very significant contribution for an intermittent resource.

Solar

Far less developed is Washington's solar resource (Figure 1-6). The eastern half of the state is richer in this resource than the western half, but even the relatively low rate of solar radiation energy in the Puget Sound region is sufficient to support residential rooftop photovoltaic systems, residential water heating systems and other solar technologies.

Figure 1-6: Solar potential in Washington. (data source State University of New York, Albany / National Renewable Energy Laboratory)

Theoretically, the available solar energy is sufficient to supply the state's total energy needs. Practically, the solar energy potential in Washington is highly dependent on the technologies available to capture it, so monitoring the development of solar technologies is critical to the state's Energy Strategy. Since the potential of the solar resource is so vast, a sufficiently low-cost, new technology would alter the energy landscape significantly.

Bioenergy

Over the last five years, Washington agencies and research institutions have made significant progress in identifying obstacles to, and opportunities for, bioenergy development. Much of this work has focused on assessing bioenergy feedstocks that are environmentally and economically sustainable.

The University of Washington, under contract with the Washington Department of Natural Resources (DNR), recently completed a comprehensive Washington Forest Biomass Supply Assessment of woody biomass available from public and private timberlands in the state as a result of harvest operations.[9] The assessment considers a wide range of variables, including forest characteristics, environmental restrictions, harvest levels, cost of biomass collection and transportation, and market competition and pricing.

[9] www.dnr.wa.gov/ResearchScience/Topics/OtherConservationInformation/Pages/em_biomass.aspx **(S0075)**

The assessment found that 16 to 27 percent of the woody biomass generated in 2010 entered the marketplace. Given existing economic and geographic restraints, significantly more could be made available for bioenergy projects. The balance will be left onsite to support forest ecosystem functions. Larger volumes of biomass may become available as technologies improve and markets grow. To maintain ecological sustainability, DNR is evaluating existing forest practices to ensure adequate resource protection.

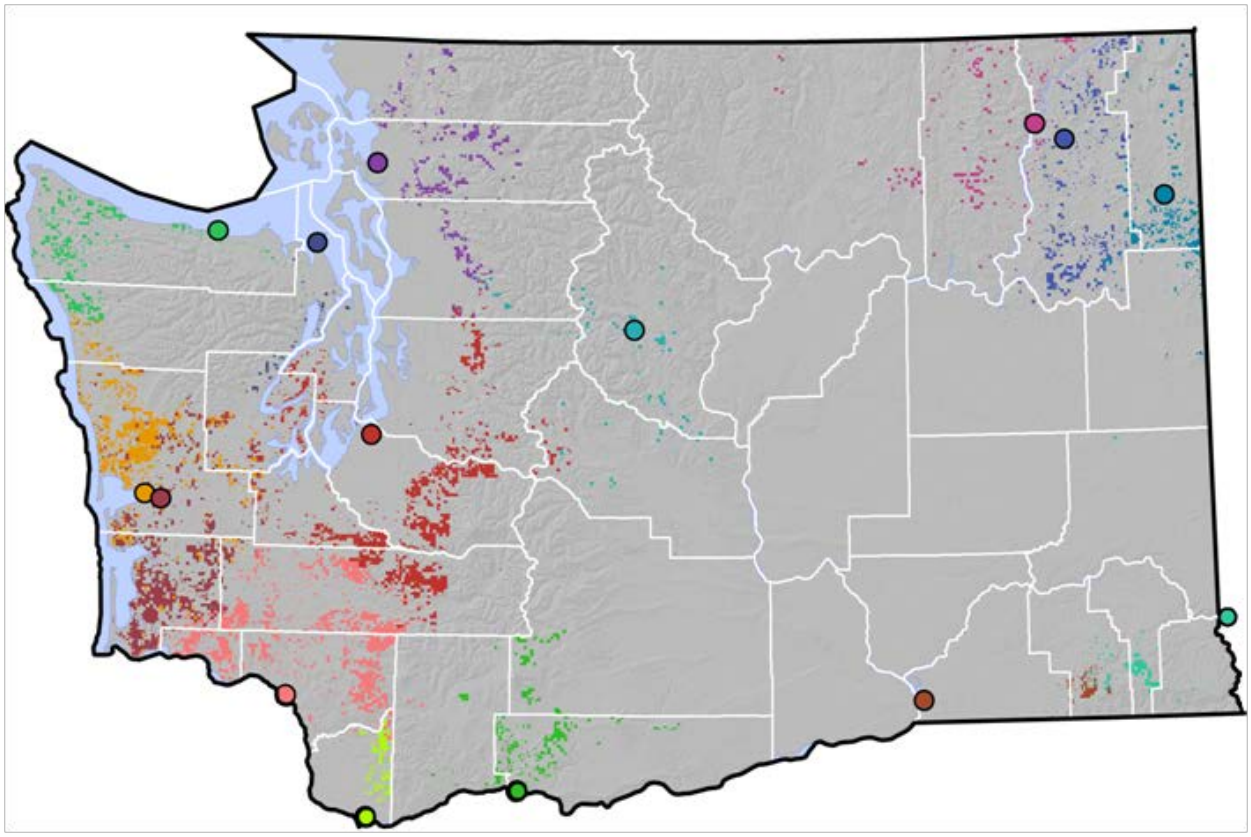

Figure 1-7: Fuelsheds for significant facilities currently using woody biomass in Washington. (source: University of Washington School of Forest Resources)

Figure 1-7 is an example of the analysis available through the assessment's biomass supply calculator, which will soon be available for public use. This scenario shows where 15 major facilities currently using woody biomass might source their fuel, given likely conditions: a conservative level of harvest activity, relatively low biomass aggregation costs, and a market price for woody biomass of $40 per bone-dry ton. While not designed to serve as an investment grade assessment, the calculator can help determine where facilities fueled by woody biomass might be located, and the scale appropriate for a sustainably sourced fuel supply.

Similar assessments of other bioenergy feedstocks are also available:

- Washington State Biomass Inventory[10] is a thorough county-level assessment of biomass feedstock volumes and their energy content;

[10] www.pacificbiomass.org/WABiomassInventory.aspx **(S0076)**

- WSU Biofuels Cropping Systems Research and Extension Project[11] has conducted extensive research on dedicated bioenergy crops for the state's various growing regions;
- Washington State Department of Agriculture Dairy Digester Inventory[12] profiles existing on-farm anaerobic digesters and explores the potential for further development; and
- Two additional studies on the use of biomethane from farms, landfills and wastewater treatment facilities for electrical generation, heating and transportation fuel will be available from Commerce and the WSU Energy Program in the near future.

[11] www.css.wsu.edu/biofuels/ **(S0077)**

[12] agr.wa.gov/FP/Pubs/docs/343-WashingtonDairiesAndDigesters-web.pdf **(S0078)**

Chapter 2 – Choosing and Analyzing Policy Choices

2.1 Resources and Demands Today

Key to applying rational policy to Washington's entire energy system is an understanding of how different energy sources power different energy demand sectors. Taking in the big picture is an essential step toward major changes in how energy is used, such as the electrification of transport, increased penetration of (electric) heat pumps for heating, deployment of compressed natural gas or propane as a transition fuel for vehicles and a reduced hydroelectric supply anticipated from changes in regional climate. Figure 2-1 details energy flows in Washington for 2009, the most recent year for which data are available on all sources and consumers of energy.

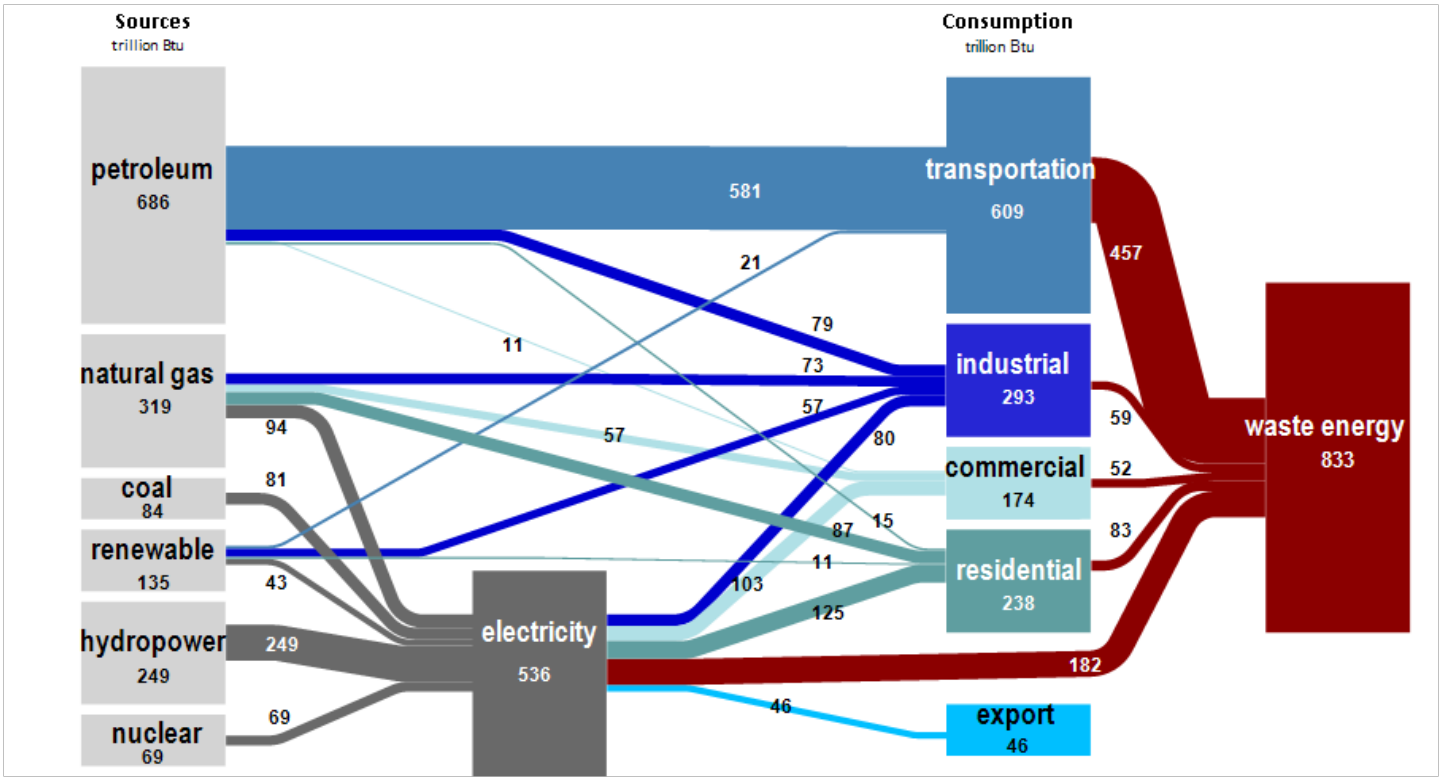

Figure 2-1: Energy flows in Washington during calendar year 2009. Flows sum to less than totals, because flows under 10 TBtu are not shown. (W0006)

The thickness of each line is proportional to the quantity of energy being delivered or consumed; these quantities appear as numeric values on or adjacent to each line, in trillion British thermal units (TBtu). Boxes on the left of the diagram denote primary energy, representing the heating value of a combustible substance (petroleum, natural gas, coal or biomass renewables), the heat released by fission (nuclear), or the kinetic electricity value of moving water (renewable energy from hydropower), or the electric potential of captured wind or solar energy.

In 2009 (the year shown in Figure 2-1), 1,543 TBtu of primary energy was consumed in one year by the state; this is the sum of the six grey sources shown on the left of the figure. Of those

1,543 TBtu, 536 were used to generate electricity, while the remaining 1,007 TBtu were delivered directly to demand sectors.

The electric generators lost 182 TBtu of the delivered primary energy as waste heat. Most of that waste heat was in the exhaust of the boilers and combustion turbines that converted fuels into electricity, while a much smaller portion was lost in the transmission and distribution wires that delivered the electricity to the demand sectors.

The demand sectors lost another 651 TBtu of their total energy received as either primary fuel or electricity.[13] Of the four demand sectors, the transportation sector is the least efficient user of received energy, delivering only 25 percent of the received energy as useful work and losing the remainder as waste heat. This was an important driver of the choice to focus this release of the Energy Strategy on transportation, as described in Section 3.1 below.

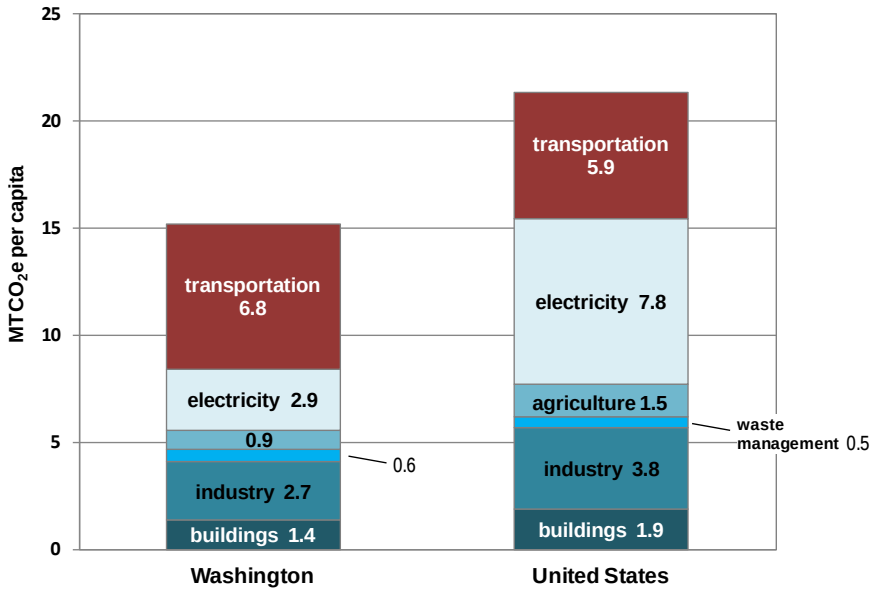

Figure 2-2: Greenhouse gas sources: Washington compared to national average. The average Washingtonian is responsible for a total of 15.2 $MTCO_2e$, the average American for 21.4 $MTCO_2e$. $MTCO_2e$ means metric tons of carbon dioxide equivalent. (W0002)

The waste heat flows shown for the commercial and residential demand sectors reflect inefficiency in the equipment used to combust the delivered fuels, but do not account for indirect heat loss from poorly insulated buildings, inefficient building design or lax building management.

[13] The quantity of waste heat lost in each demand sector was calculated according to loss factors developed for Washington State by Lawrence Livermore National Laboratory: 75 percent loss in transportation, 20 percent loss in the industrial sector, 30 percent in commercial and 35 percent in residential. Those loss factors account for inefficiency in the equipment used to combust the delivered fuels, but do not account for indirect heat loss associated with the building envelope. If one considers potential improvements to building design and construction, the loss factors in the commercial and residential sectors, and to some extent the industrial sector, are much higher. See H C Granade et al, *Unlocking Energy Efficiency in the U.S. Economy*, McKinsey Global Energy and Materials 2009. **(R0011)**

If one considers potential improvements to building design and management, the loss factors in the commercial and residential sectors are much higher.[14]

When compared to other states, Washington's energy system is characterized by relatively clean and low-cost electricity from hydroelectric generators; thermal energy with a larger than usual contribution from biomass; and typical transportation energy. Because Washington's electric energy is low-greenhouse gas, transportation energy contributes a larger fraction of the state's greenhouse gases than in most other states (Figure 2-2). Washington's per-capita transportation emissions are boosted even further due to large military bases and commercial operations at busy, international sea ports.

2.2 Scenario Planning

Analyses of policy impacts require forecasts of future energy flow, prices and greenhouse gas emissions. The Technical Experts Panel conducted such forecasts out to calendar year 2035, representing a time horizon of slightly less than 25 years. Twenty to 25 years is the typical long-term time frame of other energy forecasting entities, like the U.S. Department of Energy (DOE) Energy Information Administration (EIA) and the Northwest Power and Conservation Council. This period represents the maximum span of time for which any predictions of the future could be considered to have sufficient accuracy to be useful for energy planning purposes[15] and coincides with one of Washington's legislated greenhouse gas goals

Natural Gas: Surprise!

There is a limit to how much dramatic change can be envisioned through a process such as scenario planning. Highly unlikely "black swan" events can make it a challenge to forecast the future in a useful way. One such event is the recent, massive change in the North American natural gas prospect. Less than 10 years ago, the continent was thought to be past its peak production. Some new natural gas was available north of the Arctic Circle, but only enough to supply the continent's needs perhaps another decade. Soon, it would become necessary to ship liquefied natural gas (LNG) from more distant locations.

The dwindling reserves increased natural gas prices and, in the early- to mid-2000s, natural gas operators were motivated to try unconventional extraction technologies. One of these, hydraulic fracturing ("fracking"), opened access to a massive reserve of domestic gas previously considered economically untouchable. In probably the most dramatic sign of this sea change, LNG import facility plans launched in the late 1990s have been replaced by new proposals for LNG export facilities in British Columbia, Louisiana and elsewhere.

The implications for Washington's Energy Strategy are significant. Natural gas releases approximately 25 percent less carbon per unit of energy when compared to gasoline and 44 percent less when compared to coal. When a near-term conversion to renewable fuel is impossible, natural gas can bridge the transition with moderate reductions in greenhouse gases using mature and low-cost combustion technologies. Replacing gasoline in conventional internal combustion engines with compressed natural gas (CNG) is a quick pathway to reduce greenhouse gases from transportation. Last year's Energy Strategy Update proposed just that for the state's fleet vehicles.

Still, black swans must be greeted with caution. Fracking comes with a host of unsolved legal and environmental questions. The eventual answers to those questions will affect the depth of the new resource's penetration into the American market, and Washington's Energy Office will be tracking this new resource closely to respond as quickly as possible to its changing potential.

[14] See, e.g. H C Granade et al, *Unlocking Energy Efficiency in the U.S. Economy*, McKinsey Global Energy and Materials 2009. **(R0011)**

[15] This statement is obviously subjective to some degree, but is probably a fair summary of opinions held by Technical Experts Panel members. Some energy analysts might find 10 years a reasonable maximum based on cautionary experiences like, for example, the recent wild growth in estimated, recoverable North American natural gas reserves that occurred in less than that time span. Others might find forecasts out to 100 years important in order to capture the impact of commitments we make to future global climate change, or to fully capture the anticipated lifetime of new energy infrastructure.

(25 percent below 1990 levels by 2035).

Of course, the future is unpredictable, so the decision was made to test policy packages against a variety of possible futures, or scenarios. There is substantive literature on scenario planning; building on this prior work, in September 2010 Commerce convened members of the Technical Experts Panel and the Advisory Committee in a workshop to develop four scenarios about the 2035 world. Workshop participants were led through a process to describe two fields of uncertainty about the future world, areas that reflected social, economic, political or technological trends *outside the state's realm of control*, the uncontrollable background against which the state can control its policy choices. Workshop participants agreed that the fields most relevant to Washington's energy policy decisions would be *innovation* and *opportunity*, and *geopolitical stability*. The workshop process is described in detail in Appendix A.

Once the two focus areas were identified, the workshop participants described four possible future worlds in 2035, each one representing one pair of extremes as shown in Figure 2-3.

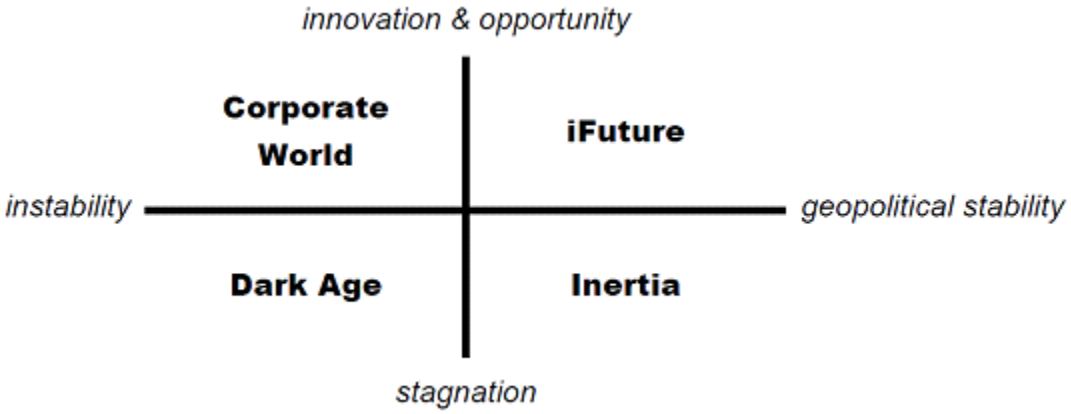

Figure 2-3: Background scenarios developed in the September 2010 scenario planning workshop, which will be used to test policy frameworks. The four scenarios, *Corporate World*, *iFuture*, *Dark Age* and *Inertia*, represent different outcomes for national and global parameters beyond the control of Washington policy makers. A robust energy policy framework will fare well in all of these climates.

For example, iFuture represents high innovation and opportunity in a geopolitically stable world, while Dark Age represents a lack of innovation against a background of geopolitical turmoil (e.g., war or isolationism). As a final step, the workshop participants constructed storylines describing *believable* pathways from the current world to the extremes posed for 2035. Hence, each world is extreme but believable, creating a realm of possibility. If any policy fares well when tested against all four of these worlds, it will likely fare well in the actual future, which is likely to lie within the realm of possibility.

2.3 Forecasting Energy Indicators Through 2035

In order to assess the effectiveness of the proposed policies relative to the three legislated goals, it is necessary to forecast the most relevant energy indicators. Commerce developed nominal, reference case forecasts for the following indicators:

Primary energy consumption – the total quantity of primary energy consumed, per year, within the borders of Washington

Gross energy expenditures – the total expenditures on primary energy and electricity in the Washington economy, reported both in inflation-adjusted dollars and as a percentage of gross state product (GSP)

Average household energy bill – the total expenditures on refined fuels and electricity by the average Washington household, reported both in inflation-adjusted dollars and as a percentage of the household budget

Gross greenhouse gas emissions – greenhouse gas emissions due to combusting solid, liquid and gaseous fuels within the borders of Washington, plus greenhouse gas emissions ascribable to electricity consumed in Washington

The 2012 Energy Strategy forecasts are based on the EIA forecasts delivered in the *Annual Energy Outlook 2011*. The Annual Energy Outlook (AEO) forecasts are well established, sophisticated and appear reliably every year, so they form a solid backbone on which to create comparable Energy Strategy analyses in future release years. The AEO is primarily a national forecast with a significant amount of information available at the regional level. Commerce adapted the Pacific region forecast to Washington, prorating according to population and sector shares of historical consumption. Additionally, at the advice of the Technical Experts Panel, the EIA's electricity sector sub-forecast was swapped out for the regional electricity sector forecast prepared by the Northwest Power and Conservation Council.

The reference case primary energy consumption forecast for Washington is shown in Figure 2-4 and is a modification of the AEO 2011 forecast. It incorporates an estimate from the EIA on the impact of the recently announced corporate average fuel economy (CAFE) standards, which require a 5 percent annual increase in vehicle fuel efficiency from 2017 to 2025. Transportation energy consumption is by far the largest individual sector, but exhibits the lowest growth rate (0.25 percent per year) due in large part to federal vehicle fuel efficiency standards and anticipated fuel price increases. Total primary energy use in the reference case grows by about 0.8 percent per year, or a bit under the population growth rate of 1 percent per year.

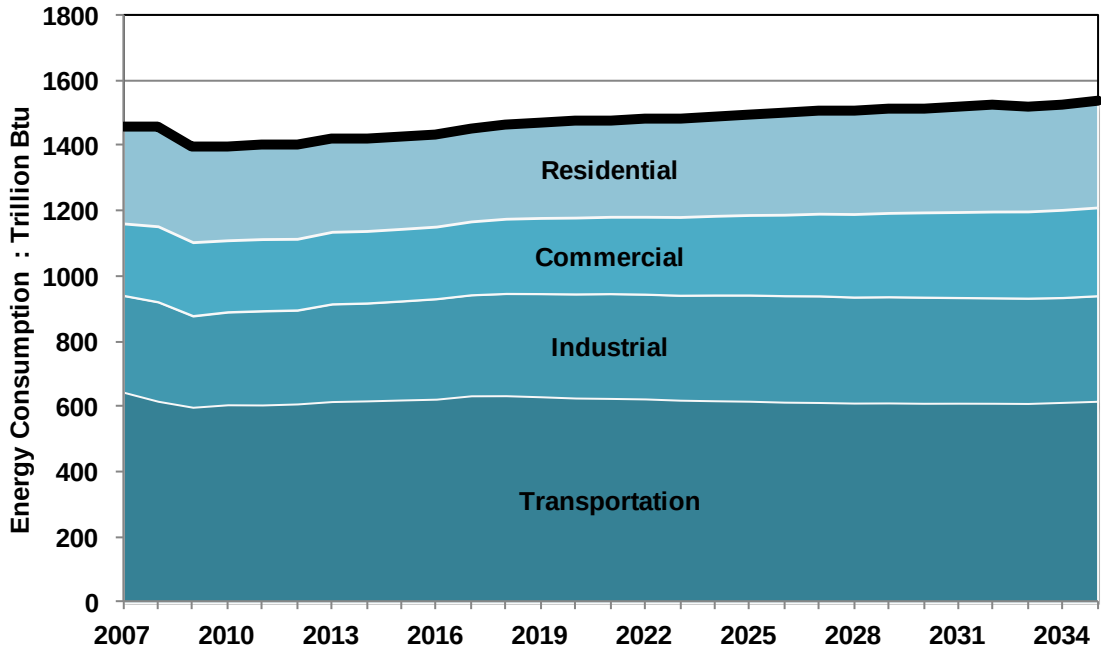

Figure 2-4: Forecast primary energy consumption in Washington through 2035, by end use sector. Primary energy consumed by electric generators is allocated to the end use sectors according the quantity of electricity they consume. (W0011)

Total state energy expenditures have risen sharply over the past five years as energy prices for many fuels have soared. The recent recession has dampened prices and energy consumption, but a return to economic growth will likely renew upward pressure on energy prices. Figure 2-5 illustrates the energy expenditure forecast for Washington through 2035.

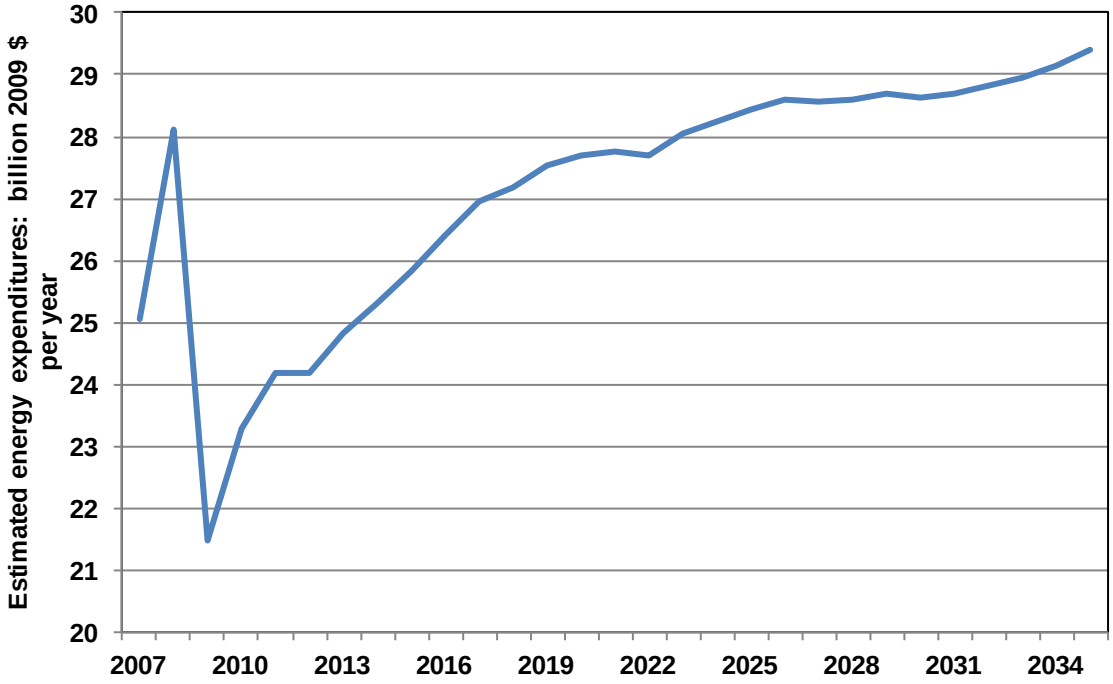

Figure 2-5: Forecast gross, direct energy expenditures in Washington through 2035. (W0011)

As illustrated in Figure 2-6, household expenditures are dominated by expenditures for fuel to power vehicles. This dominance has become more pronounced over the last several years as gasoline and diesel prices have risen, with 2008 being the most extreme. As described previously, there is more uncertainty regarding future oil prices than just a few years ago, and the long-term price of oil is expected to increase. Higher oil prices could result in the transportation share of household energy expenditures increasing.

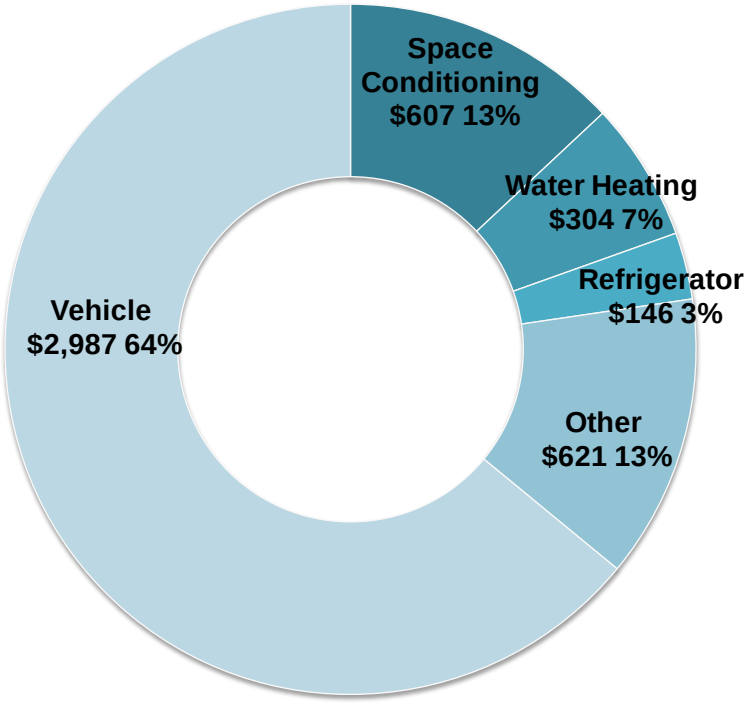

Figure 2-6: Average Washington household annual energy bill by end use, in 2008. Total energy spending shown in the chart is $4,720. (EIA Residential Energy Consumption Survey, W0008)

The annual residential energy expenditures, based on EIA AEO 2011 results, are forecast to decline from 2011 to 2035, as shown in Figure 2-7. This is primarily due to increasing federal automobile efficiency standards, but also partly due to more purchases of efficient appliances, electronics and heating systems.

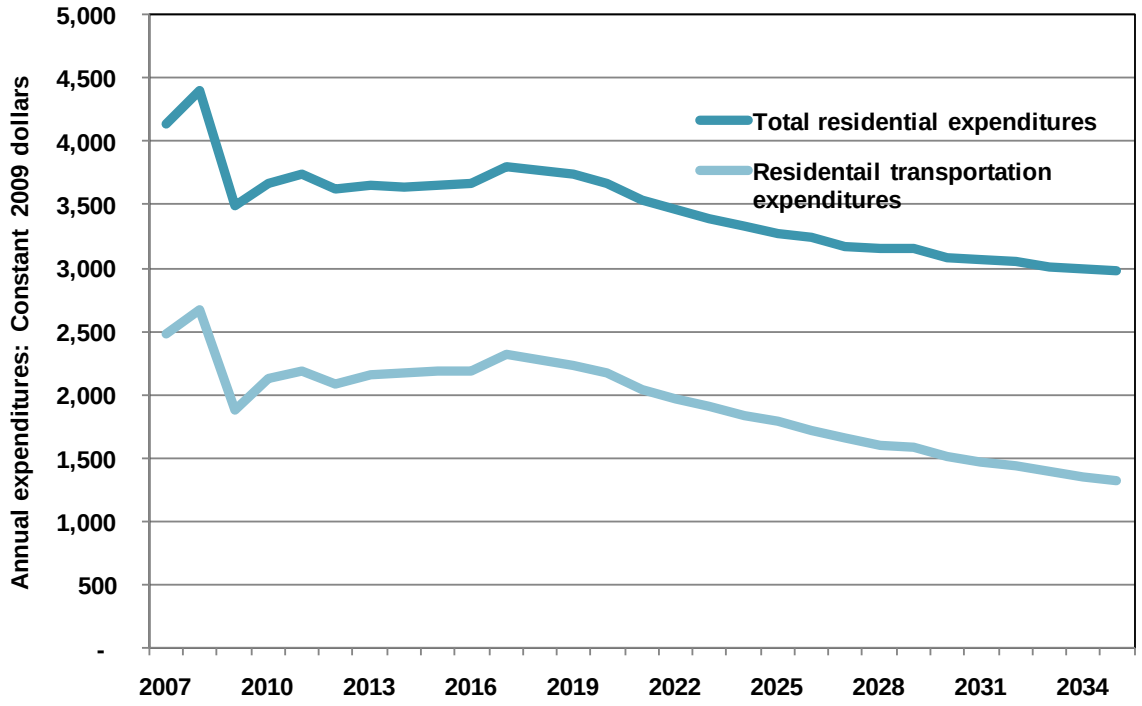

Figure 2-7: Washington residential energy expenditures projection through 2035. Annual residential energy expenditures are expected to decline primarily driven by improving efficiency in transportation. (W0011)

Figure 2-8 summarizes greenhouse gas forecasts from 2010 and 2011 projected to the year 2035. The difference between Washington's 2010 and 2011 projections of greenhouse gas emissions are due to a combination of the newly implemented federal fuel efficiency standards for vehicles, an updated energy forecast and several other secondary changes to inventory methodology summarized in Appendix B.

Over the coming years, climate change impacts will also likely alter the supply and demand for energy.[16] An increase in severe weather events may lead to outages or damage to energy infrastructure. Climate change impact assessments and adaptation will need to be incorporated into existing programs and planning for the energy sector, such as accounting for hydropower production changes. Although the 2012 Energy Strategy does not address the effects of climate change or incorporate climate projections of temperature and hydrology in the forecasting of supply and demand, future updates will. Future updates will also help build the capacity for the energy sector to identify vulnerabilities to climate change, and protect and adapt energy infrastructure and system reliability.

[16] A Hamlet and M McGuire Elsner, "Effects of projected climate change on energy supply and demand in the Pacific Northwest and Washington State," University of Washington Climate Impacts Group 2009. http://cses.washington.edu/cig/res/hwr/ccenergy.shtml. **(R0163)**

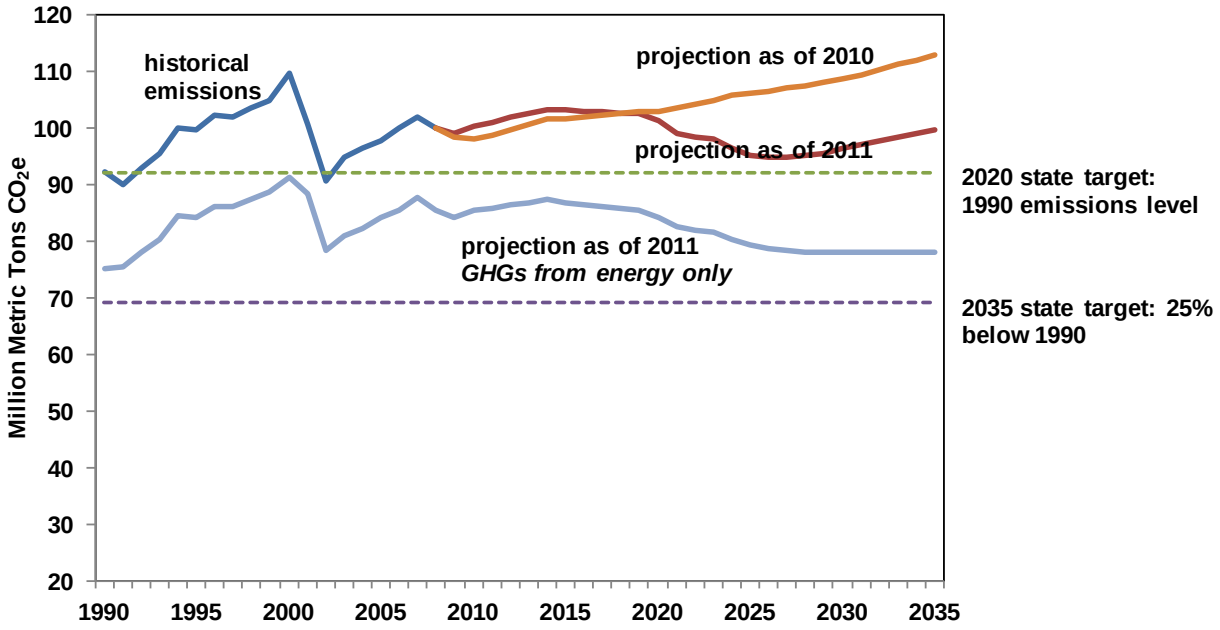

Figure 2-8: Washington greenhouse gas emissions projection through 2035. (W0001)

2.4 Policy Options and Policy Focus

Throughout the 2012 Energy Strategy process, Commerce maintained a master Policy Options list (Appendix C) documenting the policy suggestions of the Advisory Committee and a number of additional stakeholders. Commerce staff and members of the Technical Experts Panel, or other individuals called upon by the Panel, provided opinions and analysis on the policies compiled in the list and, based on that input, Commerce eliminated less promising options from the list. Commerce then assembled candidate policy packages, which were tested against the three goals and nine principles using a qualitative policy package decision tool to ensure that all policy packages addressed all of the goals and principles.

In January 2011, the Advisory Committee suggested that this release of the Energy Strategy have a central vision in order to focus policy effort, rather than have it dispersed across over one hundred unique suggestions catalogued in the Policy Options list (and thousands of possible combinations in the form of policy packages). The Advisory Committee and Commerce collaborated to identify *Transportation Efficiency* as the primary vision of this release of the Energy Strategy, according to the rationale described below in Section 3.1 "*Why Transportation Efficiency?*" Two minor focus areas, *Buildings Efficiency* and *Distributed Energy*, were chosen by Commerce to ensure coverage of all goals and principles in a way most consistent with the prior discussions with Advisory Committee members.

2.5 Near-Term and Long-Term Options

Commerce eventually identified 31 policy options covering the three focus areas and these are each detailed in separate sections below. Within each focus area, policy options are divided into *near-term recommendations* that appear to have enough support among stakeholders that they

can be implemented or launched in one to two years, and *long-term policy options* that require continued analysis, negotiation, or both.

Near-term recommendations conclude with a recommendation for *implementation* generally intended for action over the next two years, though some may extend as long as the next Washington State Energy Strategy in 2015.The recommendations contain a mix of approaches, including the reinforcement or expansion of existing activities ("continue to" or "increase"), specific new actions ("amend," "adopt," "launch") or, in a few instances, a longer listing of options for consideration.

Near-term recommendations are intended to be mutually compatible such that the state could move forward on all of them simultaneously, as a complete and consistent package. Some near-term recommendations can be implemented within existing programs and budgets, while others may require new authorizations or appropriations.

Long-term policy options conclude with a recommendation for *next steps* generally intended for action beyond two years. Items in the long-term category are ones that often require more analysis, research or pilot testing, may need significant additional funds to undertake, or that may require substantial actions by other private or public sector organizations that are not likely to happen in the next two years.

Long-term policy options are only options, so they may be mutually exclusive. They should not be envisioned as a policy package the way the near-term recommendations can be. In some cases, the long-term options may even be eventual replacements of one or more near-term recommendations.

2.6 Analysis Principles

As the Energy Strategy evolves in future editions, the state's quantitative analysis of competing policy options will follow an integrated framework designed by the Technical Experts Panel early in the process and described in more detail in Section 8.3.1. For the 2012 Energy Strategy, however, Commerce has depended heavily on existing analyses on a policy-by-policy basis, supplemented by new analysis from the State Energy Office and members of the Technical Experts Panel. To keep reported results as sound and consistent as possible, Commerce chose existing research and designed its own analyses following a few principles.

- Forecasts of policy impacts are based on energy demand and price forecasts supplied by the EIA, except where more accurate regional data can be supplied by a local organization such as the Northwest Power and Conservation Council or Puget Sound Regional Council;
- Sensitivity of analysis outcomes are tested against the four futures described during the September 2010 Scenario Planning Workshop; and
- Greenhouse gases and economic costs are considered on a lifecycle basis where possible. Renewable energy resources are recognized to have greenhouse gas emissions associated with facility construction and fuel refining; indirect economic impacts and job creation are weighed together with the direct cost of energy.

Chapter 3 – Advancing Transportation Efficiency

3.1 Why Transportation Efficiency?

In January 2011, the Advisory Committee decided that this release of the Energy Strategy should have a central vision in order to focus policy effort in a thoughtful, coordinated and effective way. During the month of February Commerce brainstormed various possible themes and, on March 10, brought a suggested vision of *Transportation Efficiency* to the Advisory Committee.

Washington, and the Pacific Northwest in general, has a long and successful history of describing, measuring and implementing electric energy efficiency measures as an energy resource, with strong analytic and policy support from the Northwest Power and Conservation Council. The *Transportation Efficiency* theme is an opportunity to apply that experience and expertise to the "other half" of the energy system.

In Washington, utilities with at least 25,000 customers are required by law to obtain all cost-effective conservation. Additionally, the Bonneville Power Administration supplies at least some power to nearly all utilities in Washington, and is required by federal law to make cost-effective energy efficiency a priority. Hence, a large amount of the "low hanging fruit" of energy efficiency has been picked in the electric sector. There is no similar legal framework in the transportation sector, so there is a large and exciting potential for new analysis and discovery there.

An examination of the primary sources of and demands for energy in Washington (Figure 2-1) highlights the potential for efficiency within the transportation sector. The vast majority of energy used is never applied to moving vehicles and ends up being lost as waste heat. The primary reason for that loss is that the majority of vehicles in use are direct-drive internal combustion engines, which deliver, on average, barely 25 percent of the energy in the fuel to the wheels on the road. New federal CAFE standards promise a substantial improvement in that number. Meanwhile, hybrid electric vehicles are becoming commonplace after the introduction of the Toyota *Prius*, while the Nissan *Leaf* appears to be signaling a similar rollout of consumer-oriented, all-electric vehicles. Significant electrification of the transportation sector seems imminent, and a focus on this in the 2012 Energy Strategy will help the state to prepare.

Figure 2-1 also shows that 44 percent of the state's end use energy consumption is in the transportation sector. Not visible in the diagram is the relatively high cost of transportation energy: 60 percent of the state's energy *expenditures* are in the transportation sector.[17] The figure shows that the vast majority of Washington's petroleum use comes from the transportation sector. Therefore, a significant fraction of that 60 percent of energy spending is leaving the state's economy in the form of imported oil purchases.

National and international energy agencies indicate that there is considerable uncertainty and potential volatility regarding future oil prices[18] and that long-term oil production may be restricted

[17] State energy data are all for calendar year 2008, drawn from the U.S. DOE's State Energy Data System, unless otherwise noted. **(R0117)**

[18] EIA 2011 Annual Energy Outlook, p. 61. **(R0090)**

by "political decisions and limits on economic access to resources."[19] In the 2010 World Energy Outlook, the International Energy Agency highlights the need to reduce the demand for oil to reduce the economic burden of oil use and vulnerability to supply disruptions.[20] Washington has little ability to influence long-term world oil prices, but implementation of this Energy Strategy can make the state less dependent on oil, improve Washington's energy-related resiliency, and help keep people and business moving even while energy price volatility increases.

Energy efficiency has particular advantages for low-income and vulnerable populations. In the electric sector, efficiency is widely known as a way to reduce home energy costs. Transportation efficiency can have an equally significant impact on the household budget, by not only reducing the fuel requirements for family vehicles, but also by increasing the number of transportation options and reducing the number of trips required. However, some strategies to reduce energy consumption and greenhouse gas emissions in the transportation system could result in costs to low-income households. Before any strategies are implemented, further analysis of the impacts to low-income and vulnerable populations will be necessary.

Finally, transportation emissions account for 45 percent of the state's *entire* greenhouse gas inventory, including agricultural and industrial emissions, as well as energy consumption in non-transportation sectors.[21]

3.2 Building on Prior Work

3.2.1 Climate Action Team

Commerce, in consultation with WSDOT, recommended that the Advisory Committee draw candidate Energy Strategy policies from the transportation policy recommendations developed during the state's Climate Action Team process in 2008. The 2008 recommendations are largely consistent with many of the policy options identified during the Energy Strategy process and, more importantly, they are the product of intensive stakeholder negotiations coupled with preliminary analysis of costs and greenhouse gas impacts. The Transportation Implementation Working Group, a broad transportation stakeholders' sub-group of the Climate Action Team, issued *Reducing Greenhouse Gas Emissions and Increasing Transportation Choices for the Future*,[22] which featured a set of recommendations as follows:

1. Expanding and Enhancing Transit, Rideshare and Commuter Choice
   - 1A: Washington Transportation Access Network
   - 1B: Enhancements to Urban Commute Trip Reduction and Rideshare Programs
   - 1C: Statewide Residential Trip Reduction Program

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[19] EIA 2011 Annual Energy Outlook, p. 61. **(R0090)**

[20] International Energy Agency, World Energy Outlook 2010, Executive Summary, p. 7. **(R0091)**

[21] Washington State Department of Ecology, *Washington State Greenhouse Gas Emissions Inventory*, 1990-2008. Available at http://www.ecy.wa.gov/biblio/1002046.html. **(S0027)**

[22] See Appendix 4 of report at http://www.ecy.wa.gov/climatechange/2008CATdocs/IWG/tran/110508_transportation_iwg_final_report.pdf **(S0028)**

2. Compact and Transit Oriented Development Recommendations
   - 2A: Promote and Support Housing and Employment Density
   - 2B: Develop and Provide Parking Incentives and Management
   - 2C: Encourage Bicycle and Pedestrian Accessibility
   - 2D: Encourage Urban Brownfield Redevelopment
   - 2E: Transportation Concurrency

3. Climate Change and Transportation Funding — Crisis and Opportunity
   - 3A: Align Investments and Operations with the Achievement of the VMT and Greenhouse Gas Reductions of ESSHB 2815[23]
   - 3B: Pursue New Revenue Sources to Support Transportation Choices

4. Use Transportation Pricing To Meet the Goals

5. Non-VMT Recommendations to Reduce Greenhouse Gas Emissions
   - 5A: Improvements to Freight Railroads and Intercity Passenger Railroads
   - 5B: Diesel Engine Emission Reductions and Fuel Efficiency Improvements
   - 5C: Transportation Systems Management
   - 5D: Vehicle Electrification
   - 5E: Evaluate and Implement a Low--Carbon Fuel Standard

The Climate Action Team's recommendations were not offered in any particular order of priority. Commerce constructed its preliminary Transportation Efficiency policy package by beginning with this set of recommendations, reevaluating and adjusting them according to events since the Climate Action Team process took place, and adding new initiatives from the Policy Options list.

3.2.2 2011 Energy Strategy Update

Several initiatives in the 2011 Energy Strategy Update affected transportation energy policy.

- Energy-aware growth management
- Electric vehicle charging station siting
- Uniform regulatory protection for charging stations
- Amending Washington's renewable fuels standard (RFS)
- Compressed natural gas

The third item, uniform regulatory protection for charging stations, has already been fully implemented.[24] Work on the four remaining initiatives continues and a detailed status update is

[23] ESSHB 2815 has since been codified in RCW 47.01.440 relating to VMT goals, and RCW 70.235.020 relating to greenhouse gas targets. VMT means Vehicle Miles Traveled. Climate Action Team recommendation 3A states that transportation investments and operations need to be aligned both with legislated greenhouse gas targets and with legislated VMT reduction benchmarks.

[24] SHB 1571, 2011 Regular Session, as codified in RCW 80.28.

available in Section 7.4 of this document. The 2012 Energy Strategy does not replace or displace any of the recommendations made in the 2011 Update, though it does provide additional recommendations in the cases of growth management and Washington's RFS.

3.2.3 *Moving Washington* and Sustainable Transportation

The *Moving Washington* framework and the approach to sustainable transportation connect well with the 2012 Energy Strategy's emphasis on transportation efficiency.

Moving Washington

Washington's economic vitality and livability depend on reliable, responsible and sustainable transportation. *Moving Washington* is WSDOT's approach for creating an integrated, 21st century transportation system. It represents the state's framework for making transparent, cost-effective decisions that keep people and goods moving and support a healthy economy, environment and communities. *Moving Washington* reflects the state's transportation goals and objectives for planning, operating and investing. State law directs public investments in transportation to support economic vitality, preservation, safety, mobility, the environment and system stewardship.[25] The *Moving Washington* program identifies the state's highest transportation priority as maintaining and preserving the safe and long-lasting performance of existing infrastructure, facilities and services.

Three essential transportation strategies work together to integrate investments, resulting in cost-effective solutions: operate efficiently, manage demand and add capacity strategically. Many of these strategies are among those highlighted in the 2012 Energy Strategy.

Operate efficiently – Strategies that improve operations get the most out of existing highways by using traffic management tools to optimize the flow of traffic and maximize available capacity. These strategies include utilizing traffic technologies such as ramp meters and other control tactics to improve traffic flow and reduce collisions, deploying incident responders to quickly clear collisions, optimizing traffic signal timing to reduce delay and implementing low-cost, high-value enhancements to address immediate needs.

Manage demand – Whether shifting travel times, using public transportation or reducing the need to travel altogether, managing demand on overburdened routes allows the entire system to function better. Strategies include variable rate tolling in ways that reduce traffic during the most congested times and balance capacity between express and regular lanes, improving the viability of alternate modes, and providing traveler information to allow users to move efficiently through the system.

Add capacity strategically – Targeting the worst traffic hotspots or filling critical system gaps to best serve an entire corridor, community or region means fixing bottlenecks that constrain the flow. Upgrading a failing on-ramp merge or hard shoulder running during peak periods can free up the flow of traffic through a busy corridor. From improving rail crossings and ferry service to working with transit agencies to connect communities, from building direct-access ramps for

[25] RCW 47.04.280(1).

carpools and transit to including paths for pedestrians and bicyclists, capacity improvements require strong partnerships with a shared vision for the corridor.

Sustainable Transportation at WSDOT

Sustainable transportation supports a healthy economy, environment and community, and adapts to weather extremes, diminished funding and changing priorities. Furthermore, a sustainable transportation system is built to last, uses fewer materials and energy and is operated efficiently.

WSDOT's sustainable transportation approach is consistent with the 2012 Energy Strategy and helps reduce energy consumption and greenhouse gas emissions by focusing on four primary strategies:

- Improve fuel - Support efforts to lower the carbon content of fuels and find alternative fuels.
- Advance vehicle and vessel technology - Improved vehicle and vessel technology will lead to vehicles and vessels that run on energy sources other than petroleum with higher rates of efficiency.
- Support system efficiency - Operate the transportation system to maximize efficiency and improve traffic flow.
- Manage demand for transportation - Actively support efficient transportation options such as carpooling, vanpooling, working from home, taking transit, bicycling, walking or conducting activities closer to home.

WSDOT is currently engaged in many efforts to reduce transportation emissions for the state as a whole. Through public-private partnerships, Washington is leading the charge toward cleaner transportation with a network of publicly accessible electric vehicle (EV) fast charging stations along Interstate 5 between Canada and Oregon, creating the nation's first "Electric Highway." WSDOT invests in and promotes a variety of strategies for commute options, including the use of carpools, vanpools, buses, bicycling, walking, compressed work hours and working from home, for a more efficient transportation system. WSDOT has been administering the Commute Trip Reduction Program since 1991 and incident response teams clear accidents to keep traffic moving. The Ferries division deploys several strategies to decrease fuel consumption and decrease emissions, such as using biodiesel blends and exploring the use of LNG in vessels, as well as retrofitting a vessel with a hybrid electric engine.

3.2.4 Federal Policy Initiatives

In July 2011, the Obama administration announced an agreement with automobile manufacturers and autoworkers to move forward with aggressive new CAFE standards that require a 5 percent annual increase to the average fuel economy of new light duty vehicles from 2017 through 2025, and a 3.5 percent annual increase for light trucks. The new CAFE standards will result in a combined 54.5 miles per gallon (mpg) rating for both classes of light vehicle by model year 2025.

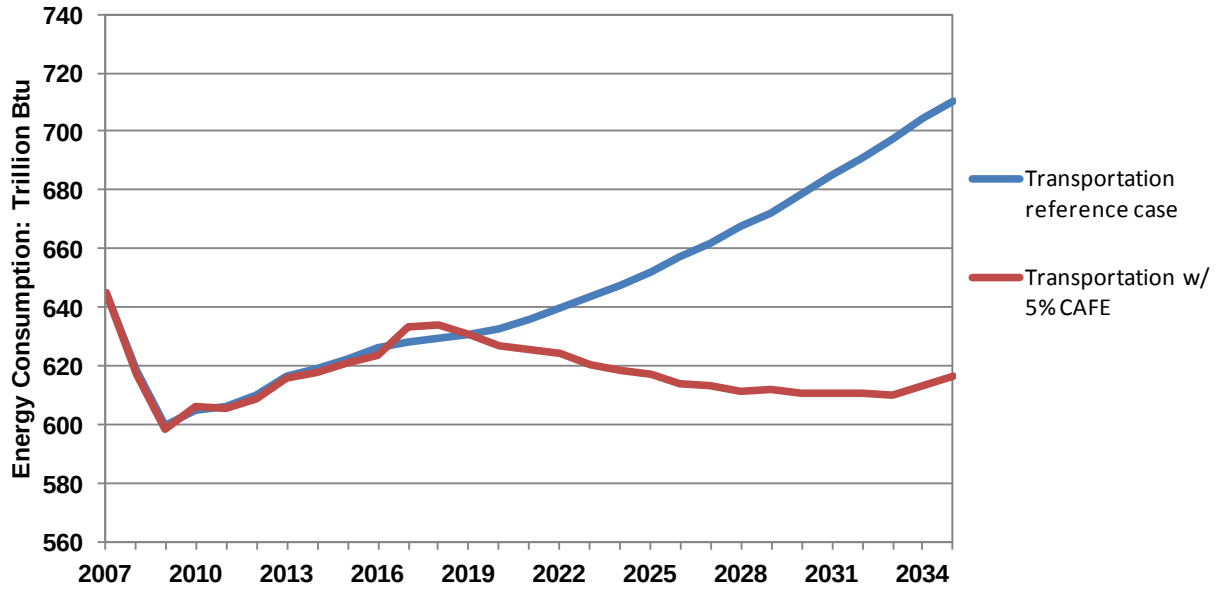

Figure 3-1: Effect of the July 2011 CAFE agreement on Washington transportation sector energy consumption. The blue reference case reflects the prorated Energy Information Administration projections offered in the Annual Energy Outlook 2011 as used elsewhere in this Energy Strategy. The red line reflects the projected consumption with the new agreement applied. (W0011)

Figure 3-1 shows the dramatic effect that the new CAFE standard will have on Washington's projected transportation energy consumption. As the 2012As the 2012 Energy Strategy goes to press, the federal government is rolling out, for the first time ever, fuel economy standards for heavy-duty vehicles as well.[26]

Figure 3-1 does not yet incorporate the heavy-duty vehicle standards, so it is an understatement of the effect these new federal policy changes will have. The figure demonstrates the power of national policy on the transportation sector and sets a realistic expectation for the impact made by a state policy. However, there are plenty of ways to not only embrace and amplify the impacts of CAFE, but to make Washington a leader in developing technologies and creating jobs driven by the new standards, and to create additional policy in subsectors unaffected by CAFE.

3.3 A Transportation Policy Package

With input from the Advisory Committee, Technical Experts Panel and 2008 Climate Action Team, Commerce grouped and prioritized the recommendations developed in 2008, and added a few new policy recommendations that have evolved since then.

[26] *Federal Register* vol.76 no.179, "Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles" pp.57106-57513 (Sep.15, 2011). **(R0180)** The new rules were developed collaboratively by the U.S. Environmental Protection Agency and the National Highway Traffic Safety Administration, see http://www.nhtsa.gov/fuel-economy **(R0181)** and http://www.epa.gov/otaq/climate/regulations.htm... **(R0182)**

Commerce worked with WSDOT to develop basic principles to guide the prioritization of transportation policy measures:

- Analyze whether it is possible to prioritize investments to support energy efficiency goals while at the same time improving the long-term economy of the state, or at least not negatively affecting the economy;
- Analyze approaches in other states, such as California's SB 375,[27] as potential models for better aligning transportation investments and smart growth;
- Prioritize investments to support a more energy efficient transportation system; and
- Modify transportation system performance measurement approaches to focus on person and goods throughput as well as vehicle throughput.

The result is a balanced and comprehensive policy package that addresses the transportation energy picture from three angles.

1. **Vehicles and fuels** policies take the most direct approach to reduce transportation energy consumption and greenhouse gas emissions. They regulate or influence the nature of consumer products on the market, namely the fuel efficiency of vehicles and the carbon content of fuels.

2. **Travel efficiency** policies reduce the demand for transportation fuel by increasing the average number of riders per vehicle, reducing trip lengths, reducing congestion in the system and encouraging development patterns that support more walking, bicycling and transit use.

3. **Pricing** policies place a price on energy consumption, greenhouse gas emissions or road use. Ultimately, they impact vehicles and fuels or travel efficiency, but they also allow the market to find the best solutions by attaching a price tag to the policy goals.

Within each of these policy groups, Commerce prioritized policies to be either **near-term recommendations** or **long-term options**. Near-term recommendations are policies for which research has demonstrated a high potential, prior implementation experience in Washington or elsewhere demonstrates their effectiveness, or an important pilot opportunity exists. Long-term options show high promise for addressing one or more of the Energy Strategy goals, but exhibit a high level of uncertainty such that more research is necessary before moving ahead with implementation.

Commerce has identified nine near-term recommendations and eight long-term options for the transportation sector, as shown in Table 3-1.

[27] http://www.leginfo.ca.gov/pub/07-08/bill/sen/sb_0351-0400/sb_375_bill_20080930_chaptered.pdf **(R0092)**

	vehicles and fuels	travel efficiency	pricing
3.4 near-term recommendations These are mature policy concepts, or pilot projects to test newer policy concepts.	3.4.1 electric vehicle support 3.4.2 RFS 3.4.3 diesel engine fuel efficiency improvements	3.4.4 Commute Trip Reduction program expansion 3.4.5 smart growth and transportation planning 3.4.6 transportation systems management 3.4.7 Regional Mobility Grants	3.4.8 electric vehicle mileage pricing pilot 3.4.9 car sharing and mileage based insurance
3.5 long-term policy options These are candidates for long-term policy and require piloting or additional analysis before deployment.	3.5.1 revenue neutral feebate 3.5.2 low carbon fuel standard 3.5.3 advanced aviation fuels 3.5.4 improvements to railroads	3.5.5 comprehensive trip reduction program 3.5.6 energy efficient transportation choices	3.5.7 emerging pricing methods - congestion pricing - mileage pricing - cordon pricing 6 carbon pricing

Table 3-1: Menu of transportation policy options.

The last long-term option, *carbon pricing*, is an economy-wide approach to energy system management that affects transportation as well; it is discussed separately in Chapter 5.

3.4 Near-Term Recommendations

3.4.1 Electric Vehicle Support

Policy Description

The last three years have seen the resurgence of plug-in electric vehicles (PEV) as a viable vehicle alternative. Electric drive platforms, of which PEV are one example, have significantly greater energy efficiency than conventional combustion engines and can deliver zero tailpipe emissions. The lifecycle greenhouse gas emissions from PEV depend on the electricity generation mix. Washington has the third cleanest electricity generation in the nation with one of the lowest retail prices per kilowatt-hour. Thus, the larger market deployment of PEV represents a great opportunity for Washington to achieve the goals of the Energy Strategy.

The state has been a national leader in developing a PEV-friendly system through work at the city, regional and state levels. With the recent creation of the state PEV Task Force stakeholders from across the state have a forum in which to discuss and coordinate activities that will foster PEV markets. The figure below summarizes activities that have been conducted in the four key areas of infrastructure planning, infrastructure deployment, markets support and education and outreach.

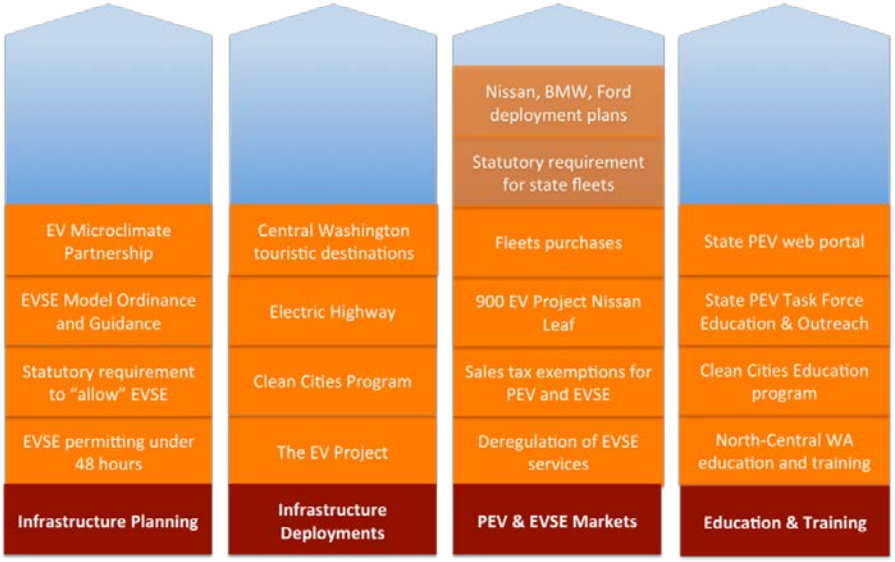

Figure 3-2: Activities of the PEV Task Force to date. EVSE means Electric Vehicle Supply Equipment.

While there is clearly a role for state and local governments to help prepare the conditions for the arrival of PEV, it is also important to define that role so that it does not overlap or interfere with the private sector, which ultimately has the responsibility to drive the larger, sustained markets for electric vehicles. This policy option focuses on three areas:

1. **Vehicle market support**: Understand the costs and benefits of PEV to the state and to consumers in order to determine where supportive policies may be needed;
2. **Charging infrastructure deployment support**: Plan and invest in a coherent, integrated basic network of charging stations and remove undue barriers for further deployments; and
3. **PEV systems integration**: Assess and implement systemic strategies to integrate PEV into the energy grid and the built environment.

Washington is one of the leaders in the United States for the deployment of electric vehicles. Washington is one only seven states initially selected for EV infrastructure by the federally-led EV Project;[28] Washington is a participant in the West Coast Green Highway Project;[29] electric vehicle related business are emerging across the state; and local governments have been supporting the deployment of electric vehicle infrastructure.

In 2010, Washington developed model guidance on vehicle charging equipment siting for local jurisdictions. Nearly 100 jurisdictions across the state have adopted some version of those

[28] http://www.theevproject.com/index.php

[29] http://westcoastgreenhighway.com/

standards. In 2011, Washington enacted legislation to exempt charging facilities from utility-level regulation – an important step in encouraging private sector development of PEV infrastructure. Washington State government is also a major contributor to the deployment of PEV charging facilities through creation of the nation's first electric vehicle highways on Interstate 5 and U.S. Highway 2.[30,31]

Finally, the energy and emissions reductions benefits associated with electric vehicles are not limited to light duty vehicles. Electrically powered transit vehicles (such as King County's trolley buses) reduce emissions and energy consumption. The infrastructure to support electrically powered trolley buses and other electrically powered transit should be expanded as well.

Previous Research and Experience

In 2011, Governor Gregoire asked Commerce to collaborate with WSDOT to convene a state PEV Task Force. The Task Force now serves as the statewide forum for PEV policy and deployment planning. Since early 2011, the PEV Task Force has discussed the actions needed to support the deployment of PEV in Washington. Most of the Task Force's thinking was consolidated into a proposal submitted to the U.S. Department of Energy in June 2011. Although this competitive proposal was not funded, that document outlines in more detail much of the progress on PEV to date and the gaps moving forward. In addition, the Western Washington Clean Cities coalition was awarded $15 million from DOE for alternative vehicle development activities including EVs.[32]

Electrically powered transit can be much more energy efficient than other modes of transportation. In addition, because Washington's electric power is much cleaner than most of the country's, the greenhouse gas emissions associated with electrically powered transit can be very low. For example, one estimate of the greenhouse gas emissions for King County Metro Transit's electrically powered trolley buses indicates that trolley bus emissions per passenger mile are about one-fourth the emissions of standard buses.[33]

New Analysis

No new analysis on this topic was conducted for the 2012 Energy Strategy.

Implementation

- To inform policymaking, maintain an updated model of the lifecycle cost of PEV ownership compared to other vehicle platforms.
- Assess the role of government investments in charging infrastructure and determine the infrastructure needed to support and accompany the larger market deployment of PEV. As part of this task, complete installation and assess the impact of the I-5 and Highway 2

[30] *Light-Duty Vehicle and Fuel Technology*, June 2011

[31] For more information on Washington's electric vehicle activities see www.electricdrive.wa.gov

[32] www.wwcleancities.org/

[33] King County Trolley buses emissions per passenger mile: http://www.dot.state.ri.us/documents/enviro/Climate_Change_Workshop_Presentation_4-14-10.pdf

vehicle charging station program (installation to be completed in late 2011 with assessment activities to follow).

- Work with the states and provinces in the Pacific Coast Collaborative to develop a group electric vehicle purchase request for public fleets.[34] If this effort is successful private fleets would also be encouraged to acquire electric vehicles.
- Integrate PEV into discussions about electric infrastructure and generation policy in the state in order to identify synergies and potential challenges.
- Compete for federal funding to expand the deployment of electric vehicles and infrastructure in the state, including electrically powered transit.
- Promote the development of electric vehicle equipment manufacturing facilities, following examples such as the September 2011 opening of the SGL Automotive Carbon Fiber production facilities for BMW electric vehicles in Moses Lake.

3.4.2 Renewable Fuels Standard

Policy Description

In 2006, the Washington State Legislature passed an RFS requiring gross diesel fuel sales statewide to consist of at least 2 percent biodiesel or renewable diesel, and gasoline sales to consist of at least 2 percent ethanol, by December 2008. Federal fuel content requirements for ethanol have since rendered the state's ethanol standard irrelevant. The biodiesel requirement has not been met due in part to a lack of legislated enforcement authority, but also due to the high administrative burden associated with a volumetric requirement versus the more common universal requirement that has been successfully implemented in other states.[35]

The incapacity to realize the state's biodiesel consumption goals through a volume-based RFS led to legislative initiatives in the 2010 and 2011 sessions calling for transition to a universal content requirement. These efforts were unsuccessful, largely due to concerns over potentially higher fuel prices, fuel quality, engine performance and fuel distribution infrastructure.

As shown by the successful implementation of a universal 5 percent biodiesel (B5) requirement in Oregon, which is dependent upon Washington refineries and wholesale distributors for its fuel supply, these concerns have largely been addressed. Biodiesel producers are consistently providing high-quality fuel, distributors are becoming familiar with proper storage and handling practices, and nearly all major engine manufacturers support the use of low-level biodiesel blends in their equipment. Petroleum distributors continue to add biodiesel storage and blending

[34] http://www.pacificcoastcollaborative.org/Pages/Welcome.aspx

[35] A volumetric mandate requires that a minimum fraction of total, annual fuel sales consist of the renewable fuel. Verifying a volumetric mandate requires certification and tracking of all blendstocks entering the fuel supply throughout the year. A universal mandate requires that fuel dispensed at any pump at any time contain a minimum fraction of the renewable fuel, and can be verified by random testing.

infrastructure to meet the biodiesel content requirements in Oregon and British Columbia, and B5 is now cost competitive and, in some cases, less expensive than diesel.[36]

Low-level biodiesel blends are also proving viable in other sectors, from rail and maritime to home heating and industrial uses. Field trials by Burlington Northern Santa Fe, Amtrak, Canadian Pacific[37] and others have demonstrated successful use of biodiesel blends in diesel locomotives, and biodiesel use for home heating (bioheat) is growing rapidly in many northern states.

Biofuels for aviation are also being developed in Washington; this topic is addressed separately in long-term policy option *Advanced Aviation Fuels*, Section 3.5.3. These advanced processing technologies will yield a variety of co-products, including renewable diesel and gasoline, lubricants and precursor chemicals. Building markets for these products will help ensure aviation biofuels become cost-competitive. Both biodiesel and renewable diesel qualify for RFS compliance in Washington. Enabling the RFS to function properly as a universal content requirement will help support the development of aviation biofuels.

State agency use of biodiesel is helping to resolve issues associated with fuel distribution, handling and storage. With recent enhancements to the state's procurement process, agencies continue to make significant progress toward meeting the requirement for 20 percent annual biodiesel use under Revised Code of Washington (RCW) 43.19.642. Washington State Ferries, which accounts for 87 percent of agency diesel consumption, conducted extensive field trials and is successfully using B5 in two-thirds of their fleet. The remaining vessels will begin using biodiesel in 2012. Ferries plans to use 20 percent biodiesel in its fuel supply as soon as budgets allow. Biodiesel use by other state agencies has increased nearly three-fold in the last two years. The latest biannual report[38] from the Department of Enterprise Services shows biodiesel use by agencies other than Ferries has now reached 12 percent.

Washington is home to an innovative and motivated biodiesel industry; a more successful biodiesel standard would encourage further development of this industry in the state. Though there is ongoing debate about the exact degree of reductions, biofuels can reasonably be expected to deliver at least modest greenhouse gas emissions reductions relative to fossil fuels.[39] Commerce proposes to support reasonable legislation in the 2012 legislative session that converts the existing, volume-based RFS to the universal standard that has proven successful in other states.

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[36] Analysis by the Washington Trucking Associations documented a price premium of 4.7¢/gal for B2 relative to ultra low sulfur diesel (ULSD) in Spokane, WA over an 8-month period beginning in June 2010 (March 3 2011 memo on SSB 5478, **S0091**). Energy Office tracking of diesel and biodiesel prices (**W0012**) shows the magnitude of price volatility to eclipse the magnitude of the systematic difference. Moreover, prices for B5 are likely to be slightly lower than B2 due to the existing, large market for this product in Oregon, and due to the absence of handling charges that would come with a universal (rather than volumetric) standard.

[37] www.cpr.ca/en/in-your-community/environment/Documents/CP-Biodiesel-Demonstration-Final-Report-June-2010.pdf **(R0183)**

[38] www.ga.wa.gov/News/2011-01-BiodieselReport.pdf **(S0079)**

[39] Biodiesel blends can also provide fuel efficiency improvements to engines by increasing fuel lubricity.

Previous Research and Experience

The U.S. Environmental Protection Agency (EPA) is implementing a federal RFS as part of the Energy Independence and Security Act of 2007 (EISA). The federal approach includes not only requirements on the content of renewable fuel by volume, but also on the carbon intensity of these fuels. Carbon intensity is the total amount of carbon emitted into the atmosphere for each gallon of fuel, including extraction, refining, and ultimately combustion in the vehicle. In an effort to obtain better estimates of carbon intensity, the EPA has analyzed numerous fuel production pathways. For example, canola oil is a key raw material for biodiesel produced in Washington. In 2010, the EPA published its determination that canola oil biodiesel meets the lifecycle greenhouse gas emission reduction threshold of 50 percent required by the EISA, putting it on equal footing with biodiesel made from soy oil, algal oil and waste oils, fats and greases.

A number of additional incentives for biofuels available in Washington provide important related experience, including:[40]

Alternative Fuel Loans and Grants

- The Energy Freedom Program was established in 2006 through the Washington State Department of Agriculture to "promote public research and development in bioenergy and to stimulate the construction of facilities in Washington to generate energy from farm sources or convert organic matter into fuels." Nearly $11 million was appropriated for the Energy Freedom Account, primarily in low-interest loans, to support oilseed crushing and biodiesel processing around the state. Responsibility for future awards was transferred to Commerce in 2007, but no additional appropriations have been made and all repayments of initial loans have been recaptured for the state General Fund. The Program also includes the Green Energy Incentive Account, which provides financial assistance for alternative fueling infrastructure along Interstate corridors. Funds have yet to be appropriated for this account. The Program is set to expire June 30, 2016.[41]
- Biofuel Distribution Incentives
- Equipment and related services used for the retail sale of B20 or higher biodiesel blends or E85 motor fuel are exempt from state sales and use taxes. Fuel delivery vehicles and related services are exempt from state sales and use taxes if at least 75 percent of the fuel is B20 or higher biodiesel blends or E85 motor fuel. These exemptions expire July 1, 2015.[42]
- A business and occupation tax deduction is available for the sale or distribution of biodiesel or E85 motor fuel. This deduction is available until July 1, 2015.[43]
- Sales and use of non-highway biodiesel and biodiesel blends by farm fuel users is exempt from retail sales and use taxes.[44]

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[40] A summary of these incentives can be found on the website of the Alternative Fuels and Advanced Vehicles Data Center of the U.S. Department of Energy (http://www.afdc.energy.gov/afdc/laws/laws/WA/tech/3251). **(R0093)**

[41] RCW 43.325

[42] RCW 82.08.955 and 82.12.955

[43] RCW 82.04.4334

[44] RCW 82.08.865 and 82.12.865

Biofuels Production Incentives

- Qualifying buildings, equipment and land used in the manufacturing of alcohol fuel, biodiesel or wood biomass fuels or for biodiesel feedstocks are exempt from state and local property and leasehold excise taxes for a period of six years from the date the facility becomes operational. This incentive expires December 31, 2015.[45]
- A reduced business and occupation tax rate is available to manufacturers of wood biomass fuel.[46]
- Waste vegetable oil, specifically cooking oil gathered from restaurants or commercial food processors, used to produce biodiesel for personal use is exempt from state sales and use taxes.[47]
- A business and occupation tax credit of $3 per ton through June 30, 2013, then $5 per ton through June 30, 2015, is provided for forest-derived biomass used for the production of biofuel.[48]
- The sale and use of forest materials for biofuel production is exempt from state sales and use taxes through June 30, 2013.[49]

New Analysis

No new analysis of this policy option was conducted for the 2012 Energy Strategy.

Implementation

- Amend existing law to require universal 5 percent biodiesel or renewable diesel content in diesel.
- Exempt emergency backup generators due to long-term fuel storage concerns.
- Consider provisions allowing for seasonal or geographic exemptions for blends below the 5 percent requirement due to addition of cold weather fuel treatments.
- Explore the benefits of restoring the recently expired B & O tax rate reduction for biodiesel and renewable diesel producers in order to stimulate advanced biofuel industry development.
- Conduct a comprehensive biofuel incentives study toward rationalizing Washington's biofuel policy.

[45] RCW 82.29A.135 and 84.36.635
[46] RCW 82.04.260(1)(f)
[47] RCW 82.08.0205 and 82.12.0205
[48] RCW 82.04.4494
[49] RCW 82.08.956, 82.08.957, 82.12.956 and 82.12.957

3.4.3 Diesel Engine Fuel Efficiency Improvements

Policy Description

The Department of Ecology (Ecology) identified a variety of technology-based strategies that improve the fuel efficiency of diesel-powered vehicles or provide alternatives to diesel fuel use. These strategies include:

- Eliminating unnecessary engine idle time by introducing or expanding the use of anti-idling technologies;
- Improving the fuel efficiency of existing diesel vehicles and equipment by replacing inefficient older engines with new, more fuel efficient engines; or by modifying existing engines to increase their efficiency;
- Increasing the use of low viscosity lubricants and technologies that reduce rolling resistance (such as single wide tires), reducing weight and improving aerodynamics;
- Replacing freight handling equipment with battery electric, hybrid or plug-in electric hybrid equipment;
- Installing electrification infrastructure for the goods movement sector, such as providing access to electricity pedestals for truckers at rest stops across interstate highways;
- Increase use of more efficient diesel buses, such as hybrid buses;
- As discussed in other sections of the 2012 Energy Strategy, augmenting or replacing petroleum fuel use with biodiesel, biogas, natural gas or other low carbon fuels; and
- Basic maintenance.

Additionally, Washington State Ferries has identified diesel engine emission reductions and fuel efficiency improvements for its ferry fleet.[50]

In addition to reducing energy consumption and greenhouse gases, these strategies also reduce toxic air pollution. Ecology's Clean Diesel Program and the Puget Sound Clean Air Agency's Diesel Solutions Program are providing funding assistance to diesel fleets to implement some of these strategies. Specific public and private sector fleets include vehicles and equipment that move freight (trains, trucks and port cargo handling equipment), mass transit vehicles (ferries, transit buses and school buses), public works vehicles (WSDOT, counties, cities and PUDs), and emergency response vehicles (fire engines, aid trucks and ambulances). WSDOT has conducted cost benefit analyses of several strategies to conserve fuel used by the state ferry fleet, including operating on fewer engines, slowing boat speeds, implementing passive restraint systems at the dock, loading and unloading procedures and exploring the use of liquefied natural gas.[51]

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[50] Source: Washington State Ferries, email communication, October 18, 2011. **(S0070)**

[51] *Updated Report on Fuel Cost Mitigation Plan*, Washington State Department of Transportation, February 2011. **(S0031)**

Previous Research and Experience

Basic maintenance such as regular oil changes, tire pressure checks and tune-ups can also improve efficiency by to 2 to 5 percent. In the Puget Sound Clean Air Agency's experience, fleet owners have enthusiastically implemented these strategies. For example, Darigold implemented a tire pressure check program in partnership with Les Schwab. Over a 12-month period, Darigold improved efficiency and reduced tire blowouts, saving the company over $230,000 in one year.

Ecology partnered with 18 school districts and two transit authorities to install diesel fueled engine pre-heaters and cabin heaters on more than 300 buses. These heaters eliminate the need to idle the bus engine while de-icing and defrosting the windows on cold mornings. At an average cost of about $2,500 per bus, the heaters annually save about 140 gallons of diesel for a school bus and about 240 gallons for a transit bus. Those savings will equal the cost of the heaters in 2.5 to 4.5 years. For these 300 buses, Ecology estimates these technologies will conserve more than 500,000 gallons of fuel over the expected 10-year life of the heaters. Ecology will fund the installation of these heaters on another 400 school buses in 2012.

The Poulsbo Fire District and Ecology recently completed a demonstration project that installed auxiliary generator systems on two fire trucks and auxiliary battery systems on two aid trucks. These auxiliary systems eliminate the need to idle the primary engine to power emergency lights and electrical systems. The Poulsbo Fire District estimates an annual savings of 4,000 gallons of fuel. At a cost of about $18,000 per generator system and $3,000 per battery system, the Poulsbo Fire District expects to save about $20,000 annually in fuel and maintenance costs. Ecology will fund an expanded demonstration project for another fifteen to twenty fire districts in 2012.

Ecology has partnered to install idle reduction technologies on four switchyard locomotives owned by Tacoma Rail and three switchyard locomotives owned by TEMCO, LLC. The technologies circulate engine oil and heating/coolant system fluids, keep the batteries charged and start and stop the engine based on ambient air temperature and air pressure in the brake system.

Tacoma Rail saved 59,000 gallons of fuel during the first year of operation. At a total technology cost of $221,000 for the four engines, the systems paid for themselves in the first year of operation. TEMCO saved 312 gallons of fuel and $1,215 for one week of operation on the first engine retrofitted. At a total technology cost of $75,000 for three engines, Ecology expects TEMCO to save about $190,000 annually.

For transit agencies, which typically rely on standard diesel buses, the increased use of hybrid buses can reduce fuel consumption by 30 percent compared to standard coaches, according to King County Metro Transit.

New Analysis

No new analysis of this policy option was conducted for the 2012 Energy Strategy.

Implementation

- Seek a dedicated source of funds to pursue the strategies outlined above;
- Support continued use of state funds, such as the Model Toxic Control Account (MTCA), to fund projects that reduce air toxins, conserve energy and reduce greenhouse gases;
- Seek federal funds to supplement the use of dedicated state funds;
- Develop an education and outreach program to promote the use of technologies that conserve energy and reduce fuel consumption;
- Explore the benefits of an assertive, statewide, voluntary program versus a state regulation to reduce unnecessary engine idle time; and
- Implement Washington State Ferries efficiency improvements:
  - Modify Jumbo Class (two vessels) from operating on four engines during transit to three engines and modify the Jumbo Mark II Class (three vessels) from three engines to two engines during transit;
  - Slow vessel speeds on selected routes (Edmonds-Kingston and Seattle-Bainbridge) to save fuel;
  - Reduce the energy used to hold the vessel at dock through passive restraint systems and by investigating the limits of safely reducing propeller turns while maintaining the vessel in position for loading and unloading;
  - Increase the use of biodiesel up to 20 percent in the fuel mix as budget becomes available;
  - Adopt hybrid diesel-electric technologies as feasible and as money becomes available (currently Washington State Ferries has a grant application to retrofit one vessel);
  - Optimize fuel efficiencies on 144 new vessels through efficient hull design, optimized propellers and the use of heat recovery;
  - Retrofit Electromotor Division (EMD) engines with 1042 Powerhead Kits to reduce the use of engine lube oil and particulate emissions. EMD engines are installed in 13 of the 22 vessels in the Washington State Ferries fleet. These retrofits reduce particulate emissions by a minimum of 25 percent; and
  - Install fuel flow meters to monitor and manage fuel consumption.

3.4.4 Commute Trip Reduction Program Expansion

Policy Description

The Washington State Legislature passed the Commute Trip Reduction (CTR) Law in 1991[52] to improve air quality, reduce traffic congestion and reduce fuel consumption through employer-based commute programs aimed at encouraging the use of alternatives to driving alone. Under

[52] RCW 70.94.521-555

this law, local governments in the most congested areas of the state establish goals for reducing single occupancy vehicle (SOV) trips and vehicle miles traveled (VMT), and develop plans and policies to achieve those goals. The major employers (worksites with 100 or more full-time employees) in these jurisdictions are mandated to draft and implement a plan to reduce SOV trips by providing various incentives and mechanisms, such as parking cash-out, transit subsidy, telecommuting and a compressed work schedule. The program affects approximately 1,050 worksites in six regions of the state. Other employers, such as small businesses, K-12 schools, seasonal agriculture, construction or employers with swing shift schedules, are not required to participate. The state is responsible for monitoring and reporting on these plans, and provides technical assistance and grants through the CTR program. All employers in the state are eligible for tax credits if they provide commute subsidies to their employees, capped at $60 per employee per year. The state funding for WSDOT to provide grants and technical assistance is about $6.2 million for the 2011 - 2013 Biennium; the Department of Revenue administers an additional $5.5 million directed toward the tax credit program. In each biennium, local municipalities spend about $1.8 million and employers invest about $98 million in the program. The program's performance is measured through employee surveys conducted every other year at participating worksites.

The Energy Strategy aims to increase the number of employees subject to the CTR program in order to further reduce energy consumption and greenhouse gas emissions associated with commute trips. Doing so would build on current success and outcomes with commute trips while providing a means to pilot approaches to other types of trips (see discussion of a comprehensive trip reduction program in Section 3.5.5).

Several different options can be deployed to achieve this goal. One option is to lower the threshold of eligibility, requiring more employers participate in the program. This change may face various operational issues, as these worksites may lack adequate financial and staff resources to implement the program. The CTR Board has examined this approach to program expansion. Analysis in 2005 showed that including employers of 50 or more would add nearly six times the worksites while doubling the number of covered employees. The CTR Board determined that this approach was too unwieldy and expensive under the current program structure.

An alternative method to program expansion, believed by the CTR Board to be more effective, is to provide funding to continue the Growth and Transportation Efficiency Center (GTEC) program (authorized by RCW 70.94.528), which targets small employers, schools, neighborhoods and others in dense employment centers. These organizations are not required to participate in CTR, but encouraged to change commute behavior through various incentives, such as improved infrastructure, campaign programs and fare subsidies. The state provided $2 million in the 2007 - 2009 Biennium to seven cities around the state to develop and implement GTECs, but additional funding has not been appropriated. Since the loss of state funding, most of these cities have continued elements of their programs using a dwindling combination of local and federal funds, but continued performance and expansion is not possible without state support. This option provides a more flexible and efficient implementation model for program expansion. GTECs also provide a mechanism to test approaches to reducing other trip markets besides the commute. Due to a lack of funding, however, less data has been collected on the effectiveness of the GTEC program. Qualitative feedback from local partners, such as transit

agencies, local government staff, elected officials and business associations indicates that the program was successful in helping to promote transportation efficient land use policies and creative solutions for reducing SOV trips. WSDOT analysis shows that the GTEC approach increased the performance of existing CTR worksites within the GTEC area, indicating that overall trip reduction results can be increased with targeted funding that provides flexibility in local implementation.

Previous Research and Experience

According to WSDOT, approximately 500,000 rush hour commuters at more than 1,050 major worksites are part of the travel market affected by the CTR program. Another 235,000 commuters at thousands of additional worksites can be reached through the GTEC program. WSDOT estimates that the CTR program reduced VMT at CTR-affected worksites by about 153 million miles between the 2007/2008 and 2009/2010 surveys, about 5.7 percent of the qualifying VMT. However, because the CTR program affects only the trip to work at some worksites in some parts of the state (about 6 percent of the light duty vehicle VMT market, as shown in Figure 3-3), this VMT reduction represents a reduction in statewide light duty vehicle VMT of only about 0.3 percent.

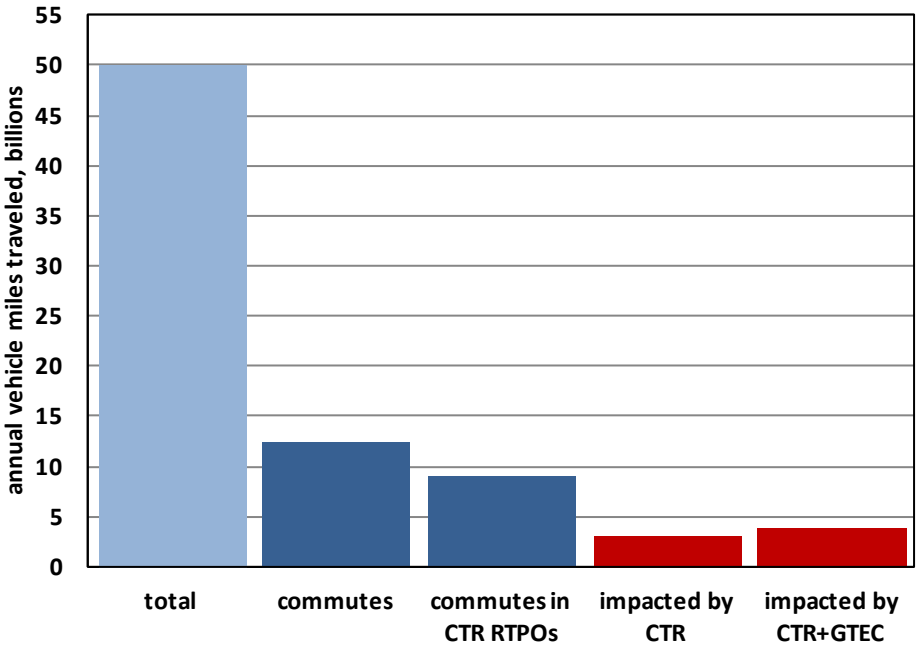

Figure 3-3: 2009 annual statewide light-duty vehicle VMT and CTR travel market. RTPO means Regional Transportation Planning Organization. Without GTEC, CTR impacts about 34% of commuting VMT in CTR RTPOs, or 6% of total VMT. With GTEC, CTR impacts about 42% of commuting VMT in CTR RTPOs, or slightly under 8% of total VMT. (W0014)

New Analysis

Commerce took two different analytic approaches to evaluate the policy outcomes of CTR Expansion. One approach used an elasticity-based model called Trip Reduction Impacts of

Mobility Management Strategies (TRIMMS).[53] The University of South Florida, under the sponsorship of the Florida State Department of Transportation, developed the model. Its most recent version incorporates the geographical and socio-economical features of major metropolitan areas, including three major areas of the CTR program: Seattle-Tacoma-Bremerton CMSA, Spokane MSA and Portland-Salem MSA. These three metropolitan regions cover most of the current targeted areas. Furthermore, the elasticities used in the model are based on regression analysis on the past performance of Washington's CTR programs. These features make the model suitable to estimate the effects of the expansion for Washington. The model requires the user to provide various assumptions, such as the number of program participants and availability of incentives.

The other approach assumed that the CTR expansion will result in the same level of VMT and greenhouse gas reductions per employee for newly eligible participants as has been experienced historically by the program. In reporting results for the 2007/2008 to 2009/2010 program period, WSDOT estimated the total VMT change based on the difference in average VMT per employee between the 2007/2008 and 2009/2010 survey cycles. This difference in average VMT per employee was multiplied by the number of employees and the number of workdays annually. While this approach is straightforward, it does not consider how other variables, such as fuel costs and economic conditions, may affect results. For example, gas prices have been fluctuating significantly in recent years and affected commuting behaviors nationally. Gas prices, however, actually declined between the survey cycles so they are not a likely cause of the VMT change. In addition, a severe national recession began in late 2007, which may have affected how commuters perceive the costs of driving and the merits of various incentives provided by the CTR program.

The CTR program reduced VMT in the affected travel market by 5.7 percent over a two-year period for a total two-year reduction of almost 154 million VMT. Comparable TRIMMS analysis indicated a reduction in VMT of 2.4 percent per year, for a total two-year VMT reduction of over 92 million VMT. Table 3-2 below summarizes the estimated VMT reduction from CTR expansion based on results from the two-year program cycle. To make outcomes from both analysis methodologies comparable, Commerce set assumptions for both to simulate a doubling of the number of commuters participating in CTR.

[53] Sisinnio Concas and Philip L Winters, Quantifying the Net Social Benefits of Vehicle Trip Reduction: Guidance for Customizing the TRIMMS Model, Center for Urban Transportation Research, University of South Florida, April 2009, http://www.nctr.usf.edu/pdf/77805.pdf **(R0094)**

	existing CTR	double CTR (WSDOT analysis)	double CTR (TRIMMS analysis)
Portion of travel market affected	6%	12%	12%
Total annual VMT reduction (*one year change*)	76,881,742	153,763,485	92,568,500
Average annual VMT reduction per commuter	162	162	97
Annual % VMT reduction (*relative to total LDV VMT*)	0.15%	0.31%	0.19%
Annual % VMT reduction (*of travel market affected*)	2.9%	2.9%	1.2%
Annual fuel saved (*gallons*)	3,787,278	7,574,556	4,560,025
Annual fuel cost savings (*at $3.00/gallon*)	$11,399,707	$22,799,413	$13,725,674
Emissions reductions (*metric tons CO_2e*)	34,362	68,725	41,374

Table 3-2: Annual impacts of CTR expansion. For comparative purposes, both analysis methodologies were deployed under assumptions that double the number of commuters participating in CTR. LDV means light duty vehicle. (W0004, W0014)

Both techniques suggest that the level of VMT reduction is marginal relative to the total statewide VMT. However, when compared to the targeted VMT, CTR expansion can result in a meaningful reduction. The assumptions applied for this comparative analysis do not specify a target year for the expansion, so cumulative reductions to the year 2020 or 2035 would require additional analysis that includes assumptions regarding the rate of program penetration over time.

Both methods can provide rough estimates on the impacts of the CTR expansion, but share several significant limitations as an estimation technique. First, they do not account for likely diminishing or increasing effects of the expansion caused by different socio-economic characteristics of the targeted employees. For example, large worksites targeted in the past may have better resources to run the program and may or may not be located in more favorable areas well served by transit, such as downtown Seattle. Second, these estimation techniques fail to incorporate the long-term effects of housing and employment choices.

When employers demonstrate long-term commitments to offer incentives such as transit subsidies, employees may in turn relocate themselves to a location where they can reach the worksite in a one-seat transit ride. In fact, transportation-related elasticities, demand responsiveness to price change, are usually larger in the end than in the short-run as documented in the TRIMMS model. Lastly, these estimation techniques measure the impact of a CTR program on commute trips only. In reality, it is highly possible that the use of non-SOV modes for commute ends up encouraging the use of non-SOV transportation for trips unrelated to commute. For these reasons, these estimation techniques are likely to underestimate the impacts of the CTR expansion on energy consumption.

Implementation

The 2012 Energy Strategy recommends expanding the CTR program through refunding of the GTEC program. WSDOT will refine their analysis to ascertain the funding level with the highest efficacy and, if appropriate, consider requesting an appropriation from the Legislature. WSDOT would use a small portion of the funds to provide technical assistance, with the majority going to competitive grants with a requirement for local match.

A portion of the grant funding would go to local governments with existing GTEC plans to update and implement the activities in their plans. The remaining portion of the grant funding would go to local governments to develop and implement new GTEC plans.

WSDOT would provide planning models and tools, technical assistance and measurement support to certified GTECs, and would report on program performance, including reduced trips and VMT, fuel and emissions savings.

To develop a more comprehensive program that addresses all trip types (a comprehensive trip reduction program as described in the set of long-term strategies), the following steps are recommended for implementation:

- Provide funding support for new and ongoing GTEC programs as a way to test trip reduction strategies for the non-commute travel market, such as individualized marketing;
- Fund preliminary pilot studies through a competitive grant program to address all trip types (to help the state begin to define a broader program);
- As part of these pilot studies, test measurement and evaluation methods to evaluate the impact of strategies and programs on all trip types; and
- Create an advisory group to begin defining a statewide comprehensive trip reduction program. This could be framed around overall mode share goals, at least for urban areas.

3.4.5 Smart Growth and Transportation Planning

Policy Description

Smart growth[54] encompasses several facets of comprehensive planning and implementation and is a vital aspect of the Energy Strategy's energy efficient transportation theme.

> "Smart growth" means different things to different people. There is no single definition of smart growth; its meaning depends on context, perspective and timeframe. The common thread among different views of smart growth is development that revitalizes central cities and older suburbs, supports and enhances public transit, promotes walking and bicycling, and preserves open spaces and agricultural lands. Smart growth is not no growth; rather, it seeks to revitalize the already-built environment and, to the extent necessary, to foster efficient development at the edges of the region, in the process creating more livable communities. (Association of Bay Area Governments website)

Local comprehensive plans and development regulations have a direct impact on how communities grow and function. Plans and regulations that incorporate smart growth principles reduce energy use, primarily by supporting travel that is more efficient. Compact, mixed-use communities can provide greater housing and employment balances, increased transportation options and shorter travel distances between destinations. Implementing smart growth strategies also provides additional benefits, such as improving human health by enabling access to more walking and biking facilities, allowing more efficient delivery of urban services, preserving productive farm and forestlands and increasing community livability.[55] Smart growth

[54] For a list of the ten smart growth principles, visit http://www.epa.gov/smartgrowth/about_sg.htm **(R0096)**

[55] http://www.fhwa.dot.gov/livability/index.cfm **(R0097)**

strategies are synergistic; implementing multiple smart growth strategies together provides greater benefits than the sum of the benefits of individual strategies.

> Approximately two-thirds of total development on the ground in 2050 will have been built between now and then, which creates great opportunities and responsibilities to develop in a manner that addresses the resiliency of communities to respond to the impacts of a changing climate and resource demand and production equitably and sustainably.[56]

Smart growth strategies reduce greenhouse gas emissions through reduced energy consumption. Emissions from transportation-related activities account for nearly half of the total greenhouse gas emissions in the state. In *Land Use and Driving: The Role Compact Development Can Play in Reducing Greenhouse Gas Emissions,* the Urban Land Institute (ULI) reviews the evidence from three separate studies that documented the effect of compact development on driving and greenhouse gas emissions. All three studies concluded that, "Compact development strategies can decrease driving enough to produce meaningful reductions in national levels of greenhouse gas emissions by 2050."

According to the ULI Land Use and Driving report, "The demographic trends between now and 2050 will lead to major metropolitan growth. This development pressure could result in sprawling, automobile-oriented suburbs - the type of development that increases both the need for driving and corresponding greenhouse gas emissions. Yet, because this development has not yet been built, it represents an opportunity to shape resulting land use patterns and achieve broader greenhouse gas emissions reduction targets."[57]

Smart growth is a long-term strategy because the built environment changes gradually. Yet it is also an immediate opportunity - Washington cities and counties will be completing their third round of periodic updates to their comprehensive plans between 2015 and 2018. These plans will guide urban form in our state. By 2030, OFM estimates an additional 1.7 million people will call Washington home, increasing the total state population by about 26 percent.[58] Local comprehensive plans will influence where these people live and work, which in turn will affect where and how they travel.

Compact and Transit Oriented Development is a form of smart growth that is an integral part of the recommendations in the 2012 Energy Strategy, as it was in the 2008 Transportation Implementation Working Group[59] of the Climate Action Team.[60] The recommended strategies include:

- Promote and Support Housing and Employment Density

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[56] *Smart Growth Guidelines for Sustainable Design & Development*, Jonathan Rose Companies LLC & Wallace Roberts and Todd, 2009, page 1, based on *Leadership in a New Era*, Nelson, A.C., Journal of the American Planning Association, Vol. 72, no. 4, 2006, pp. 393-409. **(R0184)**

[57] Land Use and Driving: The Role Compact Development Can Plan in Reducing Greenhouse Emissions, The Urban Land Institute, 2010, p. 13. **(R0095)**

[58] Office of Financial Management Forecasting Division. *Forecast of the State Population: November 2009 Forecast.* November 2009: 50. **(S0034)**

[59] Background information regarding the working group is available at: http://www.ecy.wa.gov/climatechange/2008CAT_iwg_tran.htm **(S0035)**

[60] Background information regarding the Climate Action Team is available at: http://www.ecy.wa.gov/climatechange/2008CAT_overview.htm **(S0036)**

- Develop and Provide Parking Incentives and Management
- Encourage Bicycle and Pedestrian Accessibility
- Encourage Urban Brownfield Redevelopment
- Transportation Concurrency

Smart growth strategies that increase transportation energy efficiency are consistent with the state's transportation system policy goals in RCW 47.04.280.

Previous Research and Experience

Elements of this 2012 Energy Strategy recommendation are based on earlier research and conclusions from the following sources:

- The 2008 Climate Action Team report, *Leading the Way: Implementing Practical Solutions to the Climate Change Challenge*, which had broad stakeholder participation in developing the recommendations. The Transportation Implementation Working Group made specific recommendations, which are included in Appendix 4 of that report.
- In WSDOT's *2010 Sustainable Transportation* report, *Appendix C* includes strategies to reduce emissions from the transportation sector, thereby decreasing energy/fuel use. Appendix C is also known as the Executive Order 09-05 Section 2(a) Report, which specifically addresses reductions in vehicle miles traveled. Notably, Figures F-14 and F-15 provide strategies to reduce vehicle miles traveled.
- The *Washington Transportation Plan 2030*, a long-range transportation plan prepared by the Washington Transportation Commission.
- The 2008 Land Use and Climate Change (LUCC) Advisory Committee made policy recommendations regarding transportation and land use planning, which were included in the Department of Commerce's *Planning for Climate Change: Addressing Climate Change through Comprehensive Planning under the Growth Management Act* report.
- In California, the Sustainable Communities and Climate Protection Act of 2008 (SB 375) requires the state's Air Resources Board to develop regional greenhouse gas emission reduction targets for passenger vehicles. ARB is to establish targets for 2020 and 2035 for each region covered by one of the state's 18 metropolitan planning organizations.

New Analysis

No new analysis of this Smart Growth and Transportation Planning policy option was conducted for the 2012 Energy Strategy. However, analysis is planned for 2012 per the implementation steps below.

Implementation

There are multiple ways to implement the recommended strategies. According to *Planning for a New Energy and Climate Future* (American Planning Association, 2010), "Examining

comprehensive plans and other planning documents to see if energy and climate change issues are addressed and integrated is an important step…the importance of addressing energy and climate in the comprehensive plan should not be overlooked."

Some implementation actions are already underway:

Commerce is in the process of updating its Transportation Guidebook to recommend best practices for reducing greenhouse gas emissions and promoting energy efficiency in transportation planning and decision making.[61] The update will address the newer requirement to include a pedestrian and bicycle component in the transportation element of comprehensive plans prepared under the Growth Management Act, as well as examples of multimodal planning and transportation concurrency provisions. The updated guidebook is expected to be released in early 2012.

Commerce Growth Management Services will provide a technical assistance webpage devoted to planning for energy aware communities, addressing such topics as smart growth, compact communities, transportation, infrastructure, economic development, brownfield redevelopment and parking. The webpage will be available by December 31, 2011.

Other policy options and implementation steps that merit further analysis and consideration include:

Promote and Support Housing and Employment Density in Urban Growth Areas

- State, regional and local governments should work cooperatively to support density increases in urban growth areas, in designated centers and transfer of development rights recipients. These efforts could include establishing new revenue sources (tax credits, loans, revolving funds), expanding finance incentives (such as the Multi-Family Tax Exemption), prioritizing infrastructure investments in these areas and comprehensive planning to provide for adequate public services.
- Educate and reach out to elected officials, the public, stakeholders and decision makers to overcome barriers to Compact and Transit-Oriented Development.
- Develop measures to reduce vehicle miles traveled though compact and transit oriented development. Some of the most promising opportunities include:
  - Combine land use policy, siting decisions, demand management and transportation needs to leverage the value of existing infrastructure investments and future transportation investments (e.g., incentives to concentrate jobs, housing and government facilities and services close to transit hubs).
  - Make significant progress toward meeting statewide greenhouse gas reduction goals by developing and coordinating a mix of innovative transportation strategies, with a focus on alternative energy sources and technologies, while managing congestion through

[61] The guidebook is geared toward local government planners and developing or updating the transportation element of a comprehensive plan under the state's Growth Management Act and is being prepared in a public process with stakeholder participation.

transportation demand management, land use policy and pricing and providing transportation choices.

- Improve integration of transportation and land use planning, such as supporting infill and redevelopment in transit-supported corridors, with the goal of reducing vehicle miles traveled and greenhouse gas emissions.
- Require use of multi-modal level of service standards and concurrency approaches, where possible, to promote density and reduce the development costs of infrastructure to the public.
- Public transportation support should be recognized as a significant component of smart growth and transportation planning in the communities served by transit.

- Coordinate these smart growth and transportation planning strategies fully with the related policies of CTR Expansion in Section 3.4.4 and the Residential Trip Reduction Program in Section 3.5.4. Specifically, strategies related to growth and transportation efficiency centers are well suited to enhance smart growth and transportation planning under the Growth Management Act.

Develop and Provide Parking Incentives and Management

- State agencies should provide guidance and education at the state level that recognizes the importance of parking management in Compact and Transit-Oriented Developments. Examples of parking management policies include discouraging the construction of principal use long-term parking, encouraging shared parking, providing preferential parking stalls for shared vehicles and pricing street parking in retail and employment centers.
- Provide funding for transit and multimodal infrastructure facilities, such as park and ride facilities, pedestrian access between parking areas and transit services and provisions of bicycle parking and storage facilities at multimodal infrastructure facilities.

Encourage Bicycle and Pedestrian Accessibility

- Adopt a complete streets policy for Washington that focuses on facilities that would be utilized effectively and improve mobility and safety. A complete streets policy recognizes that city streets are key public spaces that often make up much of the developed land in the urban environment. However, they are frequently built to facilitate the movement of motor vehicles above all other users. Over the years, less attention has been paid to design features like sidewalks and bike lanes that make streets safe and pleasant places to walk or bike. Complete streets are designed and built for all users (those using automobiles and transit, as well as pedestrians and bicyclists) and therefore serve everyone.[62]
- Regional Transportation Planning Organizations (RTPOs) and local governments should develop multimodal transportation plans that provide regional bicycling networks that coordinate with public transportation services in the region. The plans should identify how improvements will be made, when and by which party. Local governments should address

[62] http://www.cascade.org/Advocacy/pdf/Complete-Streets-Guide_2011.pdf **(R0166)**

any specific requirements in their development regulations, such as bicycle parking/storage requirements, crosswalk surfacing, transit stop amenities and so on.

- Improve bicycle and pedestrian infrastructure:
  - In denser urban neighborhoods, provide traffic calming measures to shorten street crossing distances.
  - Buses should be fitted with bicycle carriers, rapid transit stations should have bicycle parking/storage and all rapid transit lines should be bike-accessible during off-peak hours, with a long-term goal of extending such accessibility to peak hours as well.
  - Consider providing "bike stations" at major activity centers, transit hubs and in Central Business Districts.

Encourage Urban Brownfield Redevelopment[63]

- Include state funding for urban brownfield redevelopment and add a grants component that augments the state's brownfield revolving loan. These actions will result in opportunities for land aggregation, promoting town centers and compact development.
- State and local governments should coordinate to encourage greater brownfield redevelopment by supporting the policy recommendations in the 2011 Ecology report, Washington State Brownfield Policy Recommendations.

Transportation Concurrency

- The state should provide guidance to help local governments increase the use of multimodal transportation planning, establish level of service standards for all modes and the use of concurrency requirements to address all modes. This could include detailed guidance on incorporating multimodal issues into comprehensive plans and development regulations, as well as providing examples from local governments that have adopted such provisions.
- Encourage local governments over a certain size, or in certain regions, to adopt multimodal transportation system levels of service standards and concurrency regulations. An example of multimodal concurrency provisions could be to allow a fee in lieu of payment to support multiple transportation modes (such as adding bicycle lanes, providing bicycle parking, filling sidewalk gaps, making crosswalk improvements and increasing transit amenities) in designated centers or other locally predetermined locations. The intent is to allow for continued infill development, without causing concurrency failures, where transportation options are available to supplement personal vehicle use.

[63] See the Department of Ecology publication: Guide to Leveraging Brownfield Redevelopment for Community Revitalization **(S0040)**

3.4.6 Transportation Systems Management

Policy Description

Transportation Systems Management (TSM) strategies help to improve transportation system efficiency. As described in more detail in WSDOT's report on the Governor's Executive Order 09-05,[64] improving system efficiency will help reduce greenhouse gas emissions from the transportation sector by smoothing the flow of traffic to prevent stop-and-go driving and by maintaining vehicle speeds at 45 - 65 mph (the optimal range for reducing greenhouse gas emissions). System efficiency strategies include ramp metering, incident response, signal timing, traveler information, travel management center (TMC) operations, active traffic management (ATM), transit signal priority, eco-driving and roundabouts (these terms are described below). Most system efficiency strategies are based on congestion management and will therefore be most effective in the urban areas where congestion occurs regularly. However, some strategies — such as signal timing, roundabouts and eco-driving — will be effective in rural areas as well. Those strategies are designed to minimize any type of stopping event, regardless of whether there is congestion or not, and therefore will be effective on rural and other types of low traffic volume roads.

Compared to some other strategies to reduce energy consumption and greenhouse gas emissions, system efficiency strategies are relatively easy to implement, very low cost and will begin reducing energy consumption and greenhouse gas emissions almost immediately. The ability to implement these strategies immediately means that their cumulative effects could, over time, outweigh some longer-term greenhouse gas emission reduction strategies. These strategies also reduce individual and transit travel times and increase safety.

Previous Research and Experience

Roads System Strategies

WSDOT and local governments are already pursuing several system efficiency strategies to help relieve congestion, but with additional funding WSDOT and local governments could accomplish more to reduce congestion, energy consumption and greenhouse gas emissions. Following are some of the system efficiency strategies recommended based on their ability to provide immediate benefits with a relatively high reduction rate:

- **Signal Timing.** Signal timing involves calibrating signals in order to produce the optimal flow of traffic at intersections and through corridors. WSDOT and local governments currently recalibrate signals regularly, but with additional funding may be able to match the newest traffic patterns more frequently on key corridors. A recent study done by the WSDOT Environmental Office found that the retiming of 347 signals in the most congested region would result in an annual decrease of 57,420 metric tons of CO_2 (Leth and Sexton, 2009).

  There are 6,700 total traffic signals in Washington; of these:

[64] See Appendix H in report: http://www.wsdot.wa.gov/NR/rdonlyres/7CE0134C-9E0F-41DC-BE5F-0363D046245B/0/04Appendixc.pdf **(S0072)**

  - 931 are WSDOT owned and operated
  - 106 are owned by WSDOT and operated by others
  - 195 are owned by others and operated by WSDOT

- **Incident Response (IR).** Incident response drivers respond to the scene of disabled vehicles and collisions and remove those blockages from the road, allowing traffic to flow freely. WSDOT already has approximately 55 IR vehicles around the state. With additional funding for greenhouse gas reduction, WSDOT would be able to concentrate more IR teams in congested areas, allowing traffic to flow more smoothly and enabling the system to run more efficiently.
- **Ramp Metering.** Ramp meters control the rate at which cars enter the mainline, which results in a more smoothly flowing mainline. WSDOT has approximately 140 metered ramps around the state. According to a 2002 Minnesota study in which the city turned off all 420 Twin City ramp meters for approximately a month, "Ramp metering results in a net annual savings of 1,160 tons of emissions" (Twin Cities Metro Area Ramp Meter Study, Appendix D, p. 1-1 and 4-4, 2002). Strategically adding ramp meters to key highway high volume on-ramps during congested times will result in higher speeds on mainlines and greater greenhouse gas reductions.
- **Traveler information and funding for Traffic Management Center (TMC) operations.** Traveler information allows travelers to make informed choices about when to leave, what route to take and what mode to take to ensure the smoothest possible trip. WSDOT currently hosts a website, a 5-1-1 phone line and cellular phone applications, among several other sources of traveler information. Expanded TMC operations would allow WSDOT and local governments to better manage new equipment added to the system. These strategies would work best combined with signal timing, incident response and/or ramp metering.
- **Active Traffic Management.** ATM involves the use of technology to harmonize speed, warn drivers of back-ups ahead, close and open lanes, and provide for dynamic rerouting. ATM will be added to parts of I-5, I-90 and SR 520 over the next few years. Reductions in greenhouse gases stem from reducing start and stop traffic and congestion.
- **Roundabouts.** Using roundabouts to replace signals at selected intersections aids in directing traffic flow, often providing a congestion reduction benefit. There are approximately 218 roundabouts statewide, with 57 of those on state routes.[65] Roundabouts frequently reduce the need to come to a complete halt, thus reducing the acceleration events that produce higher emissions. A Swedish study calculated that a roundabout put in place of a signalized intersection resulted in an average decrease of 29 percent in CO emissions and 21 percent in NO_x emissions (Varhelyi 2002). Another study found a 30 percent decrease in fuel consumption at a roundabout intersection compared to a signalized one (Niittymaki 1999).
- **Eco-driving.** Eco-driving involves training people to drive in ways that minimize emissions; for instance, by accelerating gently and by maintaining speeds in the ideal range. This strategy would most likely benefit from leadership by a non-governmental advocacy group. It

[65] Source: personal communication, WSDOT, October 26, 2011.

is recommended that eco-driving be promoted through a widespread public education campaign, as described in Section 3.5.5.

Transit and Fleet Related Strategies

A number of strategies can also help transit systems and fleets to operate more efficiently. These include transit signal priority, automatic vehicle location, and computer-aided dispatching systems.

- Transit signal priority is an operational strategy that facilitates the movement of transit vehicles through traffic-signal controlled intersections. By reducing the time that transit vehicles spend delayed at traffic signals, transit signal priority can reduce transit delay, travel time, energy consumption and emissions.
- Automatic vehicle location is a computer-based vehicle tracking system that typically uses GPS satellites to locate equipped transit vehicles and transmit the vehicle location data back to the transit center. When combined with other technologies or processes, such as a computer-aided dispatching system, automatic vehicle location can deliver many benefits in the areas of fleet management, systems planning, safety and security, traveler information, fare payment and data collection.
- Vehicle telematics, including a host of readily available tools such as GPS and mobile sensors, help fleets operate their vehicles more efficiently. The Puget Sound Clean Air Agency's initial research suggests that some of these tools can reduce fuel consumption from 5 to 15 percent, depending on the fleet and, in some cases, can reduce collisions and fatalities.

Rail and Marine Strategies

These long-term options require further research and do not yet qualify as recommendations. However, they are included here due to fitting in the Transportation Systems Management category.

- Replace some long distance I-5 corridor commercial road transport with marine transport to reduce fuel consumption per ton of freight.[66]
- Generally, increase use of domestic marine transport where possible.[67]
- Seek interstate export opportunities to fill empty covered hopper grain cars returning to interior states.[68]

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[66] Center for the Commercial Deployment of Transportation Technologies, California State University, *Final Report: Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast*, Office of Naval Research February 20, 2007, pp.150-160. Available at http://www.ccdott.org/transfer/projresults/2005/task%203.21/task%203.21_8a.pdf. **(R0185)**

[67] The price of domestic marine transport is elevated by Section 27 of the Merchant Marine Act of 1920 (the "Jones Act"), which requires equipment and staff used for domestic shipping to be of U.S. origin. Pursuit of marine commercial transport strategies would likely require engagement in an existing political debate regarding the merits of this federal law.

[68] Biofuel feedstocks have been suggested as one possibility, but this may conflict with Washington's interest in supporting a local biofuel refining industry as described in Sections 0.0.0 and 3.5.3.

Impacts of Strategies

Figure H-1 in WSDOT's report on the Governor's Executive Order 09-05 summarizes the potential impacts and barriers for a number of system efficiency strategies.[69] *Moving Cooler*, the only comprehensive attempt to quantify system efficiency greenhouse gas reduction measures, has estimated an approximate one percent reduction in transportation-related emissions from system efficiency strategies. However, the modeling in *Moving Cooler* analyzed national level impacts and more investigation is necessary on the degree to which these national assumptions are applicable in Washington, where targeted investments throughout the roadway system may result in greater impacts than indicated in the *Moving Cooler* study.

This is an under studied area and various studies (including some in-house studies by WSDOT) have pegged the improvement from some system efficiencies as higher. When studies of system efficiency and energy consumption/greenhouse gas reductions do exist, they often focus on individual locations; for example, the installation of one new ramp meter or the effects of a single retimed signal. None of these studies consider the impacts to the full transportation system. It is challenging to extrapolate from an individual study to a system-wide improvement.

A number of studies have been conducted evaluating the impacts of transit operations and fleet management systems.[70] For example, an evaluation of a south Snohomish County regional transit signal priority project showed that the system reduced transit travel time by about 5 percent, with insignificant negative impacts to local traffic on cross streets.[71] Other studies have found that transit signal priority systems can reduce travel time by six to 27 percent.[72] Fleet management systems, such as automatic vehicle location systems, also improve the efficiency of transit operations. One study in Portland found that an automatic vehicle location system with computer-aided dispatching improved on-time bus performance by 9 percent, reduced headway variability between buses by 5 percent and decreased run-time by 3 percent.[73]

New Analysis

No new analysis of Transportation Systems Management was conducted for the 2012 Energy Strategy. Though sufficient previous research exists to justify moving forward on the measures described above, Commerce has found some researchers to have concerns that "rebound" effects might reduce the greenhouse gas reductions associated with Transportation System Efficiency measures, since increased system efficiency encourages increased use of the system, especially in areas of growing population. An accurate quantification of greenhouse gas impacts will require additional supporting research on this topic.

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[69] http://www.wsdot.wa.gov/NR/rdonlyres/7CE0134C-9E0F-41DC-BE5F-0363D046245B/0/04Appendixc.pdf **(S0072)**

[70] See many examples of studies here, under the tab "Operations & Fleet Management": http://www.itscosts.its.dot.gov/its/benecost.nsf/SingleTax?OpenForm&Query=Transit%20Management **(R0186)**

[71] See http://www.wsdot.wa.gov/research/reports/fullreports/699.1.pdf **(S0080)**

[72] See http://www.itscosts.its.dot.gov/its/benecost.nsf/ID/F1A967F0D3CD5DE58525733A006D4B07?OpenDocument&Query=Home **(R0187)**

[73] http://www.itscosts.its.dot.gov/its/benecost.nsf/ID/22A13F3DC6531533852569610051E2F3?OpenDocument&Query=BApp **(R0188)**

Implementation

System efficiency strategies are practical, proven strategies that can be implemented relatively easily. WSDOT and local governments have control over their deployment and do not face major policy or technological hurdles to implementation. The largest barrier to further reducing greenhouse gas emissions using system efficiency strategies is funding for those strategies.

WSDOT will continue to deploy system efficiency strategies such as ramp metering, incident response, signal synchronization, traveler information, TMC operations, ATM and roundabouts under its existing plans. If the agency receives additional funding to use system efficiency strategies to reduce energy consumption and greenhouse gases, WSDOT will deploy the strategies in locations that would focus on providing decreases in energy consumption and emissions. These strategies can be implemented or expanded quickly. The cost range for these operating activities for WSDOT is between a few million to tens of millions of dollars. Installation of area wide ramp meters, intelligent transportation system devices and active traffic management projects are more expensive. For local governments, the cost could be less. Other operating strategies, such as the incident response and signal timing review and improvements, are relatively inexpensive and can be implemented more quickly.

With additional funding, transit agencies can further implement transit signal priority and other transit management systems to improve operations and reduce energy consumption and greenhouse gas emissions.

3.4.7 Regional Mobility Grants

Policy Description

The Regional Mobility Grant program provides money to cities, counties, transit agencies and port authorities to deliver transit mobility projects that are cost-effective, reduce travel delay for people and goods, improve connectivity between counties and regional population centers and are consistent with local and regional transportation and land use plans. Funds are primarily used for capital construction projects, new or expanded transit service and new equipment purchases. Projects are competitively evaluated and a ranked list is submitted to the Legislature for appropriation. The program is funded through the Multimodal Transportation Fund.

The Connecting Washington Task Force[74] will be developing a 10-year investing and funding plan for the state's transportation system and presenting it to the 2012 Legislature. This effort represents an important opportunity for the state to adequately fund transportation strategies that can help keep people moving consistent with state energy goals. Previous research demonstrates that the energy efficiency of various transit expansions can vary considerably (see *Previous Research and Experience* in Section 3.5.6), so the 2012 Energy Strategy recommends that energy efficiency be considered as a key criterion in selecting those Regional Mobility Grants to be awarded.

[74] http://www.governor.wa.gov/priorities/transportation/connectwa.asp **(S0073)**

Previous Research and Experience

The Regional Mobility Grant program funded 31 projects from 2006 through September 30, 2011. These completed projects include:

- 14 park and ride lots constructed or expanded;
- More than 4,700 new park and ride lot parking stalls built;
- Four new or expanded transit centers;
- Six high occupancy vehicle and business access and transit lane projects;
- 11 equipment and/or operating new or expanded transit service; and
- 42 new buses purchased.

A summary of benefits from these projects include:[75]

- Four projects saving over 135,000 hours annually in travel delays;
- 142 million VMT reduced annually;
- 7.1 million vehicle trips reduced annually; and
- 62,000 metric tons of CO_2 reduced annually.

In addition, 25 projects currently underway include:

- Five park and ride lots under construction or expansion with 1,525 new parking stalls;
- Eight high occupancy vehicle and business access and transit lanes projects;
- Six new or improved transit centers;
- Four new or extended bus routes; and
- Eight projects improving speed and reliability through transit signal prioritization.

Anticipated estimated benefits from these 25 projects include:

- 94.5 million miles annual reduction in VMT;
- 6.1 million annual reduction in vehicle trips;
- 34,300 hour reduction in travel delays; and
- 41,000 metric tons of CO_2 reduced annually.

New Analysis

No new analysis of the Regional Mobility Grants program was conducted for the 2012 Energy Strategy.

[75] Source: WSDOT Regional Mobility Grants Program office, October 2011.

Implementation

For the Regional Mobility Grant Program, WSDOT will execute a comparative analysis to determine whether a program expansion should be targeted at a specific type of project, or whether such an expansion should allow funding for all types of qualifying projects. The comparative analysis shall include energy impacts of the program choices. One possible target for the narrower type of expansion is park and ride lot projects. Many King County Metro and Sound Transit park and ride lots along the I-5, I-405, I-90 and SR-520 corridors are operating at 100 percent capacity due to very high demand. As a result, people planning to ride the bus or train may be forced to drive when there are no parking stalls available at the desired park and ride locations, increasing transportation energy consumption. Alternatively, the increased funding could focus on more energy efficient transit approaches. Once the comparative analysis is complete, WSDOT may consider formulating a funding request to the Legislature.

In addition, to support other near-term transit service needs, the Connecting Washington Task Force should be in alignment with the Energy Strategy, and prioritize transit funding in the 10-year investing and funding plan for the state's transportation system.

3.4.8 Electric Vehicle Mileage Pricing Pilot

Policy Description

Long-term policy option 3.5.7 *Emerging Pricing Methods* examines alternatives to fuel taxes that could, in the long run, help to align the state's transportation policy with a changing automotive energy picture characterized by higher efficiency vehicles and electric vehicles. The changes described in policy option 3.5.7 are profound and early piloting can play an important role in informing future decisions. The *Electric Vehicle Mileage Pricing Pilot* takes advantage of a unique opportunity offered by emerging consumer electric vehicles to pilot at least one of the alternatives to fuel taxes described in Section 3.5.7. The pilot leverages a legislative interest in generating roads revenue from EVs,[76] and leverages early adopters of EVs who may be more willing to manage the less refined data collection systems that are inevitably associated with any pilot.

Previous Research and Experience

The Federal Highway Administration's office of Innovative Program Delivery maintains a record of prior experience with mileage-based user fees.[77] As of this writing, the record includes a 12-state study conducted by the University of Iowa Public Policy Center; pilots deployed in the urban areas of Atlanta, Georgia, Twin Cities, Minnesota and the greater Seattle area; and state pilots deployed in Nevada, Oregon and Texas.

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[76] See legislative history of 2ESSB 5251 (2011 legislative session), Concerning *Electric Vehicle License Fees*. **(S0042)**

[77] http://www.fhwa.dot.gov/ipd/revenue/road_pricing/study_reports/auto_use_costs.htm **(R0100)**

The large number of pilots and studies deployed in the past mean that Washington could make an especially sophisticated step forward into mileage pricing and design a pilot well tailored to the state's specific needs. The Oregon effort began 10 years ago, when the 2001 Oregon Legislature established the Road User Fee Task Force "to develop a design for revenue collection for Oregon's roads and highways that could replace the current system for revenue collection." The Task Force considered some 28 different funding ideas before launching a 12-month pilot program in April 2006, hinting at the sophisticated understanding of mileage pricing options available today.

New Analysis

No new analysis of this policy option was conducted for the 2012 Energy Strategy.

Implementation

WSDOT will:

- Develop a strategy to explore VMT fees, and a schedule for when such a fee system could be made market ready; and
- Launch a coordinated effort to design a mileage pricing pilot project, focused on electric vehicles, to demonstrate and test the technologies and impacts of a mileage-based pricing strategy. Among other considerations, the pilot project could include an assessment of whether rates could vary from area to area, by type of road, and/or by time of day.

3.4.9 Car Sharing and Mileage Based Insurance

Policy Description

Car sharing, mileage-based insurance and pay-as-you-drive (PAYD) scale the cost of driving with the amount of driving. By attaching the cost to per-mile use, instead of paying for it in occasional lump sums, drivers have an incentive to make the most efficient travel choices.

Mileage-based auto insurance is priced at least partially on driving distance. Unlike traditional insurance, which offers a fixed monthly or annual premium, mileage-based insurance features a variable premium correlated to driving distance. The rates charged may take into account any number of additional factors, such as driver age, driving record, geographic location and so forth. Covered drivers can save money by reducing their driving.

PAYD means that the insurance premium is calculated dynamically, typically according to the distance driven, and on other data collected from the vehicle, including speed and time of day.

PAYD/mileage-based insurance was originally advocated as a more equitable insurance product for low-mileage drivers. Low-mileage drivers may be subsidizing the accident costs of high-mileage drivers because the number of automobile accidents per person is strongly correlated with driving distance. More recently, mileage-based insurance has also been advanced as a means to reduce other negative impacts of driving such as accidents, pollution

and congestion, without increasing the total cost of driving. The 2012 Energy Strategy advocates mileage-based insurance as a way to curb energy consumption and reduce greenhouse gas emissions.

Though pure mileage-based insurance is available in Texas through Mile Meter – and as an option to drivers in several states - at least one insurer has indicated it will not offer the option in Washington because state transparency laws require insurance providers to file such policies with the Insurance Commissioner in a process that exposes trade secrets to the public, and hence to their competitors.[78] Insurance companies are not willing to bring the product to Washington without proper trade secret protection. Though there is no explicit prohibition of mileage-based insurance in Washington, the trade secret issue compounds other obstacles including, but not limited to, the costs of monitoring driving distance.

Car sharing is an approach that allows people to rent cars that are conveniently located for short periods, such as by the hour. Car sharing can be an attractive way for households to get by with one less car, knowing that they can rent a car easily for short periods when needed. The organization renting the cars may be a commercial business. Another form of car sharing, in which individuals rent out their own cars, is called personal car sharing. Under the personal car-sharing model, private car owners make their cars available to friends, neighbors or to the wider public.

Previous Research and Practice

Washington's Climate Action Team estimated the potential impacts of PAYD insurance on greenhouse gas emissions in *Washington CAT Policy Options Analysis* (2007).[79] This estimate was based on findings by the Arizona PIRG Education Fund, which indicated that when 80 percent of an existing premium becomes distance-based, light duty vehicle mileage would be reduced by 8 percent. By using this figure, the Climate Action Team estimated that PAYD insurance would reduce Washington's emissions by 1 percent based on an assumed 20 percent market penetration rate in 2020.

There are also more sophisticated estimates using price elasticity of demand. Bordoff and Noel (2008) estimated the potential impacts of PAYD insurance by using the elasticity of demand and a general equilibrium model developed by Parry (2005).[80,81] The study estimated mileage reductions for each state and concluded that it would reduce Washington's light-duty vehicle mileage by 8.3 percent. Another study by Ferreira and Minikel (2010) indicated that fully mileage-based insurance could reduce light-duty vehicle mileage by 9.5 percent (with a range from 3 percent to 14 percent), while a hybrid product with a flat yearly rate plus per-mile pricing

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[78] Washington State Senate, *Senate Bill Report: ESB 5730*, Mar 2011, http://apps.leg.wa.gov/documents/billdocs/2011-12/Pdf/Bill%20Reports/Senate/5730.E%20SBR%20APS%2011.pdf **(S0043)**

[79] Washington State Climate Action Team, *Transportation Sector Technical Work Group Policy Option Recommendations*, Dec 2007, http://www.ecy.wa.gov/climatechange/interimreport/122107_TWG_trans.pdf **(S0044)**

[80] Jason E. Bordoff and Pascal J. Noel **(R0101)**

[81] Ian W. H. Parry, "Is Pay-as-You-Drive Insurance a Better Way to Reduce Gasoline Than Gasoline Taxes?" *AEA Papers and Proceedings* 95 (2): 287–93, May 2005, http://www.rff.org/Documents/RFF-DP-05-15.pdf **(R0102)**

after the first 2,000 miles could reduce mileage by about 5 percent.[82] Lastly, Cambridge Systematics' *Moving Cooler* (2009) indicates a more modest reduction of 4.5 percent (based on an assumption that 50 percent of premiums are paid on a mileage basis and the market penetration is 75 percent), or 6.0 percent (if 75 percent of premiums are paid on a mileage basis and market penetration is 100 percent).

In a real world experiment in Texas, Progressive County Mutual Insurance Company conducted a demonstration project in 2006 and found that drivers with PAYD insurance drove 10 percent fewer miles.[83] Another field experiment in Minnesota yielded a total reduction in driving of 8 percent.[84] However, these field experiments are based on relatively small sample sizes and may or may not be applicable for statewide or nationwide implementation.

King County currently has a PAYD pilot project under development, but it is not yet underway.[85]

A few U.S. states, such as Texas, allow insurance companies to offer limited types of PAYD insurance products, while PAYD insurance is widely offered in countries such as England and Japan.

In 2010, California passed a law rationalizing insurance policy with the needs of car sharing companies and individuals.[86] Insurance companies cannot exempt owners of cars used in car-sharing programs from their policies. Under the law, car owners are not liable for damages caused while someone else is driving the car; rather, the car-sharing program can insure the car at the times that it is being driven by a non-owner.

New Analysis

Commerce analyzed one example PAYD insurance product. The analysis assumes variable premiums for collision, liability and uninsured motorist protection. These insurance premiums represent about 84 percent of the current total premium and amount to 7.5 cents per mile for average drivers in Washington.[87] In turn, the base premium will be reduced to reflect this change. For the purpose of analysis, the costs of insurance premiums will change at the rate of inflation for the analysis period.

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[82] Joseph Ferreira Jr. and Eric Minikel, *Pay-As-You-Drive Auto Insurance in Massachusetts: A Risk Assessment and Report on Consumer, Industry and Environmental Benefits*, Conservation Law Foundation and Environmental Insurance Agency, Nov 2010, http://www.clf.org/wp-content/uploads/2010/12/CLF-PAYD-Study_November-2010.pdf **(R0103)**

[83] Progressive County Mutual Insurance Company, *Pay As You Drive (PAYD) Insurance Pilot Program Phase 2 Mid-Course Project Report*, Mar 2007, http://www.nctcog.org/trans/air/programs/payd/MidTermResults.pdf **(R0104)**

[84] Cambridge Systematics, Inc., *Mileage-Based User Fee Demonstration Project: Potential Public Policy Implications of Pay-As-You-Drive Leasing and Insurance Products*, Mar 2006, http://www.lrrb.org/pdf/200639C.pdf **(R0105)**

[85] King County Department of Transportation, *Pay-as-You-Drive (PAYD) Insurance Pilot Project*, http://your.kingcounty.gov/exec/news/2007/pdf/Payasyougofacts.pdf **(R0106)**

[86] AB 1871. **(R0120)**

[87] Jason E. Bordoff and Pascal J. Noel, *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity*, Brookings Institute Press, July 2008, http://www.brookings.edu/~/media/Files/rc/papers/2008/07_payd_bordoffnoel/07_payd_bordoffnoel.pdf **(R0101)**

Commerce developed an elasticity-based spreadsheet model based on the analysis approach adapted by *Moving Cooler*, with a variety of local and updated information. The model inputs include the per-mile insurance premium for average drivers in Washington;[88] WSDOT's most recent forecasts of the statewide annual light-duty vehicle mileage;[89] EIA's fuel price forecast;[90] and in-house estimates of fuel economy. For this analysis, only premiums on collision, liability and uninsured motorist protection become mileage-based, and the mileage-based premiums would be 7.5 cents per mile, which are assumed to grow at the rate of inflation.

Although some prior research did not incorporate capital and maintenance costs of vehicles into the baseline costs of driving per mile, this spreadsheet model included them to reflect the fact that the capital and maintenance costs generally increase with mileage. This approach is consistent with *Moving Cooler* and it is assumed that these costs will grow at the rate of inflation. Finally, this spreadsheet assumes a 1:1 ratio of percent fuel reduction to percent mileage reduction.

The spreadsheet model yielded the results summarized in Table 3-3.

penetration	LDV VMT change	LDV VMT reduction	greenhouse gas reduction	expenditures reduction
	%	*billion mi*	*MtonCO_2*	*billion $*
20%	-1.12%	0.661	0.157	$0.065
50%	-2.79%	1.652	0.392	$0.163
100%	-5.58%	3.304	0.783	$0.326

Table 3-3: Annual reduction in LDV VMT, greenhouse gas emissions and energy expenditures from PAYD insurance with various market penetration rates in 2035. (W0004)

The percentage change represents annual reductions in light-duty vehicle mileage due to PAYD insurance programs. As expected, a higher market penetration results in greater mileage reductions and the level of reduction is generally consistent with the estimates in *Moving Cooler* but smaller than the other estimates. The primary causes of the differences are higher fuel prices, which lower the relative value of mileage-based premiums for drivers, and the modeling approach that incorporated capital and maintenance costs into the equation.

These reductions in driving distance translate into less fuel consumption, greenhouse gas emissions and energy expenditures. These results are summarized in the two right columns of Table 3-3.

[88] Jason E. Bordoff and Pascal J. Noel **(R0101)**

[89] Washington State Office of Financial Management, *June 2011 Transportation Revenue Forecasts, Volume 4: Alternative Forecast Tables*, Jun 2011, http://www.ofm.wa.gov/budget/info/June11transpovol4.pdf **(S0045)**

[90] Energy Information Administration, *Annual Energy Outlook 2011, Table 12: Petroleum Product Prices*, Mar 2011, http://www.eia.gov/forecasts/aeo/source_oil.cfm **(R0090)**

Implementation

- Identify and implement changes in the insurance law to enable voluntary PAYD insurance and to ensure that the policy achieves the transportation efficiency reductions expected from this policy.
- Monitor pilot project in King County to identify lessons learned that might be applicable statewide.
- Design program to avoid disproportionate impacts to rural areas.
- Identify legislative barriers to implementing private car sharing and seek changes in laws as necessary.

3.5 Long-Term Policy Options

3.5.1 Revenue Neutral Feebate

Policy Option

Feebates are market-based programs designed to influence consumer behavior at the time of purchase. These programs are intended to influence a consumer's choice of a new vehicle and thereby increase the collective vehicle fuel economy and/or reduce greenhouse gas emissions. Typically, they are revenue neutral and levy fees at initial purchase on relatively inefficient vehicles and rebates on efficient vehicles. The fee/rebate provides an incentive for consumers to purchase a more efficient vehicle. Over the long run, this feebate provides an incentive for manufacturers to design efficient vehicles.

The two primary reasons to consider a feebate program are to reduce state expenditures on gasoline and diesel and to reduce state greenhouse gas emissions. In 2009, residents and businesses spent $16 billion on purchases of gasoline and diesel; a majority of this expenditure went out of state. A feebate program can be a cost-effective way to reduce state fuel expenditures and greenhouse gas emissions, thereby meeting the state's reduction targets while saving consumers money.

Put simply, feebate programs provide the highest rebates for the most efficient vehicles, and the highest fees for the least efficient. The exact relationship between fuel efficiencies, rebates and fees includes many parameters, all of which must be considered when designing the program:

1. Benchmark: Define which vehicles are in the program and whether there are vehicle subcategories in the program. A single benchmark (single category) that includes all light-duty vehicles (cars, vans, SUVs and light trucks) is the most direct and effective approach. Another approach is to categorize by vehicle class; for instance, one feebate program for cars and another for the light truck category.[91] Feebate programs may also be categorized by vehicle footprint (correlates to vehicle volume and weight), in which two or more footprint

[91] The federal CAFE standards are bifurcated into car and light truck categories, and a third category is being developed for the largest pickup trucks, which are not currently regulated by CAFE.

categories would be established and vehicle efficiency would then be compared within each footprint category. The footprint approach is the most challenging to understand and administer, the single benchmark approach is the simplest and the vehicle class approach is of intermediate complexity.

2. Pivot point: An efficiency point must be selected above which a vehicle receives a rebate and below which it would be levied a fee at initial purchase. An emission or fuel consumption range can also be used instead of a single point; for example, a fuel economy range of 30 to 40 mpg might be exempt from fees or rebates. Typically, feebates are scaled to the grams of carbon dioxide emitted per mile (grams CO_2/mile) or kilometer, and not fuel efficiency (miles per gallon).[92] As an example, the 2016 fleet CAFE standard, 35 mpg, is equivalent to an emission rate of about 250 grams per mile. Under a feebate program, higher emission rates (lower fuel efficiency) are penalized and lower rates (higher fuel efficiency) are rewarded. See Figure 1.
3. Functional form: A second design element is how the fees or rebates vary as they move away from the pivot point. A single straight line might be used or two straight lines with different slopes above and below the pivot point. The slope of the line is the rate at which the fee or rebate increases as vehicle fuel efficiency moves away from the pivot point, typically expressed as dollars per gram CO_2 per mile ($/g/mi). For example, a vehicle 50 g/mi below the pivot point under a $20/g/mi feebate rate would receive a $1,000 rebate. Other functional forms might include zero rebate zones until a certain number of g/mi below the pivot point, or a “staircase” of increasing, flat rebates rather than a smooth line.
4. Static pivot point or continuous improvement: Advances in automotive technology and increasing CAFE standards make it reasonable to continuously increase the benchmark point for each vehicle category.
5. Point of regulation: The fee or rebate can be applied at the consumer, auto dealer or auto manufacturer level.

Previous Research and Experience

Four nations - Denmark, Norway, France and the Netherlands - have implemented feebate programs in the last five years. In addition, several nations have sliding scale registration fees for vehicles based on weight, engine displacement or horsepower. These fees have typically served as incentives to buy vehicles that are more efficient.

Denmark

- Introduced June 2007 as a modified registration tax
- Single benchmark = 150 g/km (241 g/mi)
- Benchmark expressed to the public in terms of fuel economy
- Two straight lines (linear) - different rates (slopes) for fees and rebates:

[92] It is possible to incorporate indirect emissions associated with the vehicle’s fuel type as well, for example emissions associated with electric generation used to fuel an electric vehicle. However. this requires complex fuel life-cycle analysis similar to what is required for a low carbon fuel standard.

- Rebate = $50/g/mi
- Fees = $13/g/mi

Norway

- Began taxing CO_2 in January 2007 with a rate change in January 2008
- Rebate added in January 2009 to yield a full feebate system
- Single benchmark = 120 g/km (193 g/mi)
- Functional form is four line segments with different rates
- Rebate = $52/g/mi
- Initial fee rate = $55/g/mi
- Fees increase to a maximum rate of $259/g/mi

Netherlands

- Introduced July 2006, revised February 2008
- Benchmarks based on footprint/class of vehicle
- Step function with seven steps
- Complexity precludes simple description of a feebate rate
- While this study was being completed in 2009, it was announced that the system would be abandoned in 2010 in favor of a single benchmark

France

- Introduced December 2007 (rebate only)
- Fee part added January 2008
- Benchmark in 2009: "Donut hole" from 130-160 g/km (193 – 257 g/mi)
- Benchmark in 2012: "Donut hole" from 130-140 g/km (193 – 225 g/mi)
- Functional form is a step function with nine levels
- Shape of step function yields an approximate "rate" of $16.5/g/mi

Three of the four programs have a single benchmark, the simplest approach, which means that all light duty vehicles are treated as a single group. It should be noted that the European car market does not have much of a light truck segment and so weight extremes are less pronounced. With regard to applying the fee or rebate, France uses a step function, while Denmark and Norway use multiple linear lines (piecewise approach), meaning that fees and rebates are applied at different rates. The Netherlands use a footprint based benchmark system

and applies the fee or rebate in a linear manner. Figure 3-4 below illustrates the different functional forms and tax or rebate rates used by three of the four European feebate programs.[93]

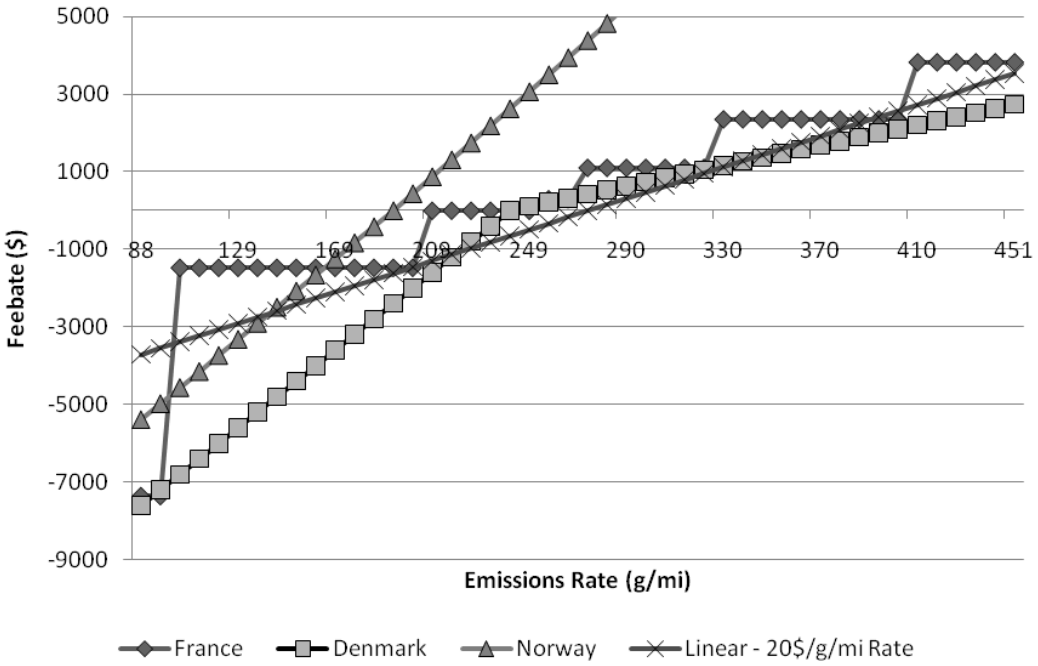

Figure 3-4: Different feebate functional forms and rates for three countries as a function of CO_2 emissions. (R0225)

Each of the European feebate programs appears to have had an effect on the efficiency of the new vehicles that are purchased. The scale of the program impact is in the range of a 10 to 20 percent reduction in fuel consumption for new vehicle purchases. The maximum fee or rebate amount (not the typical amount) ranges from approximately $4,000 to $7,000 per vehicle. The effectiveness of the Norwegian feebate program on new vehicle emissions is illustrated in Figure 3-5.

[93] State of CA Air Resources Board and the CA EPA, *Potential Design, Implementation, and Benefits of a Feebate Program for New Passenger Vehicles in California: Interim Statement of Research Findings*, February 2011. (**R0225**)

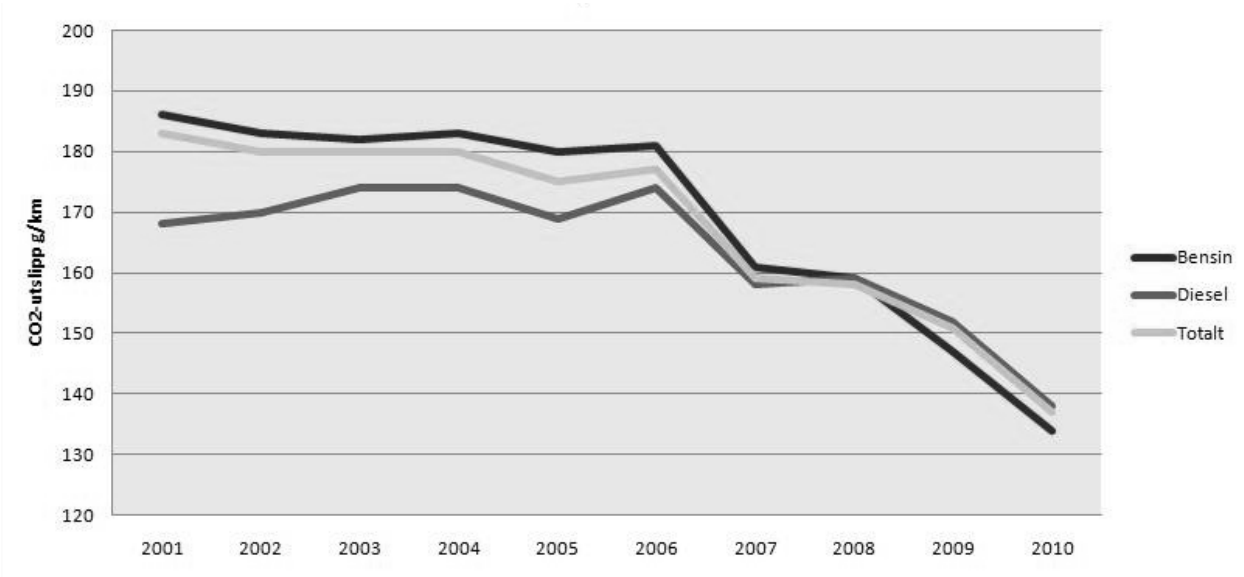

Figure 3-5: Effect of Norwegian feebate program on average new vehicle emissions through Jan. 2010. Bensin means Gasoline. (R0225)

Previous Research and Development in the United States

As part of its AB32 (greenhouse gas emission reduction program) rule development, California has done extensive research on feebate program design, implementation, effectiveness and economic impacts. The research was done by the University of California, Davis, for the California Resources Board (CARB). The research utilized several models and analyzed several factors, such as:

- One, two, or footprint based vehicle categorization
- Two rates of fee and rebate increase
- California, multistate, or national program
- Scenarios developed including static or increasing CAFE standards (2 percent per year)
- Interactive effects with CAFE and LCFS
- Assessed overall effectiveness at reducing emissions and saving fuel
- Economic impacts of several feebate scenarios including consumer welfare

The key findings of the California feebate research were:

- Single benchmark (cars and trucks combined) feebate programs delivered the greatest fuel savings of 5 percent when compared to no feebate. The footprint benchmarking delivered the least at 3 percent and separate car and truck benchmarks saw an intermediate savings of 4 percent.
- Feebate systems reduce fuel consumption primarily by changing the mix of models purchased by consumers; only a moderate fraction is due to vehicle redesign by manufacturers. This is especially true for the California-only feebate modeling scenario.

- A broader feebate program (California and the 13 opt-in states, of which Washington is one) is more effective and stimulates greater vehicle redesign by manufacturers due to the larger market share affected by the feebate program. A national program is even more effective.
- Modeling indicates that feebate programs result in reductions in consumer surplus (consumers are worse off), but this is in part due to the CARB assumption that consumers only value the first three years of fuel savings when they consider purchasing a new car. If all fuel savings accrued over the typical 12 to 14 year lifespan of a vehicle are included, the feebate program increases consumer surplus (consumers are better off).
- Feebate programs can be substituted for performance based fuel economy or emission standards such as the national CAFE standards.
- Aggressive CAFE standards diminish the effectiveness and need for feebate programs. However, a feebate program can reinforce the goals of aggressive standards.
- Spillover or leakage effects from a feebate program are possible, meaning that more efficient vehicles in California and/or the opt-in states might allow auto manufacturers to sell less efficient vehicles in non-feebate states. In addition, used vehicles from states without feebate programs might be imported to states with feebate programs thereby diminishing overall fleet efficiency.
- Feebate programs will reduce automobile sales and manufacture profitability slightly and add modest administrative costs of 0.5 to 2 percent for the state and auto dealers.
- Manufacturers with better technology or vehicles that are more efficient do better under a feebate program. Generally, domestic automakers will fare less well and Asian manufacturers will benefit from a feebate program.
- Modeling indicates that the California feebate program reduced emissions of new vehicles by 3 percent for a California only program, 5 percent for a California and opt-in state program and 10 percent for a national feebate program.[94] See Table 3-4 below for details.

program coverage	avg. reduction in new vehicle emissions	change in avg. new vehicle emission, CA	avg. fee	avg. rebate	total emissions reduction in 2020
	g/mi		*$/vehicle*	*$/vehicle*	*$MMTCO_2e$*
Calif. only	9	3% reduction	700	600	3
Calif. + opt in states	12	5% reduction	675	550	5
Entire U.S.	24	10% reduction	600	500	9

Table 3-4: Changes induced by footprint-based feebate program of $20/g/mi. (R0225)

New Analysis

Due to the complexity of modeling the impacts of a feebate program in Washington and the detailed analytical work done by California on feebate programs, it was determined that the best option was to rely on the California analysis. A quick comparison of basic economic and

[94] As a point of comparison, the Pavley I and II car standards (similar to the current and proposed CAFE standards) deliver approximately a 30 percent reduction in California vehicle emissions.

transportation statistics indicates that, on a per capita basis, California and Washington are very similar (see Table 3-5 below). Per capita diesel fuel use is significantly different between the two states, which is likely because, on a per capita basis, Washington has more trade related activity, which consequently means more heavy truck activity. Based on the comparison in the table below, the results of the California feebate program study should be applicable to Washington.

metric	units	CA	WA
gasoline consumption	*gal/yr*	401.8	408.3
diesel consumption	*gal/yr*	109.4	193.8
vehicle miles travelled	*miles/yr*	8,577	8,557
vehicle registrations	*registrations*	0.891	0.877
state GDP	*$/yr*	$45,827	$46,458
personal income 2010	*$/yr*	$41,808	$43,886

Table 3-5: Comparison of transportation and economic metrics for CA and WA. All metrics are per capita. Based on 2007-2009 averages of EIA and U.S. Bureau of Economic Analysis data. (W0013)

The California results were scaled to Washington on a population basis to estimate fuel savings and emission reductions and are presented in Table 3-6. Washington has approximately 13 percent of California's population. In 2009, approximately 2,850 million gallons of gasoline were consumed in Washington.

program coverage	avg. reduction in new vehicle emissions	change in avg. new vehicle emission, CA	total emissions reduction in 2020	
	g/mi		*MMTCO$_2$e/yr*	*mm gal/yr*
CA + opt-in states	12	5% reduction	0.9	100
entire U.S.	24	10% reduction	1.8	200

Table 3-6: Estimated emission reduction and fuel savings in Washington from a feebate program. (W0004)

The California feebate program report included research on consumer opinion. Participants in the consumer research understood how a feebate program would work, but generally had a negative view of the concept. Participants generally preferred a continuous feebate function to a step function and preferred separate class-based systems for cars and light trucks.

Next Steps

A review of the existing European and proposed California feebate programs leads to the conclusions that:

- A well-designed feebate program could be effective in Washington at reducing fuel consumption and greenhouse gas emissions. Reductions are in the range of 3 to 5 percent.
- A program focusing on light-duty vehicles could, by 2025, reduce consumption by 100 million gallons per year and reduce greenhouse gas emissions by 0.9 million metric tons.

- The effectiveness of a feebate program is dependent on California and other states adopting similar programs.
- Aggressive CAFE standards reduce the quantitative effect of a feebate program on fuel consumption, though a "continuous improvement" pivot point can allow the two programs to work together neatly.
- A feebate program with two or three categories is likely the most viable and equitable for the state. Relying on federal CAFE categorizations would be the most direct approach.
- The rate at which the fee or rebate rises or falls with fuel efficiency must be high enough to induce behavior change in consumers. California research indicated that a fee of $20/gram of CO_2 would be effective. Further research is required in this area.
- The most efficient point to collect the vehicle fee or rebate is at the automotive dealership.
- Administrative costs are anticipated to be small: 0.5 to 2 percent of total fee and rebates.

Feebates deserve ongoing attention as the state continues to develop its energy policy.

3.5.2 Low Carbon Fuel Standard

Policy Option

An LCFS is a policy framework for reducing greenhouse gas emissions by setting standards for the carbon intensity of transportation fuels. Carbon intensity is a measurement of the lifecycle emissions of greenhouse gas per unit of delivered energy or, alternatively, per unit of distance driven. An LCFS is designed to be technology neutral: it does not boost specific fuels but rather sets a performance standard that regulated parties must meet.

Previous Research and Experience

The first LCFS in the world was designed, analyzed and implemented by California following a 2007 executive order by Governor Arnold Schwarzenegger.[95] Links to the significant body of work by CARB on California's LCFS can be found at the program's website.[96] Since fuel carbon intensity depends on many parameters whose values may vary from state to state, it is not possible to extrapolate the California analysis to Washington. Hence, Ecology led its own in-depth assessment of the feasibility of adopting a California-style LCFS to help achieve the state's greenhouse gas reduction goals.[97] Ecology collaborated with TIAX LLC to perform the analysis of possible implementation pathways and their environmental impacts, and with OFM to analyze the economic effects.[98]

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[95] Executive Order S-1-07, January 19, 2007. **(R0108)**

[96] http://www.arb.ca.gov/fuels/lcfs/lcfs.htm **(R0109)**

[97] Pursuant to Washington State Executive Order 09-05. The report is *A Low Carbon Fuel Standard in Washington: Informing the Decision*, Washington State Department of Ecology, February 18 2011, available at http://www.ecy.wa.gov/climatechange/fuelstandards.htm. **(S0014)**

[98] Ecology & TIAX adapted the GREET and VISION models, both from Argonne National Laboratory, as the vehicle and fuel modeling platform. For the macroeconomic analysis, they used REMI.

Ecology and TIAX estimated the carbon intensities for a variety of fuel pathways for Washington. Their results are summarized in Figure 3-6.

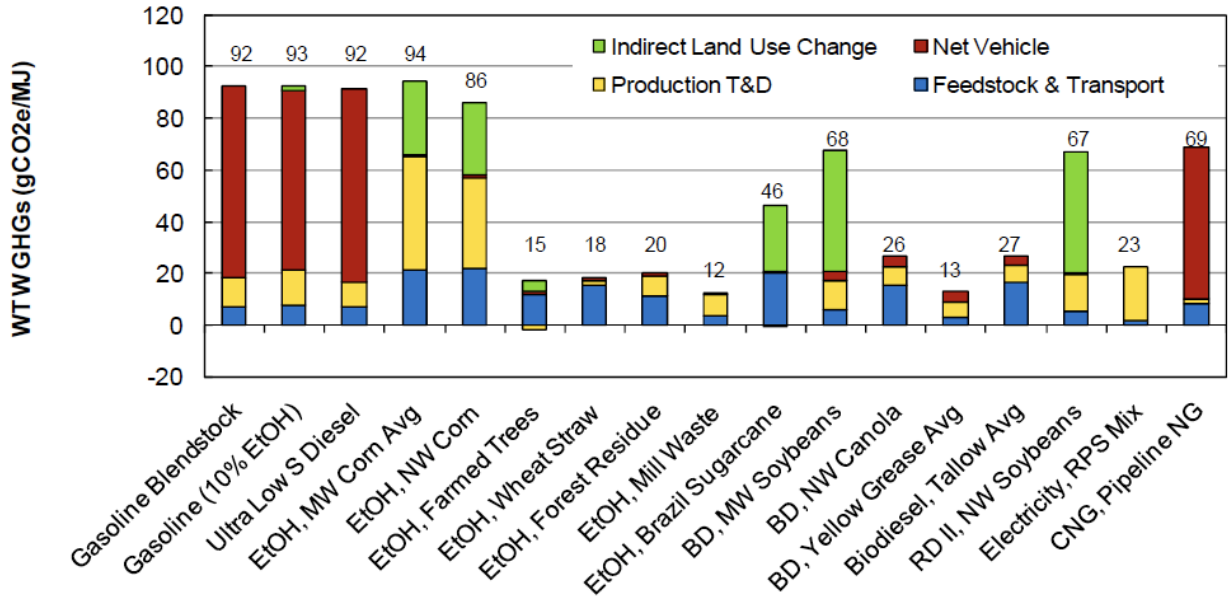

Figure 3-6: Well-to-Wheels (WTW) greenhouse gas emissions associated with 17 different fuel pathways. Well-to-Wheels refers to lifecycle emissions calculated beginning at the fuel source (a well, in the case of crude oil) and ending at the vehicle's use. EtOH means ethanol, Low S means low sulfur, Avg means average, MW means Midwest, NW means Northwest, BD means biodiesel, RD means renewable diesel, RPS means renewable portfolio standard, CNG means compressed natural gas, and NG means natural gas. (S0014)

The total height of each bar indicates the quantity of greenhouse gases emitted "well-to-wheels," including all processes beginning at primary energy extraction (the "well") up to and including consumption of the fuel by the moving car (the "wheels"). The maroon portion of each bar represents the net emissions contributed by combusting the fuel; this contribution is large for the fossil fuels because the carbon is extracted from oil wells and emitted into the atmosphere, while for biofuels this contribution is small because the feedstock crop extracts a roughly equal quantity of carbon from the atmosphere when it grows. Deploying some types of biofuel crops can induce land use conversion and, in these cases, a large green portion of the bar indicates the greenhouse gas emissions associated with that conversion amortized across a standard analysis period.

Following California's policy example, the LCFS analyzed for Washington was designed to reduce average transportation fuel carbon intensity by 10 percent by 2023 according to the schedule shown in Figure 3-7.

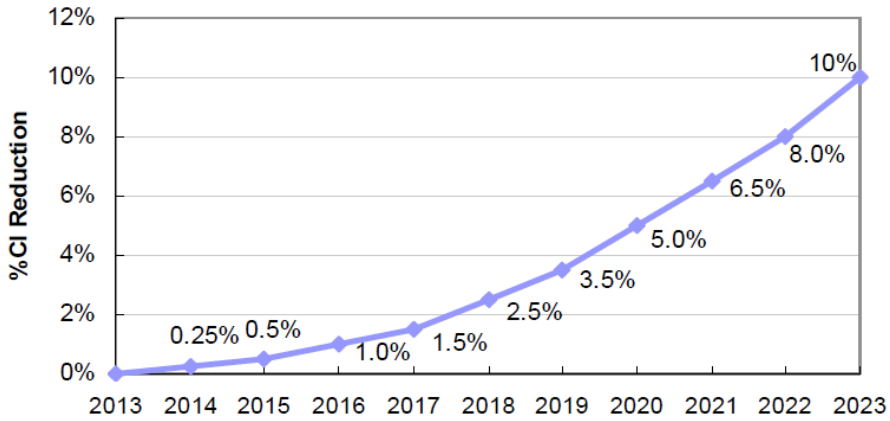

Figure 3-7: Compliance schedule assumed for Ecology-TIAX analysis. "CI" means carbon intensity. (S0014)

Ecology and TIAX modeled multiple scenarios to achieve reduction along the compliance schedule shown in Figure 3-7 and modeled, for comparison, the impact of a strengthened federal RFS2. Each of the scenarios represented a combination of vehicle and fuel technologies that could displace conventional petroleum fuels. Scenarios A through C give ethanol a more preeminent role, scenarios D and E are more centered on plug-in electric vehicles, and scenario F models a combination of electric vehicles, ethanol and biodiesel. Figure 3-8 shows the carbon emissions reductions relative to a business-as-usual reference case.

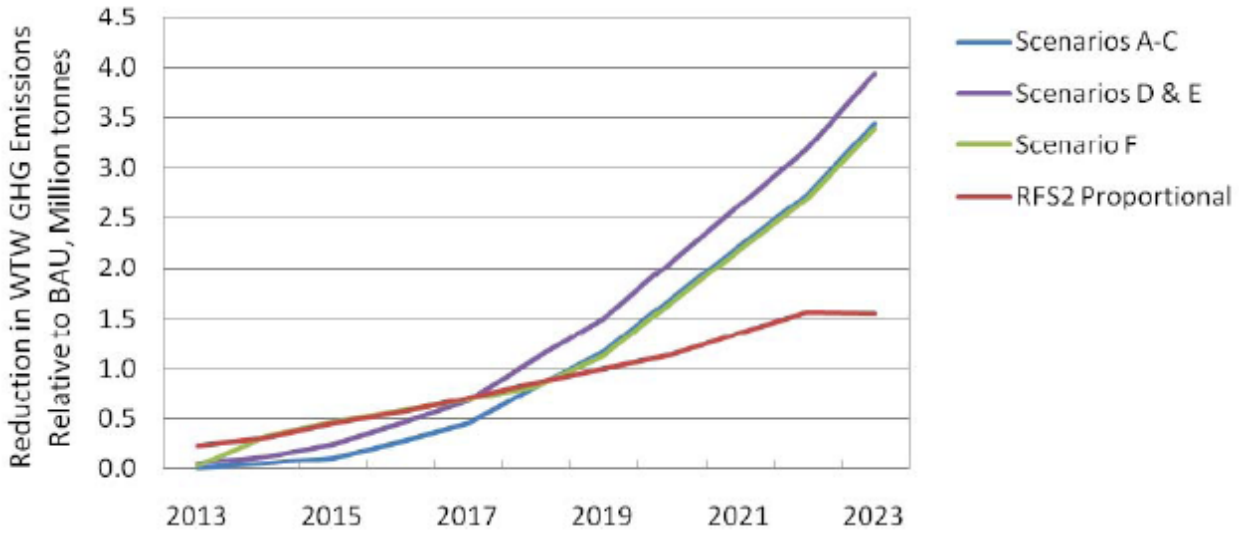

Figure 3-8: Impacts of LCFS scenarios on WTW greenhouse gas emissions. Higher values are increased reductions, relative to a business-as-usual scenario represented by the horizontal (zero) axis. (S0014)

In the figure, higher reductions are plotted as positive numbers. The business-as-usual reference case does not appear since the figure contains only the relative reductions. By 2020, estimated tailpipe carbon emissions reductions range from 2 to 4 percent, or 4 to 6 percent on a lifecycle basis; by 2023, 7 to 12 percent at the tailpipe, or 9 to 11 percent on a lifecycle basis. If Washington attracts a proportional share of the biofuels requirement of the federal RFS2, then

in 2020 the LCFS would have no additional effect at the tailpipe but 1 to 3 percent on a lifecycle basis; and in 2023, 2 to 7 percent at the tailpipe, and 5 to 7 percent on a lifecycle basis.

The environmental and economic impacts of low carbon fuel standards have received close examination by a number of independent researchers, with mixed results. Researchers express concern that an LCFS does not limit the absolute quantity of greenhouse gas emissions and that it is a financially inefficient mechanism for reducing GHGs.[99] In addition, there is substantial debate regarding the uncertainty of life-cycle emissions calculated for those renewable fuels that induce indirect land-use change.[100] Yet other researchers, while acknowledging the shortcomings of the LCFS policy approach, point out that the weaknesses can be addressed with careful policy design, and that tools like the LCFS may be a necessary "second best" option in the absence of comprehensive carbon pricing.[101]

New Analysis

No new analysis of this policy option was conducted for the 2012 Energy Strategy.

Implementation

Even though initial estimates of overall impacts of a California or Washington LCFS are generally positive – a significant reduction in emissions with a nearly neutral effect on the overall economy – Ecology has recommended to the Governor that the state not pursue the implementation of an LCFS at this time. The LCFS adopted by California is currently being challenged in court. Several federal constitutional issues have been raised and, in preliminary rulings, some of those challenges have been upheld. Ecology has recommended to the Governor that the state track the outcome of these challenges in order to develop an LCFS that will meet constitutional muster.

3.5.3 Advanced Aviation Fuels

Policy Option

Washington has a unique opportunity to become a hub for the production and use of sustainable biofuels for aviation – the state has a strong tradition of market innovation, a concentrated demand for sustainable aviation fuels, leading expertise and research capacity, and significant sustainable non-food biomass resources from both agriculture and forest residuals. The federal government has indicated a commitment to devote substantial resources to spur the production of advanced aviation biofuels for both military and commercial application

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[99] S P Holland, J E Hughes & C R Knittel, "Greenhouse Gas Reductions under Low Carbon Fuel Standards," *American Economic Journal: Economic Policy* 1 (2009) pp.106-146. (**R0219**)

[100] R J Plevin, M O'Hare, A D Jones, M S Torn & H K Gibbs, "Greenhouse Gas Emissions from Biofuels' Indirect Land use Change Are Uncertain but May Be Much Greater than Previously Estimated," *Environmental Science & Technology* 44 (2010) pp.8015-8021. (**R0221**)

[101] S Yeh, D Sperling, "Low carbon fuel standards: Implementation scenarios and challenges," *Energy Policy* 38 (2010) pp.6955-6965. (**R0220)**

in the coming years. This has the potential to reduce dependence on foreign sources of fossil fuels, reduce greenhouse gases and foster economic growth and jobs in Washington.

A targeted, strategic policy focus on sustainable aviation biofuels in Washington can encourage the realization of this potential. This policy focus could include targeting aviation biofuels in state incentive programs, strengthening research and development efforts, facilitating siting and permitting for pilot projects, job training, infrastructure development, and conducting lifecycle analyses of new technologies and pathways to ensure sustainability.

Previous Research and Experience

Advanced biofuels have already been produced and used in test flights of both military and commercial aircraft. “Drop-in” biofuels are intended to meet the same safety and performance standards as existing petroleum-based aviation fuels, and require no retooling of distribution, storage and fueling infrastructure. The international body that ensures that safety and technical standards are met for all fuels, ASTM International, has already approved a 50 percent biofuel blend for one jet fuel technology and others are expected. The U.S. Air Force has announced that it plans to meet 50 percent of its domestic jet fuel needs from sustainable biofuels by 2016.

In May 2011, Sustainable Aviation Fuels Northwest (SAFN) released a significant report resulting from a broad-based stakeholder effort led by Alaska Airlines, the Boeing Company, the ports of Seattle, Portland and Spokane, and WSU.[102] The report explores the opportunities and challenges of sustainable production of biofuels for aviation in Northwest states.

According to the SAFN report, Washington and the Northwest present a substantial market for sustainable aviation biofuels, with 865 million gallons consumed annually for commercial and military airplane use in Washington, Oregon, Idaho and Montana. By 2030, that demand is projected to grow to more than one billion gallons per year. The aviation industry presents a concentrated market with a relatively small number of fueling points. For the near future, commercial and military jet aircraft will need liquid, high energy-density fuels.

Washington is home to supplies of a number of promising sustainable feedstocks, including forest residues, oilseed crops, algae, and municipal and industrial solid wastes. Several conversion technologies are also in use or in development in Washington.

In its 2011 session, the Legislature passed SHB 1422, authorizing a residual forest biomass-to-aviation fuel demonstration project as a joint effort between the departments of Natural Resources and Commerce, with UW and WSU. The project is intended to link Washington’s forest products and aviation industries in producing sustainable aviation biofuels with feedstock from the state’s public and private forestlands.

New Analysis

No new analysis of this policy option was conducted for the 2012 Washington State Energy Strategy.

[102] http://www.safnw.com/ **(R0110)**

Next Steps

Multiple private sector initiatives are underway to bring commercial-scale production facilities to fruition in Washington. Both AltAir Fuels and Imperium Renewables are planning major drop-in aviation biofuel production facilities.

The U.S. Department of Agriculture, through its Agriculture and Food Research Initiative (AFRI), has awarded $80 million in new research funds over the next five years to broad-based regional research consortia led by WSU and UW to develop feedstocks and next generation process technologies for drop-in aviation biofuels, the largest grants USDA has ever awarded.

3.5.4 Improvements to Railroads

Policy Option

Rail transport is one of the most energy efficient ways to move people and goods along major corridors – in general, rail emissions are two to four times less than for the same trip or service by car or truck. The energy efficiency advantages of rail apply both to freight railroads and intercity passenger service. The vast majority of railroads are privately owned and only indirectly affected by state policy, but several state-level actions could help facilitate the increased use of rail or increase the energy efficiency of rail. In addition, Washington's High Speed Rail Program,[103] when completed in 2017, will lead to energy savings and emission reductions by reducing travel time and improving reliability, and purchasing new locomotives that are more energy efficient and environmentally friendly.

In the 2008 state Climate Action Team report, a number of projects and actions to eliminate bottlenecks and increase capacity for freight and passenger rail were identified based on prior planning and analysis efforts. Some of these projects have been implemented while others have not:

- Invest in capital projects that make improvements to support freight rail, AMTRAK and Sounder service.
- Support the creation of joint operating and trackage agreements between the BNSF Railway and the Union Pacific (UP) Railroad to allow equal access to mainline infrastructure, such as the current and future Stampede Pass tunnel and the Columbia River Gorge mainlines.
- Invest in the Stampede Pass line to allow for double-stack service.
- Work with the Class 1 railroads to make the improvements needed to operate the BNSF and UP lines along the Columbia River as directional running corridors.
- Increase Amtrak Cascades ridership to reduce energy use in other modes, such as highway.
- Maintain a substantive program for improving and maintaining short-line railroads that have sufficient projected freight to make a difference in air quality.

[103] http://www.wsdot.wa.gov/News/2011/02/26_HighSpeedRailAgreements.htm **(S0081)**

- Work to facilitate links to other rail forms of non-SOV travel.

In addition, the 2008 Climate Action Team report identified rail recommendations in the following categories:

- Preserve the potential for a future east-west freight corridor and increase its capacity in order to encourage more freight shifting from high energy consuming modes to rail.
- Improve capacity by extending the sunset date for the Ellensburg Lind section of the old Milwaukee Road.
- Complete the freight action strategy corridor and other grade separation projects that significantly reduce idling of cars and trucks.
- Further improve the fuel efficiency and reduce the air emissions of the equipment used by freight railroads.
- Develop a methodology for determining when rail electrification might become viable in Washington, including how to leverage future federal grants and investments in rail electrification.

Analysis in 2012 will evaluate the status of these projects and actions and identify the new projects and actions that will reduce energy consumption and emissions. The analysis will examine which will require state-level actions, whether implementation is still warranted and strategies for implementation, and additional state-level actions.

Previous Research and Experience

The Climate Action Team processes in 2007 and 2008 estimated the potential greenhouse gas emissions impacts from improving freight and passenger railroads.[104]

New Analysis

No new analysis of this policy option was conducted for the 2012 Energy Strategy. Analysis and implementation recommendations beyond those developed as part of the 2008 Climate Action Team process will occur in 2012. The analysis will include reviewing analysis conducted in 2007 and 2008 and updating the analysis as appropriate based on more recent research and implementation reports.

Next Steps

Identify resources for additional analysis in 2012 to support implementation. The additional analysis to be carried out in 2012 includes:

- Evaluate the potential energy saving and emission reduction effect of the Pacific Northwest Rail Corridor High Speed Rail Program.

[104] Leading the Way -Implementing Practical Solutions to the Climate Change Challenge, November 2008; **(S0003)**; and Washington Climate Action Team Transportation Policy Option Descriptions, December 2007. **(S0044)**

- Review rail recommendations from the 2008 Climate Action Team report to summarize which recommendations remain to be carried out, which should still be carried out that require state-level action, and update state-level implementation actions.
- Identify potential additional state-level recommendations to advance implementation of expanded freight and passenger rail systems and networks.
- Consider policies and incentives to encourage use of biodiesel-blends to fuel locomotives.

3.5.5 Comprehensive Trip Reduction Program

Policy Option

About 75 percent of vehicle travel is not associated with the commute trip to work. This strategy would build upon the state's commute trip reduction program to encourage all travelers, not just commuters, to use the transportation system in a more energy efficient manner. This strategy is centered on outreach and education and would include a broad statewide education campaign and community-based trip reduction programs:

- A broad-based education campaign to encourage people to try energy efficient transportation choices and behaviors, from walking and bicycling to using fuel efficient driving practices that can provide cost savings to people and businesses and offer health benefits.
- A residential-based trip reduction program that uses social or individualized marketing strategies to educate travelers about their options. The approach would be inclusive of all trip purposes and all potential modes of travel, with the goal of getting people to change the easy trips first and build on that success. The program may be adapted to other markets – residential, schools, institutions and employment centers.

Examples of successful residential-based trip reduction programs include Whatcom County's Smart Trips program and King County's *In Motion* program. Such programs use a variety of outreach techniques to encourage individuals to learn more about their travel options. Individuals who reduce their driving and report on their changed behavior can earn rewards and prizes. The common elements of these programs include using all trips as candidates for change, community identification and local community support, a pledge and reward system to encourage sustained behavior change, and ongoing communication and education about options and program results.

Previous Research and Experience

Based on National Household Travel Survey data in 2009, getting to and from work accounted for about 27 percent of household VMT. Work-related business was 8.4 percent of the VMT in 2001, but declined to 6.7 percent in 2009, possibly due to advancements in computing technology making it possible for more business to be handled electronically. The VMT for shopping were almost 16 percent of total VMT, up about 1 percent from the 2001 level.[105]

[105] http://www1.eere.energy.gov/vehiclesandfuels/facts/m/2010_fotw616.html. **(R0111)**

During peak hours, more non-work trips are being made, which contributes to peak period traffic congestion. In addition, as described previously in Chapter 2, total household energy expenditures are dominated by transportation-related expenditures. As shown in Figure 2-6, 64 percent of household energy expenditures go toward fuel to power vehicles. Even higher oil prices in the future could result in the transportation share of household energy expenditures being even higher.

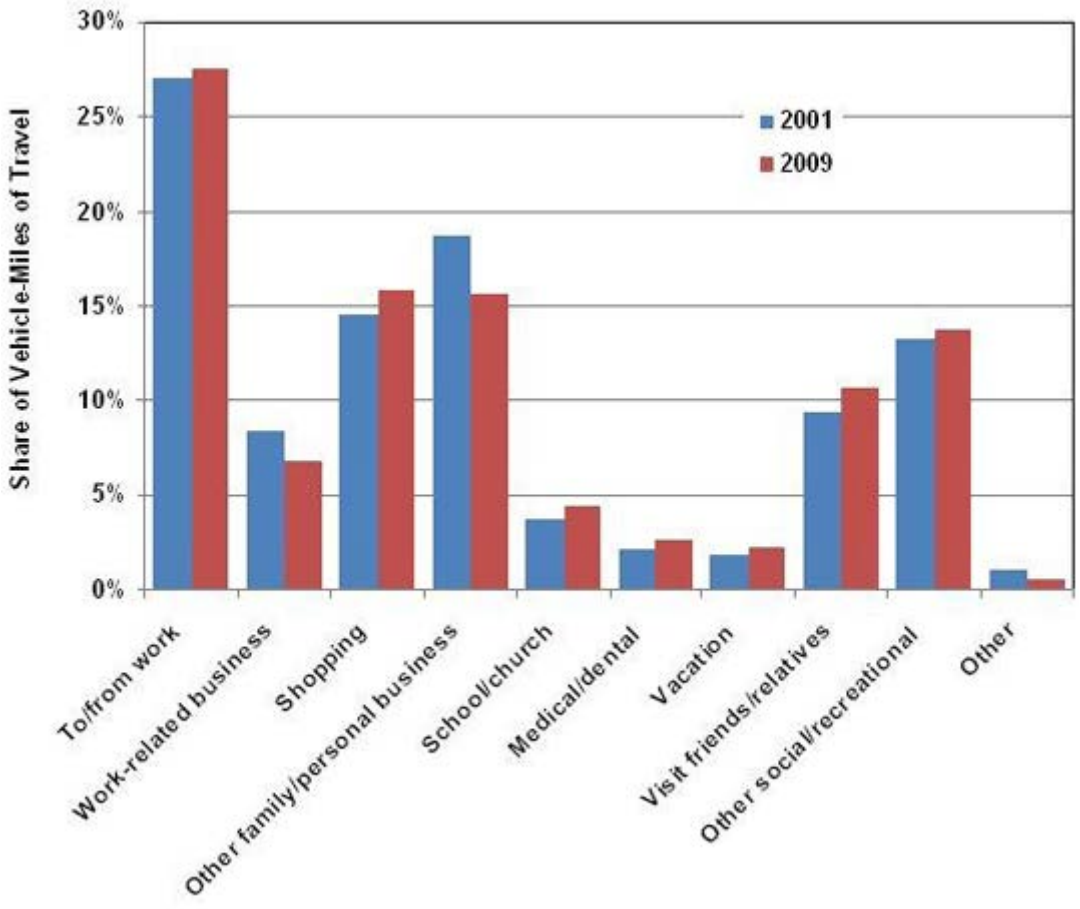

Figure 3-9: National share of household trip VMT by purpose. (R0111)

In King County, the trends appear to be similar. According to a King County Department of Transportation Study,[106] 82 percent of trips in the region are for non-work purposes and 50 percent of all trips are three miles or less and take less than 15 minutes. There are also many trips made by vehicle that are potentially walkable. This study estimated that 20 percent of all trips are less than one mile in distance and five minutes in duration (by car) and 58 percent of these trips of less than one mile in distance are made in a car.

In addition to using more efficient modes of travel, travelers can reduce energy consumption by traveling more efficiently and combining trips more often. This is called trip chaining or trip consolidation. Figure 3-10 below shows an example of potential VMT savings for a household that consolidates one weekly shopping trip and combines one additional shopping and social or

[106] http://your.kingcounty.gov/healthscape/publications/LUTAQH_final_report.pdf **(R0169)**

recreational trip. As shown, the 2009 National Household Travel Survey[107] indicates that the average household's weekly VMT is 382 miles. The average household makes 4.5 roundtrip shopping trips at an average distance of 6.4 miles one-way for each trip, and 4.2 roundtrip social or recreational trips at an average one-way distance of 11.2 miles. Using the example in Figure 3-10, if households consolidate one roundtrip shopping trip (so that they make 3.5 weekly roundtrip shopping trips instead of making 4.5 weekly roundtrip shopping trips) and chain one additional shopping trip with a social or recreational trip, this could reduce a household's total weekly VMT by 23.9 miles (6.3 percent of its total VMT). This represents a potentially low cost strategy to reduce VMT.

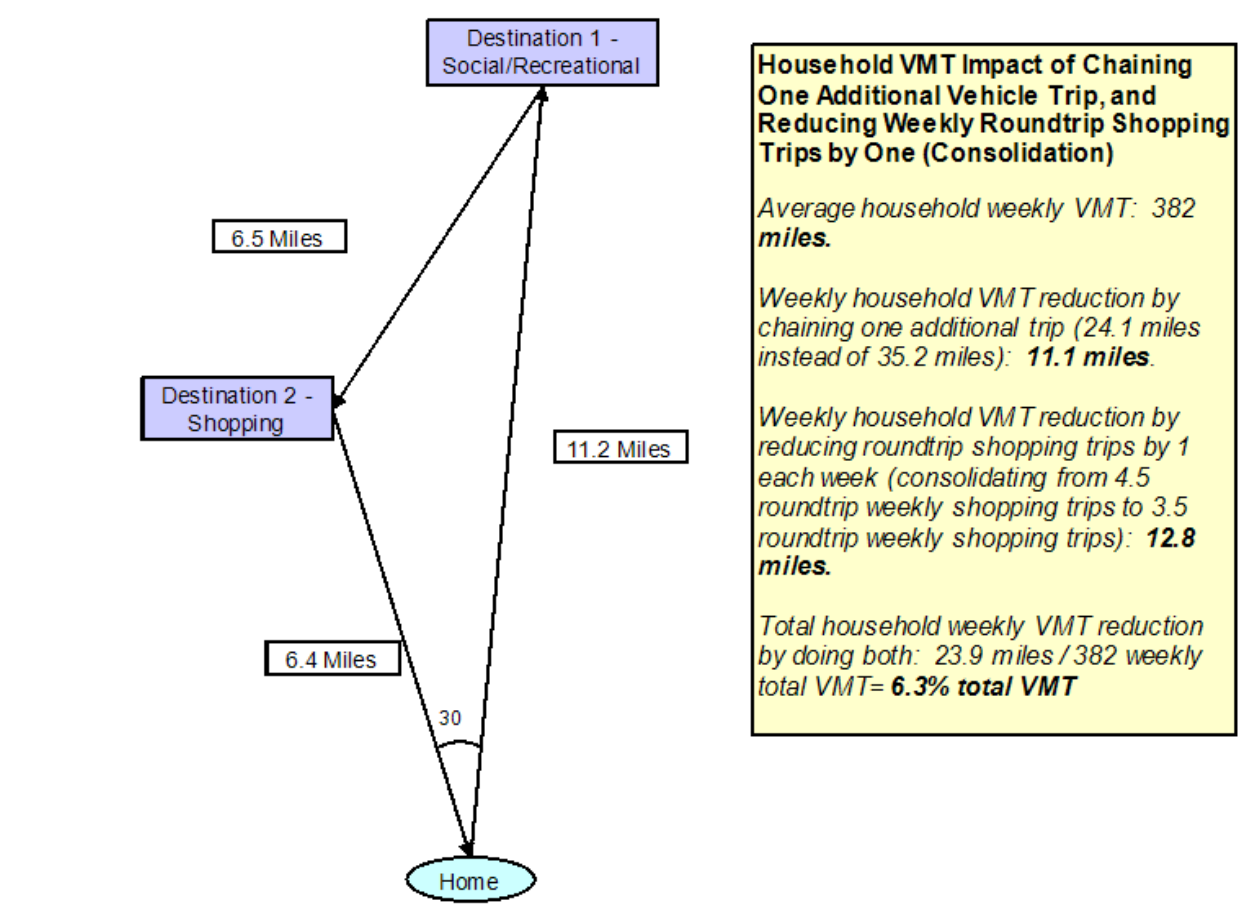

Figure 3-10: Example of household trip chaining or consolidation and VMT savings. (WSDOT, 2011)

Washington and Oregon have a number of programs that focus on encouraging and helping travelers to make more efficient travel choices. Programs and impacts on reducing VMT and emissions in several areas of the state are described below.

[107] http://nhts.ornl.gov/2009/pub/stt.pdf **(R0170)**

King County *In Motion* – Community-Based Travel Behavior Change

King County's *In Motion*[108] program was designed to address the full range of trip destinations and purposes (including discretionary trips) and to work directly with individuals rather than through a representative, such as an employer. *In Motion* incorporates all the key elements of community-based social marketing, including direct outreach, a specific call to action (e.g., change two drive-alone trips per week to some other mode), incentives and follow up (e.g., trip reporting, surveys). Based on the success of the initial pilots, *In Motion* is an ongoing tool to decrease drive alone trips and increase the use of alternative modes in target neighborhoods or on selected transit routes, and to mitigate the impacts of major highway construction projects.

Through 2010, *In Motion* has been implemented in over 20 neighborhoods across King County, reaching over 70,000 households. Based only on the number of trips actually reported by participants during the course of a project (i.e., not annualized), on average a participant in a 12-week *In Motion* program will reduce VMT by 153 and CO_2 by 155 pounds. For a typical project of 3,500 households, *In Motion* will save 57,051 VMT, 3,754 gallons of gas and 54,632 pounds (27 tons) of CO_2. Based on survey data from participants, the program typically results in a 20-plus percent reduction in drive alone travel and varying levels of increase in all other modes, depending on the availability of services and infrastructure in that neighborhood. About 50 percent of the trips changed by participants are for work. The other 50 percent are spread among shopping, appointments, recreation and other purposes.

Whatcom Smart Trips

Whatcom Smart Trips is a community-wide vehicle trip reduction program implemented by the Whatcom Council of Governments (WCOG) and the Whatcom Transportation Authority (WTA) in July 2006. The program focuses on affecting trips of all types; component programs include a travel diary,[109] incentives, Emergency Ride Home, employer partners, targeted outreach, school programs, a bike program,[110] public awareness campaigns and a neighborhood-based program.

A 2008 Neighborhood *Smart Trips* campaign targeted 10,037 Bellingham households, about one-third of the city. Contact was made with 89 percent of the targeted households and almost half expressed interest in receiving educational materials and assistance. According to the program's 2009 follow-up survey, the targeted area experienced the following:

- 22 percent increase in walking trips
- 35 percent increase in bicycling trips
- 10 percent increase in transit trips
- 25 percent increase in physical activity associated with active transportation trips
- 13 percent decrease in vehicle trips
- 15 percent decrease in vehicle miles traveled

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[108] http://www.kingcounty.gov/inmotion **(R0171)**

[109] www.WhatcomSmartTrips.org **(R0172)**

[110] www.everybodyBIKE.com **(R0173)**

- 3,500 ton decrease in greenhouse gases

City of Seattle's *Way to Go, Seattle!* Programs

Way to Go, Seattle![111] includes a variety of programs intended to encourage more efficient travel for all trip types. Following are brief descriptions of two current programs.

- One Less Car Challenge: For a variety of reasons (saving money, reducing stress, helping the environment) some people want to live with one less car in their households. The One Less Car Challenge aims to help these people by providing personal, one-on-one support to help participants learn how to get around by bus, bike, foot or carpool. Forty-four households have given up a car through the One Less Car Challenge this year to date. Of participating households, 66 percent that gave up a car were one car households. Assuming 4,100 miles per year per car given up, the city of Seattle estimates that roughly 180,400 pounds of CO_2 will be saved during the one year period during which each participant has been without a car. However, the city of Seattle estimates that the amount of CO_2 saved may be more than this since their evidence suggests that most participants do not replace their car after they complete the challenge program.
- Walk Bike Ride Challenge: The Walk Bike Ride Challenge is a program through which Seattle works with people who want to walk, bike and ride transit more. The city sends participants information and encouragement throughout the program to help them create new travel habits. Participants in this program can also win prizes. In 2011, Seattle has had four, two-month rounds of the Walk Bike Ride Challenge; and 1,628 participants have reduced CO_2 emissions by 398,498 pounds by converting drive alone automobile trips to trips taken by walking, bicycling or riding some form of transit.

Oregon's Drive Less, Save More Campaign

The *Drive Less, Save More* campaign[112] was launched in 2006 by the Oregon Department of Transportation, Metro Portland regional government, and its public and private partners. This program seeks to reduce individual car trips as part of a larger solution to address traffic congestion. The goal is to raise public awareness about the benefits of driving less through trip chaining and other smart driving strategies, such as riding transit, carpooling, vanpooling, ridesharing, telecommuting, biking and walking. Since the program launched, it has expanded beyond the Portland metro area into Salem, Eugene and Springfield, Medford and Bend.

The program works to increase public awareness about transportation choices, especially trip chaining, to reduce car trips. The goal of this campaign is to get people to use travel options and encourage drivers to trip chain. As part of the campaign, the program has launched television ads[113] and sponsored a video challenge that invited public participation in a contest to produce a television ad.[114]

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[111] http://www.seattle.gov/waytogo/ .**(R0174)**

[112] http://www.drivelesssavemore.com/ **(R0175)**

[113] One television ad example: http://drivelesssavemore.com/how-to-videos/tv-ads/bumble-bee **(R0189)**

[114] See one here: http://www.youtube.com/user/DriveLessSaveMore#p/c/0/wepNpbCOzXY **(R0190)**

Now in its fifth year, nearly 19 percent of the Portland metropolitan region's population has reduced their car trips because of *Drive Less, Save More*. The campaign estimates that it has resulted in a reduction in VMT of 21.8 million miles, which leads to a reduction in greenhouse gas emissions of 10,700 tons. The program also estimates that it has saved the public more than $8 million in auto operating costs.

New Analysis

No new analysis of this strategy was conducted for the 2012 Energy Strategy, but analysis will be conducted in 2012.

Next Steps

- Implement near-term recommendations related to comprehensive trip reduction strategies as described in Section 3.4.4 - Commute Trip Reduction Program Expansion.
- Develop toolkit that can be tailored by individual jurisdictions/organizations/communities. Could include further modifications to Rideshareonline.com for communities that need a calendaring tool.
- Provide guidance on evaluation methods and tools (including measurement surveys) and support for data collection, processing and evaluation.
- Assess allocating some funds from capital budgets to support program implementation as part of capacity management.
- Develop a travel efficiency education and outreach program, potentially modeled after recycling campaigns in Washington or the Drive Less, Save More campaign in Oregon. The state would run the statewide awareness raising campaign and support local jurisdictions in active program implementation.

3.5.6 Energy Efficient Transportation Choices

Policy Option

This policy option would increase the supply of energy efficient transportation choices. Some forms of transportation are more energy efficient than others, with walking and biking being the most energy efficient forms of transportation overall. The energy efficiency of vehicles (such as passenger cars, vans, transit and rail vehicles) is typically expressed as energy consumption per vehicle mile. Energy efficiency of travel, however, is best expressed as energy efficiency per passenger mile. Energy efficiency per passenger mile depends on the energy efficiency of the vehicle as well as the number of people being transported in the vehicle.

The current supply of energy efficient transportation alternatives is inadequate to maximize energy efficiency and, in the case of transit service, the supply is actually decreasing due to declining sales tax revenues concurrent with increasing demand for the service. Preliminary transportation stakeholder input received as part of development of the SES similarly suggests

that revenue to support transportation choices is inadequate. Investment in transportation alternatives must be increased to maximize transportation energy efficiency.

Previous Research and Experience

One of the near-term strategies, Smart Growth and Transportation Planning as described in Section 3.4.5, describes how communities can grow and function to support travel that is more energy efficient, including facilitating more biking and walking. Compact, mixed-use communities can provide shorter travel distances between destinations and therefore enable more travel by walking and biking, if safe and convenient non-motorized facilities are available. In addition, CTR and comprehensive trip reduction programs (see Sections 3.4.4 and 3.5.5) encourage an increase in more energy efficient forms of transportation, including carpooling and vanpooling.

Transit can be much more efficient than travel by passenger cars and, for this reason, the 2008 Climate Action Team report considered approaches for providing transit services through the Washington Transportation Access Network (WSTAN) proposal. The WSTAN was described as a coordinated strategy to assure that public transportation provides vital transportation connections that enable travel throughout Washington, as well as affordable alternatives to a car-dependent lifestyle.

Research of transit systems throughout the country shows that the energy efficiency of transit service can vary widely and depend on the type of transit service, transit vehicle energy efficiency and ridership. As with passenger cars, a vehicle with more passengers will be more energy efficient on a passenger mile basis than a vehicle with fewer people. National data indicates that buses and other transit vehicles are highly efficient when full. However, because transit buses are very heavy vehicles, they consume more energy per vehicle mile than passenger cars. If only a few passengers are on the bus, the efficiency per passenger mile may be lower than a passenger car. Figure 3-11 summarizes the estimated CO_2 emissions per passenger mile for automobiles and public transportation at average and full occupancy, based on national data. In this figure, the average number of passengers for private auto trips is 1.14 for work trips and 1.63 for general trips, and the emissions factors are national averages. Many transit agencies in Washington are more energy efficient than the national average and electrically powered transit in the state has much lower greenhouse gas emissions per passenger mile than the national average.

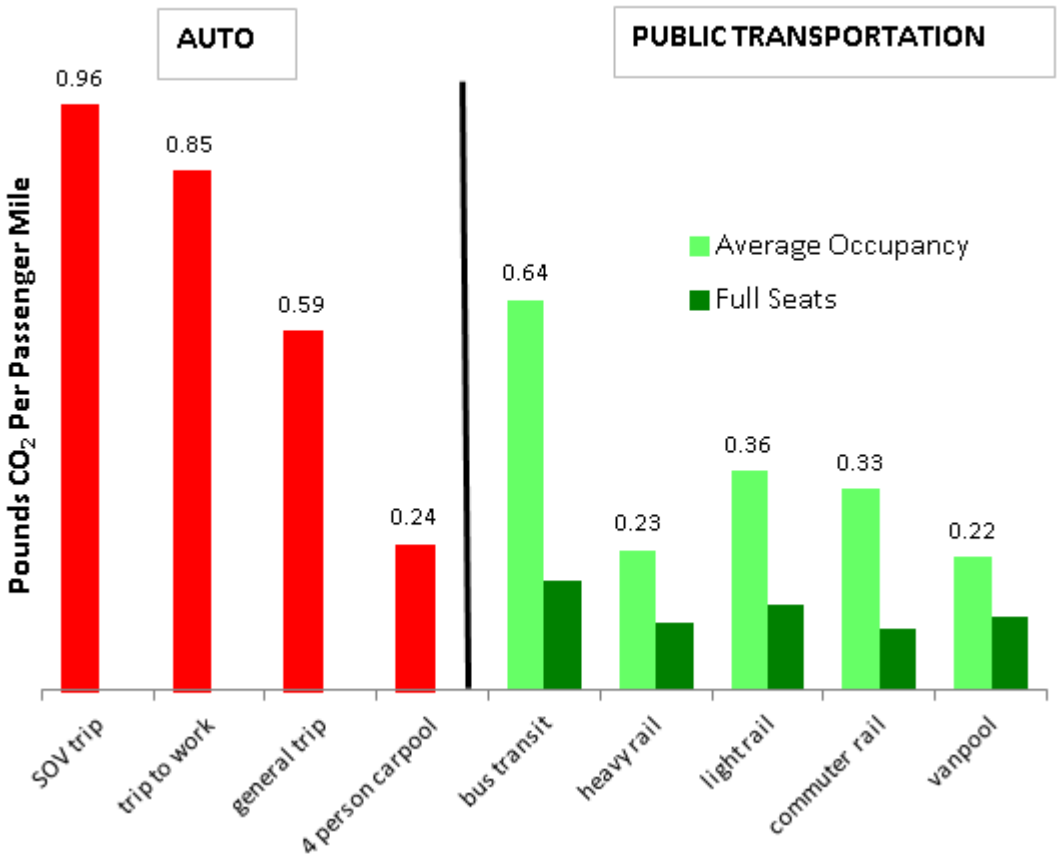

Figure 3-11: Estimated CO_2 emissions per passenger mile for average and full occupancy. The average number of passengers for private auto trips is 1.14 for work trips and 1.63 for general trips. (Federal Transit Administration, R0226)

Looking into the future, new federal CAFE standards (see discussion in Section 3.2.4 on p.27) will reduce the energy intensity of passenger cars; recent new fuel economy standards have also been set for heavy-duty vehicles, including transit buses.[115] This will help ensure that, as passenger cars become more efficient, transit vehicles also become more efficient and continue to provide energy and emissions benefits comparable to passenger cars, particularly single occupancy passenger cars. Buses will be required to reduce fuel consumption and greenhouse gas emissions by approximately 10 percent by model year 2018.

Even now, many transit agencies across Washington are using or acquiring more energy efficient transit vehicles to reduce their agencies' operating costs and greenhouse gas emissions. These transit agencies are using more biodiesel and incorporating hybrid buses, electrically powered transit vehicles and CNG buses into their fleets. They continue to look for opportunities to integrate more alternative and energy efficient vehicles into their fleets. For example, through the Federal Transit Administration's Transit Investments for Greenhouse Gas

115 http://www.nhtsa.gov/About+NHTSA/Press+Releases/2011/White+House+Announces+First+Ever+Oil+Savings+Standards+for+Heavy+Duty+Trucks,+Buses **(R0191)**

and Energy Reduction (TIGGER) program, five transit agencies in Washington were awarded grants in November 2011 to improve the energy efficiency of their vehicle fleets:[116]

- Chelan - Douglas Public Transportation Benefit Area will acquire five 100 percent battery electric transit vehicles and associated fast charge stations;
- Sound Transit will design, procure and install energy storage units for up to five light rail vehicles to capture unused energy generated by braking, and will store that energy to power trains;
- Intercity Transit will purchase hybrid biodiesel-electric replacement buses;
- The Cowlitz Transit Authority will purchase 35-foot clean fuel biodiesel buses; and
- Stillaguamish Tribe Transit Services will purchase additional hybrid sedans to expand its rideshare program.

In addition, some transit agencies in are beginning to use energy efficiency as a performance standard for transit service. Spokane Transit, for example, includes energy consumption as one of the agency's three performance standards[117] to measure the success of fixed-route service and to help determine changes to transit service. Routes are compared against annual benchmark scores set for routes similar in service type and/or vehicle types. Any route that performs below the benchmark for two consecutive years for any one of the three performance standards is considered out of compliance with the agency's fixed route service design guidelines. Spokane Transit characterizes their routes as either basic routes or commute routes. At a minimum, basic routes must meet an average passenger load factor that results in the route being at least as energy efficient as a typical SOV. The benchmark for commuter routes is higher and, at a minimum, these routes must be at least as energy efficient as the average occupancy private automobile.

Because energy volatility is expected to continue into the future, it will become increasingly important to consider energy efficiency in transportation projects and services. Energy efficiency improvements in transit can be accomplished through improvements in vehicle technology and operations, as well as by increasing the average passenger load. Significant improvements are possible, even with the use of currently available transit technologies.

For instance, a recent research project for the Transit Cooperative Research Board developed scenarios that result in long-term transit efficiency improvements. One scenario presents potential greenhouse gas emissions per passenger mile in 2030 and 2050 for a bus transit agency that adopts hybrid diesel technology, while also gaining efficiency through operational and maintenance improvements. By 2050, the improvements result in a 62 percent reduction in emissions per passenger mile from 2010 levels.[118]

Some of the long-term land use changes that are critical to improving the energy efficiency of the overall transportation system will depend on the provision of high quality transit service. The

[116] See http://fta.dot.gov/documents/2011_TIGGER-CF.FINAL.pdf for the list of all projects awarded. **(R0192)**

[117] The other two performance standards are ridership and farebox recovery ratio.

[118] "The Route to Carbon and Energy Savings: Transit Efficiency in 2030 and 2050," Prepared for the Transit Cooperative Research Program, November 2010. **(R0193)**

relationship is interdependent – long-term land use changes can't occur without supportive transit service, and transit service needs supportive land use to more efficiently provide transit service to more people.

New Analysis

No new analysis of this policy option was conducted for the 2012 Energy Strategy. Depending on actions or analysis undertaken at the state level to address revenue for transportation (such as through the *Connecting Washington* effort), new analysis conducted as part of that or related efforts may be described in 2012.

Next Steps

- Coordinate with *Connecting Washington* effort for new revenue sources for alternative transportation choices, including non-motorized infrastructure, transit, carpooling and vanpooling.
- Identify and advance implementation of near and long-term approaches to improve the energy efficiency of transit services in Washington. This can include considering funding opportunities for the acquisition of more efficient transit vehicles, and the development and implementation of approaches to improve service and support energy efficiency goals.
- Implement recommendations in Section 3.4.5 related to land use changes that can help support the long-term provision of more energy efficient transportation choices (non-motorized and transit modes).

Funding mechanisms should support transportation choices that are most consistent with near- and long-term reductions to energy consumption. These include trip reduction programs that encourage and facilitate the use of more energy efficient modes of transportation (both centers-based programs like CTR and GTEC in Section 3.4.4 and comprehensive programs per Section 3.5.5), programs that facilitate non-motorized travel and programs that support the provision of energy efficient transit service.

3.5.7 Emerging Pricing Methods

Policy Option

Currently, funding for the state's highway system is drawn primarily from gasoline and diesel fuel taxes. Through careful policymaking, the state can choose to tax products in ways that produce socially or environmentally optimal outcomes. This is the principle behind cigarette taxes (encouraging improved health) or proposed carbon taxes (encouraging use of low-carbon fuels).

The fuel taxes that fund highways encourage energy efficiency by making it more expensive to consume more energy, but they lack sophistication in their relationship to the state's evolving, modern energy system. In particular, fuel taxes do not work well together with increasingly fuel-efficient vehicles: the more desirable, low-emissions, low-energy vehicles created, the less money the state receives through fuel taxes to maintain and build the roads on which they drive.

It is reasonable to forecast a more distant future in which battery-electric vehicles eventually dominate the roadways, producing an even larger drop in collections from traditional fuel taxes. Alternative pricing methods can remove an inevitable tangle between modern energy policy that encourages efficient vehicles and the state's need to fund roadways.

The fuel tax system also runs counter to sound energy policy in that it does little to move drivers away from the congested parts of the road system. Previous research has demonstrated a clear link between road congestion and poor fuel efficiency. If the state were to price road use instead of fuel use, a door would open for modern, sophisticated pricing mechanisms to make less congested roadways lower-cost roadways, hence encouraging fuel efficient travel.

As the pressure from road congestion grows and as vehicle efficiency increases, a system-wide shift from fuel taxes to road pricing may emerge. In order to be prepared for such a shift, the state can complement the basic understanding of mileage pricing gained through the Section 3.4.8 pilot, with continued research into the costs and benefits of various system-wide alternatives.

For this year's Energy Strategy, Commerce analyzed three possible tax shifts associated with the changing picture of vehicle fuel efficiency and road pricing:

- **Mileage pricing**: a fixed fee on every vehicle mile traveled. This simple policy levies a uniform fee to all vehicles in all locations, but more complex variants could assign different prices to rural versus urban mileage or scale the rate according to gross vehicle weight (correlating to the amount of wear on roads). Mileage pricing encourages drivers to use the transportation system more efficiently by reducing trip lengths or frequencies or by using modes of travel other than a privately owned vehicle. Mileage pricing raises the same equity concerns already associated with fuel taxes, in which energy cost is a disproportionately large fraction of the household bill for low-income groups and some rural residents. See *TRB Special Report 303* for more analysis of equity issues associated with alternative pricing strategies.[119] Careful design of the mileage pricing structure could mitigate these concerns.
- **Congestion pricing**: Congestion or time-of-day pricing charges variable fees (tolls) to road users, with the fee designed to be highest when and where the road is most congested. There are a variety of ways that drivers may respond to congestion pricing and not all responses reduce energy consumption and greenhouse gas emissions. Many drivers will simply pay the toll because that makes the most sense for them. Others will respond to price signals by choosing the less expensive roadways and the level of service on the tolled system will improve. Other responses to congestion pricing include shifting non-essential trips to a less congested time of day, using a different mode (transit, carpool, or vanpool for example) to reduce or avoid the toll, eliminating non-essential trips or changing work or home locations to avoid the toll. Pricing would be applied only to congested sections of state and federal highways and some sections of principal arterials in larger metropolitan areas. In a hybrid solution with mileage pricing, a nominal fee could be applied to all state and federal

[119] Transportation Research Board, *Special Report 303 - Equity of Evolving Transportation Finance Mechanisms*, 2011, http://www.nap.edu/catalog.php?record_id=13240 **(R0178)**

highways, with additional congestion surcharges applied only to the segments affected by congestion.

- **Carbon pricing**: a price applied to carbon contained in any fuel sold, either directly through a tax or indirectly through trading prices associated with an emissions cap. Carbon pricing is a comprehensive approach to energy policy in a climate-constrained world and ties energy policy in the transportation sector more closely to policy in all energy sectors. For this reason, carbon pricing is treated separately in Chapter 5. Within the transportation system, carbon pricing is more similar to the existing fuel tax than to mileage pricing or congestion pricing.

Previous Research and Experience

Many studies, including *Moving Cooler*, have estimated the impacts of transportation pricing strategies on VMT, energy consumption and greenhouse gas emissions at the national level. In Washington, *Transportation 2040*, by the Puget Sound Regional Council (PSRC),[126] included analysis of transportation pricing strategies through use of a regional travel demand equilibrium model. The model takes various parameters, such as road capacity and configuration, land use, travel patterns and economic activity into account. This equilibrium

Cordon Pricing

Another option for pricing transportation that has received attention is cordon pricing or area pricing. A cordon is drawn around a congested area, such as a central business district, and vehicles are charged to enter the cordon or operate within it.

Cordon pricing has been introduced in several cities around the world, including London and Stockholm. The total number of vehicles entering London's city center was 16 percent lower in 2006 than before implementation in 2002.[120] Retailers in central London initially expressed concern about potential adverse impacts on their sales, but researchers found no significant effect on the overall retail sales in one quantitative analysis.[121]

Seattle has studied possible cordon pricing on its city center,[122,123] which has dense activity and an employment center well served by transit. Danna et al *estimated the quantitative effects for cordon pricing in downtown Seattle in a benefit-cost study.[124] The study extrapolated results from existing road pricing programs in London, Stockholm and Milan to estimate the major impacts of traffic volume in Seattle. The analysis found that cordon pricing averaging $2.10 on each vehicle entering the cordon could reduce the number of vehicles entering the cordon by 12 percent, resulting in a 6 percent reduction in King County's greenhouse gas inventory and a 2 percent reduction in travel time and traffic accidents.*

However, another study by QuantEcon[125] using PSRC's regional travel model found that area pricing around Seattle would have only a small reduction in regional VMT and would lower user benefits within the region. Given these conflicting results cordon pricing will remain an area of ongoing research and inquiry.

[120] Transport for London, *Central London Congestion Charging: Impact Monitoring Fifth Annual Report*, Jul 2007, http://www.tfl.gov.uk/assets/downloads/fifth-annual-impacts-monitoring-report-2007-07-07.pdf **(R0194)**

[121] Mohammed Quddus, Alon Carmel, and Michael GH Bell, *The Impact of the Congestion Charge on Retail: the London Experience*, Greater London Authority, May 2005, http://www.london.gov.uk/mayor/economic_unit/docs/impact-of-congestion-charge-on-retail.pdf **(R0195)**

[122] Booz, Allen, and Hamilton, *Seattle Variable Toll Study*, May 2009, http://www.seattle.gov/transportation/docs/FINAL%20Tolling%20Study%20report%20revised%206.25.10.pdf **(R0196)**

[123] City of Seattle, "7 Best Practices, Congestion Pricing," *Seattle Transit Master Plan Briefing Book*: pp. 7.21-7.24, http://www.seattle.gov/transportation/docs/tmp/briefingbook/SEATTLE%20TMP%207%20BP%20-%20f%20-%20Congestion%20Pricing.pdf **(R0197)**

[124] Steven Danna, Keibun Mori, Jake Vela, and Michelle Ward, *Cordon-Based Road Pricing in Downtown Seattle*, Jun 2011 **(S0082)**

[125] QuantEcon Inc, *Improving highway Efficiency and Investment Policy Through Pricing: A Challenge to the Status Quo*, Dec 2009 at http://cascadepolicy.org/news/2010/01/05/ending-highway-gridlock-in-portland/ **(R0198)**

[126] Puget Sound Regional Council, *Transportation 2040*, May 2010, http://psrc.org/transportation/t2040/t2040-pubs/final-draft-transportation-2040 **(R0043)**

modeling approach is sophisticated and can take into account complex transportation dynamics, such as variable toll rates and traffic diversion effects.

An important focus of *Transportation 2040* is congestion pricing using variable toll rates that are applied to the freeway system as well as other highways and major arterials. The toll rates are "economically optimal rates," determined by PSRC's formula to simultaneously minimize congestion and diversion impacts. Consequently, toll rates are higher during the afternoon peak hours when roadways are most congested and lower when the roadways are less congested. PSRC's simulation shows that, with the optimal rate, congestion pricing would result in a reduction in VMT of 3 percent and a reduction in transportation sector greenhouse gas emissions of 6 percent in 2040. PSRC also examined the impacts of an increased cost of driving per mile. The analysis suggested that mileage-based pricing that increased travel cost by 19 cents per mile could reduce VMT by 10 percent and greenhouse gas emissions by 5 percent in 2040. Nineteen cents per mile equates to a gasoline tax of over $5 per gallon for a 27 mpg vehicle, which speaks to the well-known, low price elasticity of demand for gasoline.

Research elsewhere has compared the efficacy of pricing mileage versus pricing fuels. The Center for Transportation Studies at the University of Minnesota recently published a report[127] concluding that fuel pricing is unsustainable and making a strong case for exploring "mileage based user fees," but leaving the precise nature of such fees open for further discussion. The Joint Transportation Committee of the Washington State Legislature commissioned a report,[128] delivered in January 2010, that raised similar concerns regarding the sustainability of fuel pricing, but favored increasing weight fees, tire fees and motor vehicles sales and use taxes over mileage-based pricing.

Lastly, there have been local field experiments on mileage pricing and congestion pricing here in the Northwest. For mileage pricing, the Oregon State Department of Transportation conducted a 12-month pilot program in 2006.[129] This pilot program tested a mileage fee that varied for peak and off-peak hours and made use of a GPS device and pay-at-the-pump system. This pilot mileage fee resulted in a 13.8 percent VMT reduction with a VMT fee of 10 cents per mile at peak hours ($2.75 per gallon equivalent at 27 mpg) and 0.43 cents per mile off peak ($0.12 per gallon at 27 mpg). This experiment also demonstrated the technical feasibility of the GPS recording and payment system. PSRC also conducted an experiment testing the feasibility of congestion pricing, as described in the report *Traffic Choice Study.*[130] This study used in-vehicle metering devices installed on 275 representative drivers in the Puget Sound region for 18 months and varied toll rates on selected road facilities (mostly highways and major arterials) by time of day and location. This experiment resulted in a 12 percent reduction in VMT and supported the feasibility of congestion pricing.

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[127] D D Coyle, F O Robinson, Z Zhao, L W Munnich Jr & A Z Lari, *From Fuel Taxes to Mileage-Based User Fees: Rationale, Technology, and Transitional Issues*. University of Minnesota Center for Transportation Studies, August 2011, http://www.its.umn.edu/Publications/ResearchReports/reportdetail.html?id=2048 **(R0179)**

[128] K Scanlan, *Implementing Alternative Transportation Funding Methods*. Joint Transportation Committee, Washington State Legislature, January 2010. **(S0074)**

[129] Oregon State Department of Transportation, *Oregon's Mileage Fee Concept and Road User Fee Pilot Program,* Nov 2007, http://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUFPP_finalreport.pdf?ga=t **(R0113)**

[130] Puget Sound Regional Council, *Traffic Choice Study*, Apr 2008, http://psrc.org/transportation/traffic **(R0114)**

In addition to the potential impacts of emerging pricing strategies on travel behavior, energy consumption and greenhouse gas emissions, it will also be important to examine the potential equity impacts of potential strategies well before they are implemented. The Transportation Research Board, in its *Special Report 303 - Equity of Evolving Transportation Finance Mechanisms*,[131] explores equity issues in-depth. Included in *Special Report 303* is the following recommendation for policy makers: "Public policy makers should engage all their constituents and stakeholders early and repeatedly in discussions of proposed transportation finance mechanisms. In addition, they and their staff should ensure that appropriate data, analytical results and communication strategies are used to address equity explicitly from the outset of a program or project."[132]

New Analysis

Commerce analyzed both a fixed per mile fee and ubiquitous congestion pricing where the per mile charge varies by location and time of day.

For the mileage pricing approach, Commerce adopted the analytical approach utilized in *Moving Cooler*, supplemented with a variety of local and updated information. The data incorporated in this model includes the most recent forecasts on the statewide annual light duty vehicle VMT by WSDOT,[133] EIA's fuel price forecast,[134] and in-house estimates of vehicle fuel economy that incorporate the recently announced new CAFE standards.

Although some prior analysis did not incorporate the capital and maintenance costs of vehicles into the baseline costs of driving per mile, Commerce's spreadsheet model included these costs to reflect that these costs generally increase with mileage. This approach is consistent with *Moving Cooler* and it is assumed that these costs will grow at the rate of inflation. Commerce tested mileage pricing at $0.05 per mile, $0.10 per mile and $0.15 per mile applied to all VMT statewide and estimated the changes to light duty vehicle (LDV) VMT and associated reductions in greenhouse gas emissions as summarized in Table 3-7.

rate	change to LDV VMT	change to LDV VMT	change to greenhouse gas emissions
cents/mi	*%*	*billion mi*	*million ton CO_2*
5	-3.72%	-2.203	-0.522
10	-7.44%	-4.405	-1.044
15	-11.16%	-6.608	-1.567

Table 3-7: Effects of three levels of mileage pricing on VMT and greenhouse gas emissions.

[131] Transportation Research Board, *Special Report 303 - Equity of Evolving Transportation Finance Mechanisms*, 2011, http://www.nap.edu/catalog.php?record_id=13240 **(R0178)**

[132] *ibid* p.100.

[133] Washington State Office of Financial Management, *June 2011 Transportation Revenue Forecasts, Volume 4: Alternative Forecast Tables*, Jun 2011, http://www.ofm.wa.gov/budget/info/June11transpovol4.pdf **(S0045)**

[134] Energy Information Administration, *Annual Energy Outlook 2011, Table 12: Petroleum Product Prices*, Mar 2011, http://www.eia.gov/forecasts/aeo/source_oil.cfm **(R0090)**

For the congestion pricing analysis, Commerce used the results of a study published by QuantEcon, based on PSRC modeling to create a forecast through 2035.[135] The forecast developed by Commerce applies congestion pricing to all congested roads and highways within the central Puget Sound region only. This creates a conservative forecast since pockets of congestion occur in places outside of the central Puget Sound, such as Olympia, Vancouver and Spokane. Two levels of congestion pricing were examined: a broad congestion pricing strategy where pricing is applied to all freeways and highways as well as major arterials, and a more limited congestion pricing approach that focuses only on freeways. Because congestion pricing is a long-term transportation policy, it was modeled as if beginning in 2020. Because the QuantEcon study published specific results for the year 2020 only, reductions in energy consumed and energy expenditures as well as reductions in greenhouse gas emissions were forecast out to 2035 using a scaling factor derived from a VMT forecast published by WSDOT: year 2020 was the base year and the scaling factor was the ratio of VMT in a given year divided by the VMT forecast in 2020. Over the 2012 - 2030 time frame, WSDOT forecasts VMT growth of approximately 0.7 percent per year.

Table 3-8 summarizes the possible impacts of broad and limited congestion pricing policies on energy consumption, greenhouse gas emissions and energy expenditures. Also presented are values for VMT reduction, toll revenue collected and net system benefits[136].

	comprehensive congestion pricing	**limited congestion pricing**	
VMT reduction	4.2%	2.9%	
GHG reduction	1.71	0.97	MMT/yr
reduction in energy consumption	190	110	TBtu/yr
fuel savings	704	400	million $/yr
net social benefits	1,614	1,281	million $/yr
revenue	6,110	1,926	million $/yr

Table 3-8: Projected effects from comprehensive congestion pricing and limited congestion pricing, in the central Puget Sound region. GHG means greenhouse gas.

The percentage changes estimated by the mileage-pricing model (Table 3-7) are very similar to the estimates in *Moving Cooler*. They are also roughly consistent with the estimates in PSRC's *Transportation 2040* report and the results of the field experiments discussed earlier, although these studies target specific geographical areas. Several findings from the broad based congestion price modeling done by QuantEcon deserve special note. First, the average speed on roadways was 11 percent higher when the system is priced which produced large social benefits since human and material resources are not dissipated with vehicles stuck in traffic. Second, a large share of these benefits were realized by the more efficient movement of freight. To the extent that congestion pricing can move high-value freight more quickly, it will add value for employers and increase their competitiveness and capacity for job creation. This new

[135] QuantEcon Inc, *Improving highway Efficiency and Investment Policy Through Pricing: A Challenge to the Status Quo*, Dec 2009 at http://cascadepolicy.org/news/2010/01/05/ending-highway-gridlock-in-portland/ **(R0198)**

[136] An accounting of fuel and time savings, toll costs and revenue collected.

analysis by Commerce shows that both mileage pricing and congestion pricing are effective in reducing VMT and its associated greenhouse gas emissions but that congestion pricing yields large social benefits by also reducing congestion. The jobs goal of this strategy will be better served with congestion pricing approach than a flat charge on all VMT.

Next Steps

Commerce will cooperate with WSDOT and OFM to increase the depth and precision of studies that estimate the impacts of mileage, congestion or carbon pricing proposals on the Washington economy. Particular topics to be addressed include:

- **Indirect economic impacts.** Because the emerging pricing methods treated in this section are deployed economy-wide, the impacts, positive and negative alike, would reverberate throughout the state economy. OFM stewards sophisticated economic modeling tools that will allow the state to forecast possible impacts of transportation pricing policies in non-transportation sectors.
- **Differentiating discretionary and non-discretionary users.** Transportation infrastructure hosts both non-discretionary users who have little flexibility on the routes and times they must travel (*e.g.* commercial haulers) and discretionary users who are able to choose their routes and times to adapt to road pricing schemas (*e.g.* individual non-commuting travel). Commerce will examine the financial impacts and tradeoffs associated with distinct treatment of the two user groups for different policy options.
- **Differentiating disadvantaged, urban and rural users.** Commerce will determine how to design strategies to avoid disproportionate impacts to the unique transportation needs of rural areas, and to create fair burdens on various income levels in the state.
- **Revenue recycling.** Pricing schemas generate large amounts of revenue and the net benefits of such polices depend on delivering that revenue back to road users in either cash (by lowering other taxes) or cost-beneficial investments in the transportation system. Competing uses for these revenues (including direct reimbursement to consumers) must be compared in a rational way, and appropriate revenue recycling packages designed to generate net social benefits. See Section 8.3.2 *The Effect of Energy Policy on Revenue Generation* for further discussion of this topic.

Chapter 4 – Making Buildings More Efficient

4.1 Why Building Efficiency?

These strategies are intended to complement and enhance existing efforts to implement building efficiency. They are directed exclusively at improving the efficiency of existing buildings, mostly in housing. At a time when there is high unemployment in the construction industry, efficiency projects in existing buildings can provide jobs while meeting the objectives of the Energy Strategy.

The building efficiency strategy takes advantage of recent momentum created by federal funding to create sustaining energy efficiency infrastructure. The American Recovery and Reinvestment Act directed substantial amounts of funding to building efficiency programs. As well as providing grants for efficiency upgrades, the federal funding provided resources for workforce development, the creation of new efficiency delivery organizations and the adoption of new professional standards. This strategy aims to take advantage of these developments while transitioning to a time when less federal funding will be available.

After transportation, energy use in buildings is the next largest energy consuming sector. The residential and commercial buildings sector accounts for 31 percent of energy consumption and 26 percent of energy cost in Washington.[137,138] While there is a long history of implementing energy efficiency in buildings, additional opportunity exists to reduce energy consumption cost effectively.

The Northwest Power and Conservation Council's *6th Northwest Power Plan*[139] estimates cost-effective efficiency measures have the potential to provide 85 percent of the region's load growth. Of these efficiency savings, over 65 percent are in the residential and commercial buildings sectors. A 2008 report from Lawrence Berkeley National Laboratory, *U.S. Building-Sector Energy Efficiency Potential*,[140] estimates there is good potential for cost effective energy savings for both electric and natural gas end uses. Relative to a business as usual base case, the report estimates a residential energy savings potential of 28 percent for gas and of 30 percent for electricity. For commercial buildings, the savings are higher at 35 percent for gas and 34 percent for electricity.

[137] Washington State Department of Commerce, Energy Strategy Update and 2011 Biennial Energy Report with Indicators, 2011 **(S0029)**

[138] U.S. Energy Information Administration, State Energy Data System. **(R0117)**

[139] Northwest Power and Conservation Council, *6th Northwest Power Plan, 2010.* http://www.nwcouncil.org/energy/powerplan/6/default.htm **(R0118)**

[140] Brown, R. et al, *U.S. Building-Sector Energy Efficiency Potential,* Lawrence Berkeley National Laboratory, 2008. http://enduse.lbl.gov/info/LBNL-1096E.pdf **(R0119)**

4.2 Building on Prior Work

4.2.1 Energy-Related Building Standards

Since 1977, Washington laws have included a state energy code to encourage construction of more efficient buildings. Mandatory energy code requirements were adopted on a statewide basis in 1986 for commercial buildings and in 1990 for residential buildings. Most recently modified in 2009 by the Legislature, the energy-related buildings standards ask the Washington State Building Code Council to develop future editions of the energy code that incrementally move toward achieving the 70 percent reduction in annual net energy consumption in new buildings The 2009 bill also directs Commerce to develop a strategic plan for buildings in order to support standards and requirements for commercial building energy disclosure for private and state owned buildings.

Building energy policies are included in RCW 19.27A - Energy-related building standards. For some time, this chapter has included the state energy code, which is the primary state policy for new building construction. In 2009, bill E2SSB 5854 made several additions to chapter 19.27A to further enhance the energy efficiency of buildings.

State Energy Code

Building energy codes provide minimum efficiency standards for new buildings, additions, major building renovations and replacement of building equipment. By implementing energy efficiency in buildings at the time of new construction or renovation, optimum levels of efficiency can be implemented at the lowest cost.

Between 1990 and 2009, the number of residential housing units and commercial floor area increased by more than 25 percent. It is anticipated the growth rate between now and 2030 will proceed at nearly the same pace.[141] By 2030, the Washington energy code will have influenced 50 percent of all building construction.

Washington's first energy code, adopted in 1977 by statute, was a voluntary requirement. The State Building Code Act and State Energy Code Act were passed by the Legislature in 1985. The State Building Code Act gave rulemaking authority to the Building Code Council, which oversees all building and energy codes within the state. The first statewide energy code, adopted in 1986, was applicable to all new buildings, and was based on ANSI/ASHRAE/IES Standard 90A-1980. In 1990, HB 2198 amended RCW 19.27A and increased the insulation requirements for residential buildings based on the energy source cost. Since the early 1990s, with a few exceptions, the energy code has been updated every three years on the same schedule as the adoption of other state building standards.

In 2009, the statute for energy codes was revised to provide the Building Code Council additional instruction in the pursuit of additional energy savings through code as follows:

[141] Based on building forecast prepared by the Northwest Power and Conservation Council in support of the 6th Northwest Power Plan.

> RCW 19.27A.160 Residential and nonresidential construction — Energy consumption reduction — Council report.
>
> (1) Except as provided in subsection (2) of this section, residential and nonresidential construction permitted under the 2031 state energy code must achieve a seventy percent reduction in annual net energy consumption, using the adopted 2006 Washington state energy code as a baseline.
>
> (2) The council shall adopt state energy codes from 2013 through 2031 that incrementally move towards achieving the seventy percent reduction in annual net energy consumption as specified in subsection (1) of this section. The council shall report its progress by December 31, 2012, and every three years thereafter. If the council determines economic, technological or process factors would significantly impede adoption of or compliance with this subsection, the council may defer the implementation of the proposed energy code update and shall report its findings to the legislature by December 31 of the year prior to the year in which those codes would otherwise be enacted.

Also in 2009, the Building Code Council adopted the 2009 edition of the Washington Energy Code. This edition is expected to reduce energy use in new single family homes by 18 to 26 percent.[142] For non-residential buildings, sector savings average 13 percent of total energy use compared to the 2006 Washington Energy Code.[143]

Meeting the energy reduction targets set by RCW 19.27A160 will require a continued market transformation effort. The energy efficiency market will need to continue to demonstrate new standards for buildings and equipment are acceptable to the market and they meet the challenge of providing economic value in a wide range of building types for consumers in Washington.

2011 Strategic Plan for Buildings

To support efficiency improvements in the built environment, the Legislature directed Commerce to develop a strategy for improving the energy efficiency in buildings. The details of this request are provided in RCW 19.27A150 as summarized below. The resulting plan is available on the Commerce website, 2011 Strategic Plan for Enhancing Energy Efficiency & Reducing Greenhouse Gas Emissions from Homes, Buildings, Districts & Neighborhoods.[144]

This building strategy is closely linked to the energy code improvements requested in RCW 19.27A160 described above. Commerce worked with the State Building Code Council to develop the framework for public input and prioritize the work. The legislation directs Commerce to develop a new plan every three years in anticipation of the next energy code adoption cycle. The first state building strategy focuses largely on improving buildings through energy code adoption and related enhancements. Future building strategies should provide input on a wider range of subjects related to energy use in the built environment.

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[142] Murray, C., Baylon, D., 2009 Washington State Energy Code: Analysis of Code Changes Adopted By the Washington State Building Code Council Washington State Department of Commerce, 2009. **(S0049)**

[143] Kennedy, M, Baylon, D., *Commercial Sector Savings Analysis: Proposed 2010 Washington State Energy Code*, Ecotope, Inc. 2009. **(S0050)**

[144] http://www.commerce.wa.gov/site/1325/default.aspx **(S0008)**

Strategies for existing buildings are limited in the strategic plan for buildings. As a result, a renewed effort is being applied in this Energy Strategy.

The building strategy discussion included the following subjects:

- Energy efficiency public outreach
- Measurement of achievement and targets for energy codes
- Aspirational code development
- Performance based energy codes
- Workforce training
- Financial mechanisms
- Financing – Market recognition of the value of homes constructed to the 2009 WSEC
- Identify costs and benefits
- Energy code training and enforcement
- State strategies to support research and demonstration
- District and neighborhood energy systems
- Address barriers for utilities to serve net zero energy homes and buildings
- Investigate methodologies and standards for the measurement of the amount of embodied energy used in building materials
- Outline of 2013 energy code recommendations

The building strategy recommendations most relevant to the current policy discussions are as follows:

Recommendation 2C: *Commerce will examine expanding the existing energy benchmarking regulations in RCW 19.27A.070(5) to include reporting of commercial benchmarking scores to the State Energy Office. This may result in a recommendation for modifications to the legislation in 2012.*

The energy strategy committee encouraged the expansion of the state commercial building energy disclosure, 19.27A.170, to support the development of future energy codes based on building energy performance rather than building construction elements. To establish energy benchmarks for new buildings, detailed public record of energy consumption in specific building types is needed. This is a secondary but important aspect to the commercial building disclosure modifications discussed for this strategic plan.

Recommendation 6: *Commerce will evaluate financial mechanisms that support increasing energy efficiency in existing buildings as well as new construction, in conjunction with implementation of the Energy Strategy update. This is the key strategic mechanism for improving efficiency in existing buildings.*

The building strategy committee agreed there was a need to provide additional financial incentives for building efficiency, but the list of possible financing alternatives included in the buildings strategy needed further development. Commerce has included their latest thinking on financing of energy efficiency retrofits in the Energy Strategy.

Commercial Building Energy Disclosure

In 2009, RCW 19.27A170 established requirements for privately owned non-residential building energy use disclosure. For all non-residential buildings with over 10,000 square feet of floor area, energy use must be disclosed to the prospective buyer, lessee or lender. The disclosure documentation is created by the building owner using the E.P.A.'s Energy Star *Portfolio Manager* software. As well as providing a summary of utility expenses, *Portfolio Manager* develops a building score relative to similar buildings. Large utilities are required to support this program by providing a minimum of 12 months of utility data to building owners on request.

Enhancements to this chapter are proposed later in this strategy to improve enforcement of the law and to enhance public awareness of commercial building energy use.

Home Energy Disclosure

RCW 19.27A180 asks Commerce to research and select an energy performance score for homes, and to provide input on an implementation strategy to reduce energy use in homes. The results of this research and reporting are included in the Commerce report, 2011 Home Energy Audit and Retrofit including Home Energy Scoring.[145] In this report, Commerce provides information on two new home energy scoring methods but postponed making a final recommendation until the scoring methods had more time in the market. The report also provides a proposal for implementation similar to the Home Energy Retrofit Marketing and Quality Control program proposed later in the Energy Strategy. The report summarizes the potential for energy efficiency improvements in existing housing. Commerce has further developed home energy disclosure concepts for this Energy Strategy.

State Building Energy Disclosure and Improvement

The final aspect of the State Building Efficiency standards is 19.27A190. This chapter requires all state-owned or leased buildings over 10,000 square feet to create and maintain a building benchmark using *Portfolio Manager*. For state buildings, a score below 70 requires a walkthrough energy audit. If the walkthrough audit identifies potential energy savings, an investment grade audit is to be completed, potentially leading to the installation of energy efficiency upgrades. For leased buildings, the benchmarking score will impact whether or not the space is to be leased by the state. Technical support for state agencies and a report of state building energy use is available from the Department of Enterprise Services.[146]

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[145] http://www.leg.wa.gov/documents/legislature/ReportsToTheLegislature/Home%20Energy%20Score%205854%20Sec%207%20Review%20Final_ed5aaddf-fa95-4639-b623-fb7be4da1a66.pdf **(S0026)**

[146] http://www.ga.wa.gov/energy/EnergyStar.htm

4.2.2 Appliance and Equipment Efficiency Standards

Appliance and equipment standards at both the federal and state level provide significant energy efficiency savings in buildings. These standards continue to be updated to provide additional savings as manufacturers incorporate additional efficiency capabilities into their products.

Federal efficiency standards currently cover 40 product classes for a wide range of energy using equipment and appliances. In 1987, the National Appliance Energy Conservation Act established minimum efficiency standards for many household appliances. The Energy Policy Act of 1992 and the Energy Policy Act of 2005 further expanded the list of covered products to include an increased number of consumer, commercial and industrial products. Under the law, the U.S. Department of Energy is required to review and update standards periodically. In 2006, the DOE recognized they were significantly behind schedule in the rule making process and have set an aggressive schedule to catch up. As a result, many new appliance and equipment requirements are expected to be implemented in the next three to five years.

Washington implemented appliance and equipment efficiency standards for a number of products not covered by federal standards. Washington RCW 19.260 *Energy efficiency* currently regulates 13 product classes.

States have historically led the nation in the development of new appliance standards. Federal standards were first adopted in 1988 to consolidate numerous state standards being developed, most notably by California. Manufacturers prefer to have a uniform standard nationally. Today, state adoption of standards helps conserve energy at the local level and encourages the federal government and impacted manufacturers to move toward national standards. Many of the products adopted in Washington and 11 other states in 2007 have been incorporated into the federal appliance efficiency rules.

4.2.3 Utility Conservation Requirements

Utilities in the Pacific Northwest have implemented energy conservation programs in Washington since the 1970s. It is anticipated that over the next 10 years utility expenditures on electric energy efficiency in Washington will average over $250 million per year.[147] Natural gas utilities have also been active in pursuing cost effective energy conservation.

Pacific Northwest Electric Power Planning and Conservation Act, 1980, established the Pacific Northwest Electric Power and Conservation Planning Council and directs the Council to adopt a regional energy conservation and electric power plan. The act also sets forth provisions the Bonneville Power Administration must follow in selling power, acquiring resources, implementing energy conservation measures and setting rates for the sale and disposition of electric energy. This act set the stage for energy conservation efforts in the Pacific Northwest, particularly for utilities served by the Bonneville Power Administration.

[147] Northwest Power and Conservation Council, 6th Plan Conservation Target Calculator, http://www.nwcouncil.org/energy/powerplan/6/supplycurves/I937/default.htm **(R0121)**

For investor-owned electric and natural gas utilities regulated by the Washington State Utility and Transportation Commission, rules have been developed requiring utilities to create the least cost mix of resources, including conservation. The following rules have been adopted by the Commission.

> WAC 480-100-238(1) ("Each electric utility regulated by the commission has the responsibility to meet its system demand with a least-cost mix of energy supply resources and conservation.");
>
> WAC 480-90-238(1) ("Each natural gas utility regulated by the commission has the responsibility to meet system demand with the least-cost mix of natural gas supply and conservation.").

Washington's Initiative 937, the Energy Independence Act passed by voters in November 2006, requires the state's electric utilities with more than 25,000 customers to acquire all cost-effective energy conservation resources in their service territories beginning in 2010. Every two years, beginning in 2010, each major electric utility is required to prepare a 10-year conservation plan and set biennial conservation targets. This impacts the state's 17 largest electric utilities who serve approximately 88 percent of the electric loads in the state. This law requires both public and investor owned utilities to plan for and acquire all cost-effective electric conservation. The law includes a financial penalty for non-compliance. While many electric utilities in the state already had active energy conservation programs, this law assures continued utility activity across the state.

4.2.4 Low-Income Housing Efficiency Programs

Low-income weatherization services have been provided in Washington since 1977. Commerce contracts statewide with 26 local agencies to do weatherization work. A fact sheet[148] developed by Commerce summarizes the funding sources for weatherization as follows:

- 2009 DOE funding: $7.2 million
- 2009 Department of Health and Human Services (LIHEAP) funding: $16.1 million
- 2010 Bonneville Power Administration funding: $2.3 million
- 2009-2011 Biennium Capital Budget Energy Matchmaker funding: $3 million
- A total of $59.5 million in 2009 American Recovery and Reinvestment Act (ARRA) funding will help weatherize an estimated 7,000 homes statewide and create hundreds of jobs through June 2011.

A recent evaluation by Washington State University[149] of the low-income weatherization program developed for Commerce provides the following summary of 2010 weatherization efforts:

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[148] Additional Information on the Commerce Weatherization program is available at http://www.commerce.wa.gov/ **(S0053)**

[149] Kunkle, R, Schueler, V. *Washington State Low-Income Weatherization Program Evaluation Report For FY2010 Final Report May 2011*, Washington State University Extension Energy Program. **(S0054)**

- Total weatherization program expenditures in FY2010 were $42 million. This is more than twice historical annual expenditures. ARRA funds accounted for more than half of program expenditures. Expenditures for all the other funding sources declined in FY2010.
- In FY2010, Washington's low-income weatherization program installed weatherization measures estimated to save weatherized households $1.4 million per year in energy costs, which is $189 per housing unit. These energy savings will accrue each year during the lifetime of the energy measures.

4.3 Buildings Efficiency Policy Package

The building efficiency policy package has been developed to increase the implementation of building efficiency measures. All of the policy options are suggested as near-term policy options. This reflects the desire to sustain momentum of efficiency programs funded through the Recovery Act and continue to create employment in the building efficiency retrofit market.

Performance and transparency policy proposals will help increase demand for energy efficiency improvements and provide supporting infrastructure for implementation. For both residential and commercial occupancies, universal disclosure of building energy use will help create demand for efficiency improvements. To help consumers identify qualified efficiency contractors, a proposed program to provide uniform standards, a quality assurance program and marketing with statewide reach has been included.

Funding and financing proposals would increase funding for energy efficiency improvements. First, a utility bill based funding design allowing cost and benefits to be shared by current and future building owners is recommended. Second, a proposal to provide real estate excise tax relief to contractors who buy distressed housing and make energy efficiency improvements prior to resale.

Low income and rental housing proposals would provide for low-income weatherization and set minimum efficiency standards for rental housing.

	performance and transparency	funding and financing	low income and rental housing
4.4 near-term recommendations These are mature policy concepts, or pilot projects to test newer policy concepts	4.4.1 non-residential disclosure 4.4.2 residential disclosure 4.4.3 marketing and quality assurance	4.4.4 meter-based financing 4.4.5 energy efficient property conversions	4.4.6 minimum standards for rental housing 4.4.7 sustaining investment in low-income weatherization programs 4.4.8 prevailing wage class for weatherization
long-term policy option		6 carbon pricing	

Table 4-1: Menu of buildings efficiency policy options.

The long-term carbon pricing option is an economy-wide approach to energy system management that affects building efficiency as well; it is discussed separately in 3.5.7.

4.4 Near-Term Recommendations

4.4.1 Non-Residential Disclosure

Policy Description

This policy recommendation modifies Washington's Commercial Building Energy Disclosure law to be consistent with more detailed regulation developed by the city of Seattle. This will enhance the transfer of energy information between utility customers, building owners, tenants and state government.

Disclosure laws require building owners to provide information on building energy use to potential tenants, investors and lenders prior to the completion of a real estate transaction. This provides information allowing the participants to assign a value to building efficiency. Disclosure of building energy use intensity and cost creates market differentiation that can drive building owners to implement building energy efficiency upgrades. Energy disclosure methods also provide feedback to building operators and tenants resulting in operational changes that reduce energy consumption.

In 2009, RCW 19.27A.170[150] established requirements for non-residential building energy use disclosure. This was followed by the development of a more comprehensive disclosure

[150] RCW 19.27A.170 http://apps.leg.wa.gov/rcw/default.aspx?cite=19.27A.170

ordinance in the City of Seattle, CB 116731.[151] For this proposal, it is recommended that Washington develop modifications to the existing state law that are consistent with the city of Seattle ordinance.[152] The city ordinance includes a number of enhancements to the state law that are the basis for this policy recommendation:

- Implementation of the law is assigned to a specific city department. The department is required to develop rules and has enforcement authority including the ability to levy fines;
- Annual submission of *Portfolio Manager* reports to the city is required. This allows the city to check for compliance and provide aggregated reporting of the results;
- *Portfolio Manager* reports are to be provided to existing tenants; and
- Tenants must provide building owners with data required to complete *Portfolio Manager* documentation. This requires the tenant to provide information on the number of people occupying the space and data on energy using devices, such as the number of computers.

In addition, the city ordinance includes a requirement that *Portfolio Manager* disclosure documentation be prepared for multi-family buildings. The city of Seattle ordinance enhances the existing state law and addresses the following problem areas in the existing state law:

- Many commercial building owners do not have easy access to their buildings' utility billing data. Leased spaces are frequently served by individual utility meters that are paid by the tenant. The utility will not provide the data to the building owner without permission of the tenant. This creates a barrier to implementation of energy use disclosure and to good building energy management.
- The benefits of automated energy data sharing have not been realized. *Portfolio Manager* is designed to accept automatic updates of utility billing data. Utility customers can request that their utilities import energy data directly into *Portfolio Manager* on their behalf, and view and track energy performance ratings in their *Portfolio Manager* account. This saves their customers the time spent manually inputting energy data into *Portfolio Manager*. Not all Washington utilities have been responsive to requests for automated utility data transfers.
- The current Washington rules do not enhance the use of *Portfolio Manager* as an energy management tool. *Portfolio Manager* has been adopted by Washington to provide consistent reporting of energy use for disclosure at the time of sale, lease or to support lending. *Portfolio Manager* is also designed as an energy management tool. Building managers and tenants can benefit from ongoing feedback and evaluation provided by *Portfolio Manager*.
- Washington does not monitor compliance with the existing commercial building disclosure law. There are no penalties assigned for non-compliance.

This proposal recommends the following modifications to the current state law to assure the potential for this policy is realized:

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[151] Seattle City Ordinance, CB116731, http://clerk.ci.seattle.wa.us/~scripts/nph-brs.exe?s1=&s3=116731&s4=&s2=&s5=&Sect4=AND&l=20&Sect2=THESON&Sect3=PLURON&Sect5=CBORY&Sect6=HITOFF&d=ORDF&p=1&u=%2F%7Epublic%2Fcbory.htm&r=1&f=G **(R0199)**

[152] City of Seattle, Building Energy Benchmarking and Reporting, http://www.seattle.gov/dpd/GreenBuilding/OurProgram/EnergyBenchmarkingDisclosure/Overview/ **(R0123)**

- Create more specific requirements for electronic reporting of billing data by utilities to assure automation of data transfer;
- Create enhancements that support owners in the development of disclosure documentation;
- Develop requirements for the tenant to participate in the development of documentation;
- Require energy disclosure to existing occupants;
- Require disclosure documentation to be maintained on an ongoing basis;
- Require ongoing annual reporting to an assigned state organization;
- Make the information on building energy use broadly available to enable consumers to independently identify buildings with low energy use;
- Consider adding and/or subtracting from the building occupancies impacted by the law; and
- Assign a lead agency for the development of detailed technical rules, enforcement and as a coordinator of technical support. This will require initial funding for rulemaking and a method to collect fees for ongoing program support.

Previous Research and Experience

Commercial building energy disclosure is required by California as well as the cities of Austin, New York, San Francisco and Washington, D.C.[153] While there are some differences in these laws, the main features of the approach are fairly consistent with the Seattle law.

Market premiums for energy efficient commercial buildings have been documented in several reports. Using the *Portfolio Manager* tool, buildings with good energy performance are identified as "Energy Star" labeled buildings. These buildings have been noted to bring higher rents and a price advantage at time of sale. Rental rates of Energy Star labeled buildings are documented as being 3.3 to 15.5 percent greater than non-labeled buildings. Sales price premiums range from less than 1 percent to 31 percent greater than the general population of commercial buildings.[154]

New Analysis

The following analysis provides a description of the labor required to complete the required disclosure documentation using *Portfolio Manager*. There are two significant functions required to create a *Portfolio Manager* report. First, to create the *Portfolio Manager* account, the building owner is required to input some information about the building type, floor area, number of occupants and a few details about special energy intense components such as number of computers or whether there is a commercial kitchen. The next step is to input annual utility data made available by the utility. This is done by hand or by authorizing the utility to update the data

[153] Institute for Market Transformation, U.S. Commercial Benchmarking Policy Comparison Matrix http://www.buildingrating.org/sites/default/files/documents/Commercial_Benchmarking_Policy_Matrix.pdf **(R0124)**

[154] Institute for Market Transformation, Rating and Disclosing the Energy Performance of Buildings: A Market-Based Solution to Unlock Commercial Energy Efficiency Opportunities. *http://www.imt.org/files/FileUpload/files/Benchmark/IMT_Rating_Policy_White_Paper.pdf* **(R0125)**

directly to the *Portfolio Manager* server. For owner occupied buildings who typically have the data for their buildings, this will typically take 15 to 35 minutes. To maintain a *Portfolio Manager* file, updating the utility data as it is issued by the utility will take another five to seven minutes per billing period, less if done automatically by the utility.[155] In addition, there must be an assumption that it will take some time for users to orientate themselves to the web and program environment prior to data gathering and input.

The process is more complex for large commercial buildings with multiple tenants served by multiple utility meters. Tenants must provide the building owner with occupancy data and provide a release authorizing the utility to provide meter data to the building owner. Utilities are required by the law to aggregate the utility meter data into a single report, allowing them to report the energy use without disclosing tenant specific data.

To maintain ongoing *Portfolio Manager* scores, it is desirable for the utility to automatically upload billing data to the server. This is not consistently implemented by the utilities. In many cases, the building owner must enter the data provided by the utility. This increases the building owner's cost of maintaining the account.

There is a cost to the utility. The utility must develop a method for electronic transfer of utility data to the server. This is carried out by exporting customer utility information using the *Portfolio Manager* Automated Benchmarking System, a free web service.

Implementation

- Develop an implementation plan, including ongoing funding plan;
- Develop legislation, including initial funding authorization request; and
- Identify a lead agency for the development of rules and enforcement.

4.4.2 Residential Disclosure

Policy Description

This policy proposes annual energy use summaries be provided to all residential utility customers. At time of sale or when a property is offered for rent, the annual energy use summary would be disclosed to prospective buyers or renters. For sellers who want to demonstrate recent improvements in housing, a home energy audit can supplement the energy bill disclosure. The following outline provides detail:

1. All housing units: An annual energy report is provided to all consumers statewide by the serving gas or electric utility. The annual energy report includes energy use and costs. The reporting format is made consistent statewide to facilitate report comparisons.
2. Housing for sale or rent: The most recent annual energy report is to be disclosed to prospective buyers or renters.

[155] Information provided by Larry Covey, Washington State University Extension Energy Program. Mr. Covey is currently providing PM ratings for state buildings.

3. For existing homes that do not have a billing history or that would like to demonstrate home energy improvements: Provide a uniform state standard for disclosure using a detailed home energy audit.

It is intended that a mandatory annual energy report be limited to energy use and cost and some limited supporting information. Supporting information would include a statement of intent and a simple statement directing the customer to energy saving resources and recommendations. The uniform format proposed would deliver the documentation to the user with limited modifications to the existing utility billing process.

Utilities should be encouraged to provide additional information that enhances the annual energy bill. While it is recommended that state requirements are simple, enhancements that provide additional context and direction should be encouraged. Information that provides comparisons to other customers or energy use based on size of home or weather conditions is recommended but not required.

Disclosure requirements will need to be detailed further. This includes the sharing of utility billing data between renters and owners, the timing of disclosure statements, requirements for disclosure of non-utility energy use and disclosure of reporting by listing services.

Adoption of a uniform comprehensive energy audit that provides an estimate of annual energy use and a detailed description of efficiency features of the home may be used as enhancement to energy bill disclosure. This may be required if utility data is not available. Exceptions for relatively new homes should be considered.

Previous Research and Experience

A comprehensive energy audit tells the property owner how to improve energy efficiency. Comprehensive energy audits are most appropriate when the property owner is ready to make improvements and, at that time, the energy audit cost can be offset with the energy cost savings of those improvements. Disclosure using utility billing data represents a lower cost method of drawing attention to energy performance and encouraging current and prospective owners to invest in energy efficiency.

Commerce completed a report, *Home Energy Audit and Retrofit Including Home Energy Scoring.*[156] This report was developed in response to the legislative request detailed in RCW 19.27A.180. In this report, Commerce recommends further examination of two recently developed home energy scoring methods. In addition, the report examines needed supporting program infrastructure. Cost of different energy audit protocols was examined as well as the cost of developing supporting infrastructure.

A number of methods for disclosing residential building efficiency have been demonstrated. This includes disclosure of an energy inspection checklist, ratings based on a detailed audit and energy bill disclosure. The two methods based on inspection or audits are called asset ratings

[156] WA Dept. of Commerce, *Home Energy Audit and Retrofit Including Home Energy Scoring* January 2011 http://www.leg.wa.gov/documents/legislature/ReportsToTheLegislature/Home%20Energy%20Score%205854%20Sec%207%20Review%20Final_ed5aaddf-fa95-4639-b623-fb7be4da1a66.pdf **(S0026)**

because a description of the building components are the primary data set. Disclosure based on energy bills is called an operational rating.

New York's Truth in Heating Law was established in 1981 to afford potential real estate purchasers and renters a right to receive the past two years utility, or fuel bills, for any property they are considering purchasing or renting.

In the early 1990s, efforts by the DOE encouraged the development of home energy rating systems to support energy efficient lending. During this time, Washington organized public meetings around the subject and prepared a business plan for the creation of a home energy rating system.[157] The business plan development included funding from several sources. The plan includes analysis of the potential energy efficient loan participants and builds a program budget for a non-profit organization to implement the program. Utilities, contractors, realtors and lenders were anticipated to sponsor the program until receipts from home energy rating fees could support it. The program costs were anticipated to be $500,000 per year (1993) for the first five years. Sponsors for the nonprofit organization did not materialize and, as a result, the program was not initiated.

Pilot projects demonstrating the use of home energy rating systems in support of energy efficient mortgages were implemented in several states in the 1990s, including Alaska, Arkansas, California, Vermont and Virginia. Each state was funded by the DOE to establish and lead a Home Energy Rating System provider organization from 1993 to 1998. Colorado and Mississippi joined the pilot program in 1996. These pilots resulted in 63,000 ratings and 8,500 energy efficient mortgages. In 1998, the final pilot year, the programs completed 13,037 home energy ratings at a program cost of $4,097,845. Of this, $1,112,811 was provided by the rating providers or homeowner participants. The balance was state, federal or utility funding.[158]

New Analysis

A number of studies have documented reduced energy use through enhanced energy billing information campaigns that provide consumers with information on home energy use compared to similar homes in their neighborhood. Consumer response to the enhanced billing information reduces energy use by up to 3 percent. These programs provide cost-effective savings.[159] They are most productive when targeted at high energy users and can be delivered at a cost of approximately $10 per customer per year.[160] It should be noted that these programs provide enhanced information that is beyond the scope of the minimum requirements of this proposal and likely cost more to implement.

Residential energy audits have demonstrated good success when initiated by the building owner. Reporting from recent home energy retrofit programs has demonstrated a 50 percent

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[157] Lineham, T. J. *Home Energy Rating System Business Plan Feasibility Study In Washington State*, Washington State Energy Office, 1995 **(S0055)**

[158] Farhar, Barbara C., Pilot States Program Report: Home Energy Rating Systems and Energy-Efficient Mortgages, National Renewable Energy Laboratory, April 2000 **(R0126)**

[159] Navigant Consulting, Evaluation Report: Opower SMUD Pilot Year2, 2011 http://opower.com/uploads/library/file/6/opower_smud_yr2_eval_report_-_final-1.pdf **(R0127)**

[160] Meeting discussion, 10/20/11, Puget Sound Energy, Conservation Resource Advisory Group.

efficiency upgrade adoption rate immediately following an energy audit. Adoption of more than one efficiency measure is common. It is anticipated that additional measures will be adopted in the future. It is recommended that homeowners have a financial investment in the audit. While utility and government programs may provide much of the energy audit funding, most programs require some financial commitment from the owner. This assures the owner is interested in the energy audit process and in implementation of efficiency upgrades. To control program costs of home energy audits and retrofits, prescreening is recommended. This includes identifying high energy use homes through energy bills and separating the curious from the serious by charging a fee for home energy audits.[161]

Commerce has not recommended detailed home energy audits for all homes as a sale or rental disclosure requirement because of past program performance and costs. The following details both cost and previous program outcomes related to home energy audits that are broadly adopted at time of sale or lending.

Energy use disclosure at time of sale or use considers the number of homes sold or rented each year and the cost to develop reporting. This detail underscores the high cost of broad adoption of building assets rating programs. Additional analysis of a billing based or operational rating will be developed for the final Energy Strategy.

- From 1996 to 2007, annual existing single family home sales ranged from 84,570 to 159,600 of an estimated 1,903,482 (2010) single family housing units.[162]
- A comprehensive home energy audit and score cost from $400 to $600 per home.[163]
- Twenty-five percent of existing homes were constructed since the introduction of the 1990 State Energy Code and could reasonably be exempt from a home energy audit and score.
- For example statewide annual cost for home energy audit and score at time of sale: 95,000 audits X $500 = $47,500,000.

For single family rental properties, the tenant turnover rate is just above 50 percent every two years. After the first two years of occupancy, the turnover rate drops to 16 percent or lower.[164]

Washington single family detached residences for rent are estimated to be 16 percent of the total single family detached residences[165] or 304,500 units, 75 percent of these constructed prior to 1990, or 228,375 units. Of these, approximately 50 percent, or 114,187, would be required to disclose energy audit scores in the first two years of the requirement. This would decrease significantly in future years. Total cost for the first two years of the disclose program:

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[161] Fuller, M.et al, *Driving Demand for Home Energy Improvements*, Lawrence Berkeley Laboratory, 2010 http://drivingdemand.lbl.gov/ **(R0131)**

[162] Washington Center for Real Estate Research, http://www.wcrer.wsu.edu/WSHM/WSHM.html **(S0057)**

[163] WA Dept. of Commerce, *Home Energy Audit and Retrofit Including Home Energy Scoring* January 2011 **(S0026)**

[164] U.S. Census Bureau, *Property Owners and Mangers Survey, Single Family Properties, Length of current rental Stay* **(R0128)**

[165] Based on U.S. Census Bureau, 2009 American Housing Survey, Seattle Metropolitan Area Detailed Table 1. http://www.census.gov/hhes/www/housing/ahs/2009Seattle/seattle09.html **(R0129)**

- For rental properties statewide home energy audits at prior to lease: 114,000 X $500 = $57,093,750 first two years.

The cost associated with providing an annual energy bill has not been developed, but should be much less than requiring audits at sale. Commerce will consult with utilities to arrive at this cost and the cost of possible enhancements.

Implementation

- Develop supporting documentation for the annual home energy bills concept. This includes detailed cost estimates, a benefits statement and implementation strategy;
- Provide opportunities to limit impacts on sellers, landlords and utilities by seeking input on best implementation methods while accomplishing primary recommendations;
- Create model legislation for disclosure of home energy reports based on utility billing; and
- Examine obstacles to disclosure of tenant utility bills by building owners and propose remedies.

4.4.3 Marketing and Quality Assurance

Policy Description

Marketing is an essential element for increasing adoption of energy efficient practices in the residential sector. The Pacific Northwest utilities have a long history of developing cooperative efficiency programs that include program specifications, training for contractors, quality assurance and marketing. It has been some time since this approach was broadly implemented for home energy retrofits. This proposal recommends bringing this type of comprehensive effort to a statewide program.

To help consumers identify qualified home efficiency contractors, the proposed program provides uniform standards, a quality assurance program and marketing with statewide reach. The program would be designed to support energy efficiency for all fuel types.

There are many different home energy efficiency programs and green remodeling programs in Washington. Each operates under their own program design. This program would serve to provide a unifying marketing and quality assurance program that increases consumer confidence in these programs. This will benefit consumer, existing efficiency programs and participating contractors.

To implement this program it is recommended that a lead administrative organization be designated to coordinate the home energy retrofit program. The program shall organize around a single brand and provide services to build confidence amongst consumers and the energy efficiency funding community that retrofit work will be completed in a quality manner and produce the expected energy savings, health and comfort benefits. Program elements include:

- Uniform marketing and branding strategy

- A consumer coaching program to carry the consumer through the multi-step retrofit process
- Certifications for workforce and industry participants
- Support for contractor business development
- Links to financing and incentives
- Providing a quality assurance backstop
  - Customer feedback mechanism
  - Conflict resolution mechanism

Likely partners are contractors, labor, utilities, weatherization organizations, local government and other interested organizations.

State government could serve as a catalyst for this program. This will require some allocation of government funding. However, it is anticipated that the bulk of funding for this type of program will be the program participants such as utilities and participating contractors, perhaps through a "checkoff" mechanism similar to that used for marketing of agricultural commodities.

Previous Research and Experience

A detailed discussion of the creation of Home Energy Retrofit Marketing and Quality Assurance Program is included in the Commerce report *Home Energy Audit and Retrofit Including Home Energy Scoring January 2011*. This report supports this concept as a needed supporting element to any home energy disclosure regulations.

A number of successful energy efficiency branding programs have demonstrated the effectiveness of collaborative marketing around consistent efficiency standards. This includes “Super Good Cents,” “Energy Star” and “Washwise.”

Two reports developed on the national level support the concept. *Roadmap for the Home Energy Upgrade Market*[166] by the SEE Action workgroup and *Driving Demand for Home Energy Improvements* Lawrence Berkeley Laboratory,[167] encourage comprehensive marketing, recognition of contractor role in encouraging efficiency sales and supporting quality assurance programs.

This concept is supported by the national *Home Performance with Energy Star* Program. The *Introductory Fact Sheet*[168] and program *Sponsor Guide*[169] provide good supporting information, a sample implementation plan and supporting marketing materials.

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[166] The Residential Building Retrofits Working Group *Roadmap for the Home Energy Upgrade Market, State and Local energy Efficiency Action Network* June 2011. http://www1.eere.energy.gov/seeaction/residential_retrofits.html **(R0130)**

[167] Fuller, M.et al, *Driving Demand for Home Energy Improvements*, Lawrence Berkeley Laboratory, 2010 http://drivingdemand.lbl.gov/ **(R0131)**

[168] http://www.energystar.gov/ia/home_improvement/HPwES_Utility_Intro_FactSheet.pdf **(R0132)**

[169] http://www.energystar.gov/ia/home_improvement/downloads/HPwES_Sponsor_Guide.pdf **(R0133)**

The program would adopt a uniform conservation implementation standard. Standards for energy conservation work are well developed in the region and nationally. This includes the Bonneville Power Administration Energy Efficiency Implementation Manual, program designs of state utilities and the DOE's Workforce Guidelines for Home Energy Upgrades.[170]

Implementation

- Identify contractors, labor, utilities, local government and others interested in developing a cooperative marketing and quality assurance program for residential energy efficiency retrofits
- Develop design for lead administrative organization
- Develop detailed implementation plan, including startup and ongoing budgets
- Examine the need for legislation to designate a lead administrative organization or streamline program contracting

4.4.4 Meter-Based Financing

Policy Description

Meter-based financing of energy efficiency retrofits enables customers to obtain investment capital and repay that investment as a charge for their utility services. Linking repayment to the utility service makes it easier to spread the investment cost among all who will reap the energy cost savings. A meter-based financing mechanism would enable everyone who benefits from an energy efficiency retrofit project to contribute to the repayment of that project's costs. The beneficiaries are the current and future occupants of the house or business, who benefit through improved energy performance and lower energy costs.

By contrast, conventional loan-based mechanisms recover all investment costs from the initial property owner, who usually receives only a portion of the future benefits. This discourages both borrowers and lenders from making the investment. The weakness of conventional loan programs is illustrated in several credit enhancement programs that offer conventional loans supported with federal recovery funds. Despite substantial support with public funds, the programs have sparked only modest interest among utility customers. It sometimes seems irrational for a property owner to turn down an upgrade project that might yield a return on investment of 10-15 percent. However, long-term paybacks may have little value to the owner who expects to sell within a few years. For example, a residential efficiency project might require an initial investment of $5,000 and yield annual cost savings of $600 per year. Despite the 12 percent long-term return, a homeowner using conventional financing who sold the property after five years would suffer a significant loss. Likewise, the owner of a rental property would be unwilling to invest in an energy retrofit if most or all of the cost savings accrue to future tenants through their utility bills.

[170] Workforce Guidelines for Home Energy Upgrades, National Renewable Energy Laboratory, U.S. Department of Energy **(R0134)**

From the investor's perspective, a meter-based approach provides a level of security that is difficult to obtain through conventional financing. A conventional loan is secured by the value of the property or by the borrower's personal creditworthiness. A loan secured by a mortgage is expensive to originate and requires that the owner have positive equity. Unsecured (signature) loans are based on the creditworthiness of the initial borrower and usually require a shorter repayment period than the life of the energy savings. By contrast, a meter-based financing mechanism could secure investor capital even if the owner defaults on his mortgage or declares bankruptcy.

Under the meter-based approach, the program would provide the initial investment funding for an energy efficiency retrofit project. The investment capital would likely not be supplied by the utility itself and could be funded from the same sources that supply conventional loan programs. Customers who opt into the program would pay a tariffed energy efficiency service charge that recovers, with interest, the program investment over the useful life of the efficiency upgrades. Depending on the cost of investment capital, the initial energy service charge would likely be about $7 per month for each $1,000 of investment. In the example discussed above, the customer receiving a $5,000 efficiency retrofit would pay an energy service charge of $35 per month. Since his energy costs decrease by $50, the upgrade has no net cost to the customer and reduces his monthly energy cost by $15.

This approach has some similarities to the "green power" or "carbon offset" programs offered by increasing numbers of public utilities, in that it lets customers select an alternative resource without having to finance the investment on their own. In green power programs, customers who wish to reduce their use of conventional fossil fuel energy may opt into a green tariff. The customer pays an extra charge for this service, and the utility uses these funds to acquire alternative power or carbon offsets. The meter-based efficiency mechanism would provide customers with a similar payment mechanism and a way to use their own homes to achieve environmental objectives.

Utilities and utility regulators may find the meter-based approach attractive because it improves the alignment of costs and benefits associated with energy efficiency programs. Utilities currently fund efficiency programs through the rates of all customers, including those customers who have not received upgrades or who paid for their own efficiency measures (such as some industrial customers and customers who own new homes). Some utilities also offer low-interest loans, which require their own investment capital. Meter-based financing would allow utilities to recover more of the cost directly from the customers who experience the energy cost savings of those upgrades and thereby reduce the financial tension between participants and non-participants. As with other efficiency programs, the terms of the meter-based program would require regulatory approval for investor-owned utilities.

Issues to resolve in developing meter-based mechanisms include:

- **The best sources of investment funds to finance efficiency retrofit projects**. An effective mechanism could require $500 million of capital statewide. These funds would probably not be supplied by utility investors. For example, Seattle City Light provides on-bill repayment for the Community Power Works program, but it does not supply the investment capital itself. A meter-based approach could be used to secure investment capital supplied

by banks, other non-utility investors or the state through a bond program such as the state Housing Finance Commission.

- **Disclosure to subsequent customers**. When a customer opts for meter-based financing, any subsequent owner or tenant will share responsibility for repayment through an energy services charge. While this charge would be offset by energy cost savings, it should be disclosed to the new customer. Existing disclosure mechanisms, including tariff disclosure requirements and recording of notice with county auditors, may prove sufficient.
- **Implementation by utilities**. A meter-based approach, involving a tariff for energy services, would represent a new business process for electric and natural gas utilities and would require implementation of new business processes.[171]
- **Utility management of energy efficiency resources**. In making it easier for customers to finance energy retrofit projects, a meter-based approach may reduce a utility's ability to manage the pace at which energy efficiency resources are acquired.[172] Any meter-based mechanism may require provisions to enable the utility to maintain a stable level of conservation activity over time.

Previous Research and Experience

Approximately 25 municipal and investor-owned utilities in Kansas offer meter-based efficiency retrofit programs. The investment capital is provided by a state revolving loan fund, using $34 million of federal stimulus funds. The program funds projects in owner-occupied and renter-occupied properties, as well as commercial properties, and there is no credit screening of customers. Project costs are repaid over a term of up to 15 years, at a financing cost of 4 percent.[173] The Kansas program is modeled on a program called Pay as You Save (PAYS) that originated in New England.

New York state enacted legislation in August 2011 that creates an on-bill financing program with capital supplied by the New York State Energy Research and Development Authority using federal funds. Implementation is expected in 2012.[174]

Energy utilities in Portland and Seattle have implemented on-bill financing mechanisms in which Enterprise Cascadia, a community development financial institution, is the lender. Investment capital is supported by federal funds. Loans made through the programs are repaid on the customer's bill, but they remain conventional loans and do not rely on a tariff to enforce payment.

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[171] In their comments on the draft strategy, Avista and PacifiCorp noted that the meter-based approach could require changes to utility billing systems.

[172] In its comments on the draft strategy, Snohomish Public Utility District raised the concern that the customer response to a meter-based financing offering could disrupt a utility's ability to meet biennial targets adopted in compliance with Initiative 937.

[173] Efficiency Kansas Program Manual, version 4, Aug. 27, 2010. http://www.efficiencykansas.com/document.fetcher.php?document_id=15 **(R0139)**

[174] http://online.wsj.com/article/APb622e2623a644c5bbd5f61ee8f512d28.html **(R0135)**

In 1993, the Legislature enacted a statute[175] authorizing investor-owned utilities to use utility tariffs to finance energy efficiency improvements. The law includes a provision that cost responsibility would transfer to successive users of the property receiving the improvement. The law provides for notification of subsequent property owners by recording the obligation with the county auditor or recording officer. [176,177,178,179]

New Analysis

All of the residential energy efficiency policies included in the Energy Strategy aim to increase market penetration of energy efficiency retrofits. This includes insulation, air sealing, duct sealing and equipment upgrades. The impact of consumer engagement and additional access to funding is expected to increase the market penetration rates for homes from the current penetration rate of less than 0.5 percent to a greater rate noted in the analysis results. To reach the higher penetration rates it is anticipated that multiple strategies will need to be in place.

Implementation

- Identify and develop potential sources of investment capital, including the Washington State Housing Finance Commission, to fund meter-based retrofit projects.
- Work with private and public utilities to develop a meter-based financing approach, addressing stakeholder concerns.
- Test customer acceptance using one or more pilot projects.

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[175] RCW 80.28.065 Tariff schedule — Energy conservation — Payment by successive property owners — Notice — Rules.
(1) Upon request by an electrical or gas company, the commission may approve a tariff schedule that contains rates or charges for energy conservation measures, services, or payments provided to individual property owners or customers. The tariff schedule shall require the electrical or gas company to enter into an agreement with the property owner or customer receiving services at the time the conservation measures, services or payments are initially provided. The tariff schedule may allow for the payment of the rates or charges over a period of time and for the application of the payment obligation to successive property owners or customers at the premises where the conservation measures or services were installed or performed or with respect to which the conservation payments were made.
(2) The electrical or gas company shall record a notice of a payment obligation, containing a legal description, resulting from an agreement under this section with the county auditor or recording officer as provided in RCW 65.04.030.
(3) The commission may prescribe by rule other methods by which an electrical or gas company shall notify property owners or customers of any such payment obligation.

[176] Merrian Fuller, *Enabling Investments in Energy Efficiency: A study of energy efficiency* programs that reduce first-cost barriers in the residential sector, May 21, 2009, http://www.sefalliance.org/fileadmin/media/sefalliance/docs/Resources/UC_Berkeley_EE_loan_programs.pdf **(R0137)**

[177] Matthew Brown, Alliance to Save Energy, Paying for Energy Upgrades Through Utility Bills, Brief No. 3, State Energy Efficiency Policies: Options and Lessons Learned, 2009, http://ase.org/resources/brief-3-paying-energy-efficiency-upgrades-through-utility-bills **(R0138)**

[178] Uyen Le, Massachusetts Institute of Technology Community Innovators Lab, On-Bill Repayment: Understanding and Advocating for an On-Bill Repayment System, January 26, 2010. http://web.mit.edu/colab/resources/ **(R0140)**

[179] Devashree Saha, et al., NGA Center for Best Practices, State Clean Energy Financing Guidebook, January 2011, http://www.nga.org/files/live/sites/NGA/files/pdf/1101CLEANENERGYFINANCING.PDF **(R0141)**

4.4.5 Energy Efficient Property Conversions

Policy Description

The housing crisis has left the state with a large stock of houses that are virtual orphans, subject to foreclosure and owned by lenders. Many are unoccupied and in poor condition. The financial crisis has left the state with many unemployed construction workers. A program to improve the housing stock and employ these workers would reap economic benefits to this state, and the benefits would be even greater if the upgrades took full advantage of the potential to increase energy efficiency.

Some individual homebuyers will see an opportunity in the pool of distressed properties, purchase a house, obtain bank financing for the purchase and improvements, employ contractors to make the improvements, and then move in. However, this takes a level of patience, skill and risk tolerance beyond the typical homebuyer. A more promising strategy is one in which developers make a business of converting properties from distressed to sale ready.

One example is Green Canopy Homes in Seattle.[180] This firm purchases homes in need of repairs and in some cases undervalued due to being bank or estate sales. After purchase, Green Canopy contracts with the Seattle-based company Ecofab to conduct an energy assessment and register a baseline energy performance score. The company serves as the general contractor on each project, hiring subcontractors as needed. The upgrade focuses on repairs, curb appeal and new appliances, with under 3 percent of the budget going to energy efficiency measures. These measures have a significant effect on energy performance, however, enough to reduce the house's carbon footprint by 12,000 pounds per year and its energy costs by an estimated $1,200 per year.[181]

Energy efficient property conversions benefit the public in multiple ways and should be strongly encouraged. They improve neighborhoods by removing vacant or dilapidated properties and by increasing the availability of quality properties. They increase employment in a distressed business sector, through both direct employment of contractors and laborers and the production of building materials. These activities also boost state and local collections of sales and real estate taxes.

Public policy should not just encourage property conversions but also those developers who will make energy efficiency upgrades. If conversions are limited to cosmetic items – new carpet and a coat of paint –the opportunity is missed to make cost-effective improvements in energy efficiency. These deeper retrofit measures are much easier to accomplish while the house is vacant and other work is also being done.

Policy makers should consider multiple approaches to encourage energy efficient property conversions. One such possibility is to address the tax burden that applies to developer driven conversions and would not apply when the improvements are made by owner-occupants. This

[180] http://greencanopyhomes.com/

[181] Commerce's *Emerging Business Models to Drive Energy Efficiency* is pending. **(S0058)**

tax burden arises from the fact that a developer driven conversion typically requires two sale transactions, each of which is subject to the real estate excise tax (REET). The tax is paid first when the developer purchases the distressed property. After the property is upgraded, the developer sells the property, presumably at a higher price, and pays the real estate excise tax again. The REET is levied at the time of sale at a rate of up to 1.78 percent.

To provide stronger incentives for energy efficiency conversions, the state could allow the taxpayer to take a credit for the first REET payment in calculating the REET amount on the second, higher transaction. For example, if a developer purchased a distressed property for $150,000 and sold the property in an improved condition for $250,000, the REET would be $2,670 for the first transaction and $4,450 for the second transaction. With the tax credit, the second REET would be reduced to $1,780.

This credit would provide a small but tangible incentive to developers to incorporate energy efficiency measures when they convert distressed properties. The tax credit should be based on a demonstration that the upgrade includes energy efficiency measures, and it should require that resale occur within a specified period after the initial purchase.

Previous Research and Experience

No previous research on this topic.

New Analysis

According to RealtyTrak, the current level of bank owned residential property sales is approximately 1,000 - 2,000 per month. If 10,000 properties per year were induced by the REET credit to perform an energy efficient property conversion, the result would be about $100 million per year in energy efficiency expenditures. The associated energy costs savings would be about $170 million, net present value. The tax expenditure would be about $18 million per year.

Implementation

- Assess interest among remodeling firms in a program to provide a tax credit for energy efficient property conversions.
- Develop legislation to establish a tax credit for energy efficient property conversions. The legislation would define eligibility requirements, including the demonstration of energy efficiency results and the period for resale.

4.4.6 Minimum Standards for Rental Housing

Policy Description

To assure a minimum level of efficiency in rental housing, it is recommended that the state establish efficiency standards for this sector. This population of housing is less likely to have been upgraded because the owner does not pay the energy utility bills. This proposal would require all rental homes to be improved at time of sale or by a specific date in the future.

Required improvements would be limited to simple cost effective measures, attic and floor insulation for example. Exceptions to the standard would be established to limit owner expenses and to limit impacts on property transfers.

- A list of minimum energy efficiency upgrades would be generated based on demonstrated cost-effectiveness in large populations of homes. For example, using the insulation standards represented in the Bonneville Power Energy Efficiency Manual, or similar documentation.
- Exceptions to requirements would be generated to assure costs are controlled. For example, wall insulation would not be required if the installation could not be completed without extensive finish work. Cost caps would be designed to limit maximum expense
- Exceptions would be made to assure the transfer of deeds did not impacts transfers between family members, as part of court-ordered property transfers, or other transfers to be defined.

Previous Research and Experience

Starting January 1, 1985, most residential properties in Wisconsin have had to meet minimum energy conservation standards at the time of ownership transfer. Private, state-certified inspectors are hired by owners to check properties for compliance with the standards. The Register of Deeds in the county will not record the transfer of a property unless it meets the minimum standard:[182] This may include:

- Insulation must be installed in all "accessible“ areas
- Windows must be double-glazed or equipped with storm windows
- Air leakage control completed
- Moisture control meets codes

Recent research has identified important physical differences between owner-occupied and rental markets for energy efficiency. Owner occupied housing is more likely to be heated with gas, rentals with electricity. Owner occupied housing is also more likely to be insulated: “For example, (in California) if the dwelling is owner-occupied and the resident pays for heating or cooling, the attic/ceiling is roughly 20 percent more likely to be insulated, and the exterior walls are roughly 13 percent more likely to be insulated.”[183]

New Analysis

Washington State University, Energy Extension, is estimating the penetration potential for energy efficiency retrofits to rental housing; the results of this work will be available shortly after this Energy Strategy is published.

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[182] Wisconsin Department of Safety and Professional Services *WISCONSIN RENTAL WEATHERIZATION PROGRAM* http://dsps.wi.gov/sb/SB-RentalWeatherizationProgram.html **(R0142)**

[183] Kenneth Gillingham, Matthew Harding, and David Rapson, “ Split Incentives in Household Energy Consumption,” Energy Journal 33 (2012) pp.37-62., **(R0160)**

Implementation

- Examine use of excise tax credit to partially fund projects;
- Identify any needed supporting infrastructure. For example, home inspector qualifications;
- Identify administrative agency and define enforcement methods;
- Develop proposed legislation; and
- Develop supporting documentation, including cost and benefit.

4.4.7 Sustaining Investment in Low-Income Weatherization Programs

Policy Description

Low-income weatherization programs are at risk because of anticipated budget reductions from state and federal funding sources. Commerce will lead a series of meetings to develop and implement recommendations for sustaining program delivery of weatherization services to low-income households. Utilities, utility regulators, low-income and tribal representatives and other stakeholders will be consulted to develop priorities for preserving and increasing the weatherization programs that serve vulnerable populations and provide energy savings for the entire utility system.

A preliminary list of subjects for discussion is presented below. It is anticipated that, by creating an opportunity for dialogue, additional areas of interest will emerge.

- Develop a long-term needs assessment and resulting conservation potential for the low-income housing sector in Washington.
- Develop opportunities and incentives that allow and encourage utilities to prioritize implementation of low-income weatherization within their conservation portfolios. Assure they are consistent with state utility conservation policies and regulations.
- Develop analysis of state “match maker” capital funding required to maximize utility funding for low-income weatherization.
- Examine opportunities to reduce program complexity that could result in increased direct delivery of efficiency services.
- Address the labor classification issues and possible cost savings resulting from changes detailed in policy Section 4.4.8.

The proposals outlined in this section are motivated by the Legislature’s directive that the state Energy Strategy “meet the health, welfare, and economic needs of its citizens with particular emphasis on meeting the needs of low-income and vulnerable populations.” Other elements of the building efficiency strategy depend on the ability of energy consumers to pay most of the cost of efficiency improvements, and policy makers have recognized that this will not work if applied to low-income households.

However, it is also a reality that public funding of low-income programs is a difficult proposition in the current budget and economic situation. Federal recovery funds provided a substantial boost to low-income weatherization, but federal support will soon drop below the pre-Recovery Act levels. Commerce anticipates a substantial reduction in funding for low-income home energy improvements. Table 4-2 describes recent funding for the Commerce managed weatherization program: 2008 represents a pre-ARRA funding level, 2010 represents a program year with ARRA funding, and 2012 represents the current understanding of weatherization funding anticipated.

	2008	2010	2012 (estimated)
U.S. DHHS LIHEAP	$6,582,508	$16,272,816	$6,065,669
U.S. DOE	$4,519,063	$24,411,657	$3,455,476
U.S. BPA	$2,305,213	$2,105,213	$2,126,250
Energy Matchmakers (State Capital Funding)	$4,500,000	$3,000,000	$3,000,000
Totals	$17,906,784	$45,789,686	$14,647,395

Table 4-2: Washington Department of Commerce Low-Income Weatherization Funding

Implementation

- Anticipated for spring of 2012, Commerce will hold a series of meetings focused on sustaining investment in low-income weatherization activities.
- The meetings are intended to produce a list of recommended actions that will be followed by agency involvement in implementation.

4.4.8 Prevailing Wage Class for Weatherization

Policy Description

Prevailing wage laws apply to projects funded by state or federal government. With the introduction of ARRA funds for residential weatherization, state and federal wage rates became a prominent issue for government funded weatherization contractors and the supporting state and local agencies. This includes implementation of federal Davis-Bacon and Washington prevailing wage rates. The system currently includes multiple and overlapping wage rates, some at a scale too high to support the resulting energy savings.

- This strategy element would create a comprehensive residential weatherization work class for Washington using recent guidelines developed by Commerce with the WSU Energy Program[184] as well as recent guidance from the U.S. Department of Energy[185] as a guide.

[184] Skill Standards For Weatherization Crew Leaders, Washington State Department of Commerce, Washington State University Extension Energy Program, 2011 **(S0083)**

[185] U.S. Department of Energy, Workforce Guidelines for Home Energy Upgrades, 2011, http://www1.eere.energy.gov/wip/retrofit_guidelines_overview.html#pubs **(R0134)**

The effort would distinguish between weatherization workers and specialized trades. For example, define work conducted under this class to include most weatherization activities, but not highly skilled labor activities (showerhead replacement vs. complex plumbing repair).

A description of the weatherization prevailing wage laws in Washington are provided on the Washington State Department of Labor and Industries webpage.[186]

New Analysis

Key weatherization measures are at risk due to labor rate impacts on efficiency cost-effectiveness tests. An evaluation of the Weatherization Program production costs shows that after adjusting for normal construction cost inflation, FY 2010 per unit direct costs were $400 - $700 higher than unit costs reported in 2006. This translates into $4 million in additional expenditures in FY 2010. The ongoing cost increase may be a result of additional costs to achieve compliance or increased wages paid for weatherization work.[187] This report also suggests that a program administrator examine the impacts of administrative and implementation cost related to compliance with complex and sometimes more expensive wage rates than in the recent past.

- "Assess the impact of higher wages on weatherization measure cost effectiveness: Higher production costs will result in some weatherization no longer being cost-effective."
- "Wage requirements versus production costs: The federal Davis-Bacon and Washington Prevailing Wage requirements result in higher wages, which benefit employees doing weatherization work. However, this has resulted in higher weatherization production costs and fewer measures being installed."
- "Accountability/reporting requirements versus administrative/overhead costs: Agencies said it is becoming more difficult and time consuming to comply with program requirements. This is driving up their administration and operating costs and decreasing the cost effectiveness of the services they provides."

It has been noted that some of the current workforce classification could result in elimination of some weatherization measures. For example, if the wage rate of a sheet metal worker is applied to residential duct insulation work, the measure will no longer be cost effective.

Next Steps

Commerce will further examine the implementation of revised wage classifications and make possible recommendations for modifications to state prevailing wage rules.

- Defining weatherization worker and simplify pay and reporting schedules
- Propose new work classification for Washington Labor and Industries for consideration

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[186] Labor and Industries web page. http://www.lni.wa.gov/TradesLicensing/PrevWage/Weatherization/default.asp **(S0059)**

[187] Kunkle, R, Schueler, V. *Washington State Low-Income Weatherization Program Evaluation Report For FY2010 Final Report May 2011*, Washington State University Extension Energy Program. **(S0060)**

4.5 Combined Assessment of Residential Potential

This section provides a description of the market potential and a cost and benefit scenario for doubling the current implementation rate for residential energy efficiency retrofits. The residential efficiency initiatives, with the exception of 4.4.6 minimum standards for rental housing, intend to stimulate and support voluntary actions that improve the efficiency of homes. A combination of these approaches is needed to move the market to action. It is anticipated that some combination of these activities will be needed to achieve the results included in this analysis. The residential initiatives include:

- 4.4.2 residential disclosure
- 4.4.3 marketing and quality assurance
- 4.4.4 meter-based financing
- 4.4.5 energy efficient property conversions
- 4.4.6 minimum standards for rental housing

Market Potential: There are a large number of homes that would benefit from additional insulation, air sealing and duct sealing. The exact numbers are unknown. A study of primarily owner-occupied homes conducted by the region's utilities examined the insulation in existing homes built in 2006 and earlier.[188] Based on this study and typical insulation upgrade guidelines Commerce made the following assessment of potential. Additional detailed analysis may be available from utility conservation potential studies developed as part of the utility least cost plans.[189] According to the study, 26 percent of homes have attic insulation rated less than R-19, 23 percent of homes have no floor insulation and 31 percent have walls with R-0 or an unknown level of insulation (Figure 4-1). Determining the level of insulation in a wall is difficult, resulting in high levels of unknown. The Bonneville Power Administration[190] and many other regional utility efficiency programs recommend adding insulation to homes with less than R-19 attic insulation, or when there is no insulation exists in the floors or walls.

The mix of measures per home will vary. Many homes will require multiple measures. Some will only require one. For this analysis, it was assumed that 20 percent or more of existing single family homes could benefit from insulation, air sealing or duct sealing upgrades. In 2006, Washington included more than 1.8 million single family homes.[191] Energy efficiency retrofits applied to 20 percent of this population would yield 365,000 Washington homes.

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[188] RLW Analytics, Single-Family Residential Existing Construction Stock Assessment, Market Research Report, E07-179, Northwest Energy Efficiency Alliance (10/2007) http://neea.org/research/reportdetail.aspx?ID=194 **(R0200)**

[189] An example of a comprehensive utility conservation potential study is from Puget Sound Energy. This is included in Appendix K. of Puget Sound Energy's Integrated Resource Plan http://pse.com/aboutpse/EnergySupply/Pages/Resource-Planning.aspx **(R0201)**

[190] Bonneville Power Administration, Energy Efficiency Implementation Manual, October 2011. http://www.bpa.gov/Energy/N/implementation.cfm **(R0202)**

[191] Washington Center for Real Estate Research, Single Family Housing Inventory, State of Washington and Counties, Year End, 2010. **(S0057)**

For the strategy elements that specifically impact rental housing, U.S. census data implies that 16 percent of homes are for rent,[192] or roughly 304,000 of the 1.8 million single family homes in Washington. Rental properties are not well represented in the existing home study referenced above. The 20 percent estimate of market potential is not expected to be representative of the single family rental market. A study from California has suggested that rental homes are more likely to need energy upgrades than owner occupied homes.[193] For example, if the dwelling is owner-occupied and the resident pays for heating or cooling, the attic is roughly 20 percent more likely to be insulated, and the exterior walls are roughly 13 percent more likely to be insulated. Washington home ownership and rental fractions are illustrated in Figure 4-2.[194]

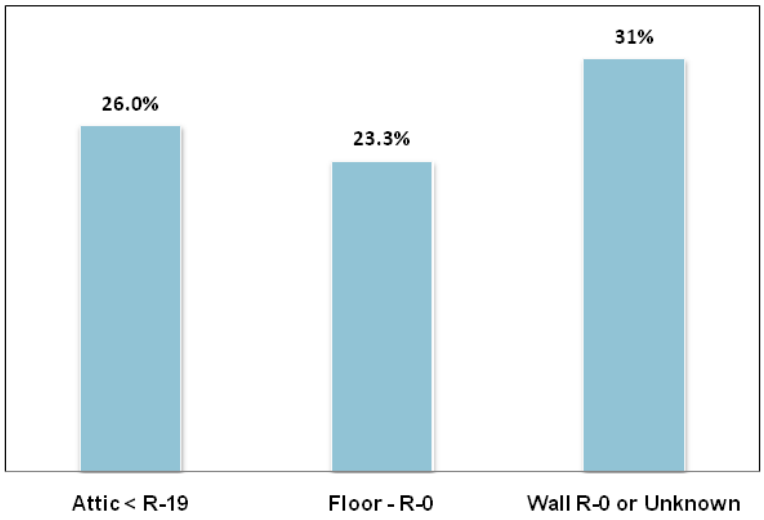

Figure 4-1: Percent of homes needing insulation

[192] Based on U.S. Census Bureau, 2009 American Housing Survey, Seattle Metropolitan Area Detailed Table 1. Seattle metro fractions applied to state single family housing data. http://www.census.gov/hhes/www/housing/ahs/2009Seattle/seattle09.html **(R0129)**

[193] Kenneth Gillingham, Matthew Harding, and David Rapson
Split Incentives in Residential Energy Consumption, August 17, 2011 **(R0160)**

[194] Based on U.S. Census Bureau data, 2009 American Housing Survey, Seattle Metropolitan Area. Data adjusted to represent statewide housing population. http://www.census.gov/hhes/www/housing/ahs/2009Seattle/seattle09.html **(R0129)**

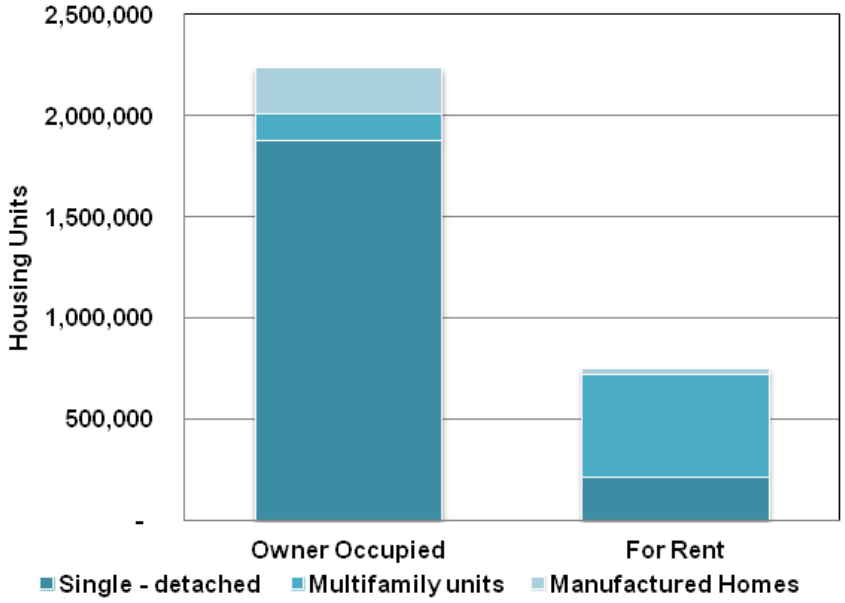

Figure 4-2: Washington Home Ownership Populations

Estimating first cost, energy benefit and carbon emissions reductions. To provide estimates of first cost and energy benefits, Commerce utilized the Northwest Power and Conservation Council data set approved by the Regional Technical Forum (RTF). The RTF data is used by public utilities to estimate energy savings for sponsored projects in the region. Based on the energy savings, the reduction in carbon emissions are calculated using fuel based emissions factors developed by the U.S. Environmental Protections Agency (EPA).

Commerce developed an estimate of the potential energy savings that may be available in a typical older home. The estimate is calculated using a prototype 1,800 square foot two-story home over a crawl space. Two variations were developed, one with ducted forced air heating systems and one without. The ducted version are applied to gas and fuel oil heated homes. The model without ducts are applied to electric and wood heated homes. The model developed is for a home with minimal insulation representing an understanding of the housing stock most in need of energy efficiency upgrades. The prototype includes R-19 attic insulation and no wall or floor insulation. The home has potential for air leakage reduction and, for the gas heated variation, duct leakage reduction (Table 4-3).

	electric	gas	oil	wood
attic insulation R-19 to R-49	X	X	X	X
floor insulation R-0 to R-30	X	X	X	X
wall insulation R-0 to R-11	X	X	X	X
air leakage control	X	X	X	X
duct sealing		X	X	

Table 4-3: Retrofit Measures Analyzed

Cost and savings for this study come from data developed by the RTF.[195] The electric utility rate is a Washington population weighted average rate based on data from the Energy Information Administration.[196] Since natural gas rates are falling, Commerce modeled a rate 5 percent less than the current rate for Puget Sound Energy. Heating oil price is a national average for 2011, from the Energy Information Administration[197]. Cord wood cost is based on prices posted on Craigslist. The resulting, per home retrofit cost and savings are documented in Table 4-4**.**

	electric	**gas**	**heating oil**	**wood**	**fuel mix weighted**
	kWh	*therms*	*gallons*	*cords*	
annual space heating savings per home	4853	278	188	1.6	
utility rate	$0.08	$1.00	$3.72	$220	
annual savings per home	$373	$278	$699	$356	$363
retrofit cost per home	$3,391	$3,929	$3,929	$3,391	$3,606
retrofit cost per home + 9% tax	$3,696	$4,282	$4,283	$3,696	$3,930
fuel mix for pre 1980 homes[198]	53%	33%	7%	6%	

Table 4-4: Retrofit space heating savings

After an examination of home retrofit activity conducted by Pacific Northwest utilities, it is estimated that less than 5,000 homes per year are weatherized in Washington.[199,200] There is a substantial gap between the potential and the actual annual activity in this area.

Table 4-5 summarizes cost and savings for a large number of homes. As noted earlier, it is assumed that the current market adoption rate for statewide home weatherization activity is 5,000 homes per year. Commerce estimates the potential for doubling this activity in the coming years from 5,000 homes to 10,000 homes per year. The resulting work adds over $16.8 million of construction activity to the state economy while generating over $1.4 million in consumer energy savings per year. Home energy upgrades are expected to provide savings for many years to come. The RTF estimates that duct sealing will provide savings for 20 years, building insulation for 45 years.

[195] RTF Unit Energy Savings (UES) Measures and Supporting Documentation, Weatherization - Single Family V2.4. http://www.nwcouncil.org/energy/rtf/measures/Default.asp **(R0203)**

[196] Energy Information Administration, Average Retail Price by State and Utility: Residential Sector, 2010. http://www.eia.gov/electricity/sales_revenue_price/xls/table6.xls **(R0204)**

[197] Energy Information Administration , Weekly Heating Oil & Propane Prices, Release date: November 30, 2011 http://www.eia.gov/dnav/pet/pet_pri_wfr_dcus_nus_m.htm

[198] Based on U.S. Census Bureau data, 2009 American Housing Survey, Seattle Metropolitan Area. Data adjusted to represent statewide housing population. http://www.census.gov/hhes/www/housing/ahs/2009Seattle/seattle09.html **(R0129)**

[199] Opinion Dynamics, Process and Impact Evaluation of the 2007–2008 Energy Trust of Oregon Home Energy Solutions Program, Oakland, 2009. **(R0205)**

[200] Puget Sound Energy, 2012-2013 Biennial Conservation Plan. **(R0206)**

homes improved per year	5,000	10,000
cost per unit	$3,930	$3,930
total cost	$19,652,178	$39,304,356
annual saving / unit	$363	$363
annual savings	$1,816,936	$3,633,873
net present value (5%, 25 years)	$25,607,800	$51,215,601

Table 4-5: Impacts of increased retrofit activity

The greenhouse gas reduction estimates are the result of the unit energy savings estimates multiplied by emissions factors. The electric factor had been developed by Commerce using data from the Washington electric Fuel Mix Disclosure.[201]The natural gas emissions rate is based on EPA's Greenhouse Gas Equivalencies Calculator.[202]The greenhouse gas emissions reduction estimates per home are detailed in Table 4-6. Table 4-7 provides a summary of greenhouse gas emissions reductions resulting from increased market adoption of home energy improvements

space heating savings	electric	gas	heating oil	wood	fuel mix weighted
	kWh	*therms*	*gallons*	*cords*	
annual savings per home	4,853	278	188	1.6	
GHG metric ton / energy unit	.000218	.0054	.0102	0	
GHG metric ton / home	1.06	1.50	1.91	0	1.20
fuel mix for pre 1980 homes	54%	33%	7%	6%	

Table 4-6: GHG emissions reductions per home

homes improved per year	5,000	10,000
metric ton / year	6,000	12,001

Table 4-7: Greenhouse gas emissions reductions resulting from increased market adoption of home energy improvements.

[201] Washington State Department of Commerce, Fuel Mix Disclosure, http://www.commerce.wa.gov/Programs/Energy/Office/Utilities/Pages/FuelMix.aspx

[202] U.S. Environmental Protection Agency, Greenhouse Gas Equivalencies Calculator, http://www.epa.gov/cleanenergy/energy-resources/calculator.html **(R0208)**

Chapter 5 – Distributed Energy

5.1 What is Distributed Energy and Why Is It Important?

In this Energy Strategy, the term "distributed energy" (DE) covers a wide range of technologies and applications: district heating (and cooling), combined heat and power (CHP), and distributed electricity generation (DG).[203] A key characteristic that ties these types together is the relatively compact geography of where electricity and thermal energy are produced and used. District heating is steam or hot water produced in a central plant and distributed to a single building or group of nearby buildings, e.g. Seattle Steam's downtown heating system.[204] Combined heat and power (sometimes called cogeneration) is an energy facility designed to produce both electricity and useful heat from a single energy source, e.g. a pulp and paper mill that uses waste wood products to generate electricity and produce steam for on-site materials processing or use in an adjacent district energy system. Distributed generation generally refers to the production of relatively small amounts of electricity (kilowatts or a few megawatts) at the same location where it will be used, e.g. solar panels on a commercial building.

Historically, distributed energy technologies were the original basis for an electric generating system and localized heating systems. Small power generating plants were situated in the neighborhood or town they served, hot water or steam pipes provided heating to downtown buildings, and factories produced their own electricity and thermal needs on-site. Over time, we moved away from such localized energy as larger power plants become much more efficient and transmission systems improved, driving down electricity costs and making both onsite electricity and thermal energy production systems less economically attractive. Other factors – including the environmental impacts of power production, health and safety concerns, and the geographical location of resources (e.g. hydroelectric plants located on large rivers) – contributed to the decline in local energy production.

Why then are we seeing renewed interest in distributed energy systems? The interest comes from a combination of technical, social and environmental factors. The equipment for producing energy close to loads has seen dramatic technical, economic and environmental improvements over the last several decades. Prices for new, small-scale renewable technologies continue to decline.[205] More individuals and businesses are seeking greater energy autonomy and consider solar systems, in particular, as a way to help achieve such independence. Developers see new economic development opportunities from DE technologies such as anaerobic digesters where they can address pollution issues while at the same time producing and selling "clean" energy. In addition, in a "back to the future" moment, we are once again beginning to better recognize the potential efficiency benefits of combining electricity production and the use of "waste" heat for onsite or adjacent off-site needs. The state's current fleet of standalone (non-CHP) fossil-fueled thermal power plants is about one-third efficient in converting fuel to electricity while

[203] The term "distributed generation" typically refers to only the last of these items, namely the production of electricity located close to the particular load that it is intended to serve.

[204] See http://www.seattlesteam.com **(R0144)**

[205] For example, the Energy Information Administration's (EIA) *Annual Energy Outlook 2011, forecasts a five-fold increase in solar generating capacity by 2035 "based on a decline in the cost of photovoltaic systems over the project period and the availability of Federal tax credits through 2016."* ***(R0145)***

modern CHP systems can have combined thermal and electric efficiencies of 60 to 80 percent.[206]

This renewed interest in distributed energy does not by itself explain why it merits consideration in the Energy Strategy. There are three key reasons. First, it is timely. Washington has established incentives as well as policy mandates that encourage the development of both renewable and distributed energy systems. The House Technology, Energy and Communications Committee has an active investigation of these incentives and policies underway with the possibility of legislative proposals for the 2012 session. That investigation also included substantial work by the Washington Utilities and Transportation Commission (UTC) on distributed energy issues related to the state's investor-owned utilities.[207] Second, citizens and businesses are asking their state and utilities to help them with development of distributed energy systems. In just the last half-dozen years, the number of small photovoltaic systems in the state has increased from a few dozen installations to more than two thousand. Finally, there are those with a long-term vision of distributed energy as a significant part of Washington's energy future. California, with its goal to develop 12,000 megawatts of distributed energy facilities by 2020, is one manifestation of that vision.[208]

Yet despite this increased interest and timeliness, Washington has several characteristics that can make it challenging to develop these systems. Not all of the factors described here are unique to Washington, but they all should be considered as existing DE policies are changed or new ones added.

- **Electricity Costs** – Washington has some of the lowest retail electricity costs in the United States. For businesses, low electricity costs increase competitiveness. For Washington's citizens such low costs mean more dollars in their pockets. However, for distributed energy developers, low electricity costs make the economic case for on-site energy production less economically attractive. Low retail rates are not an issue for sales of electricity output to utilities since those rates reflect the margin avoided cost of new supplies. However, for individuals or businesses that have cheap and reliable electricity supplies, the economic value of on-site generation to displace that low-cost power can be unattractive.

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[206] Both renewable and non-renewable resources can fuel distributed energy systems. The Energy Strategy focuses predominately on renewable energy or very high efficiency fossil- fueled systems. This focus is in keeping with the guiding principle to "reduce dependence on fossil fuel energy sources through improved efficiency and development of cleaner energy sources, such a bioenergy, low-carbon energy sources, and natural gas, and leveraging the indigenous resources of the state for the production of clean energy." (RCW 43.21F,088 (1) (d)).

[207] "At the request of Washington State House of Representatives Technology, Energy and Communications Committee (TEC Committee), the Washington Utilities and Transportation Commission (Commission) is conducting a study relating to development of distributed energy in areas served by investor-owned electric utilities. Specifically, the TEC Committee has asked the Commission to provide to the Legislature background information and detailed discussion of options to encourage the development of cost-effective distributed energy in areas served by investor-owned utilities, as well as the opportunities and challenges facing investor-owned utilities and their ratepayers in developing distributed energy in this state. The UTC issued their report on the investigation, *Report on the Potential for Cost- Effective Distributed Generation in Areas Served by Investor-Owned Utilities in Washington State,* Docket UE- 110667, October 7, 2011" **(S0084)**

[208] The California Energy Commission has opened an investigation on how to integrate 12,000 MW of distributed energy generation into the state's electricity grid. http://listserver.energy.ca.gov/mobile/m_details.php?eID=1436 **(R0146)**

- **Integration of Distributed Energy Resources** -– Washington has a reliable and well-developed electricity generation, transmission and distribution system based largely on centralized electricity production and centralized control. As distributed electricity systems achieve a higher penetration rate, especially of local electric distribution systems, electric utilities can face challenges in safely and effectively integrating those systems.
- **Maintaining Electric System Reliability** – Electric utilities are required to maintain a reliable electricity system and can even be subject to major federal penalties for failure to do so.[209] Independently operated generating projects connected to neighborhood distribution power lines can impact power quality, operations, voltage and frequently levels, and ultimately the reliability for all customers connected to the system.
- **Surplus Supplies** – The current recession as well as large amounts of new base load electricity development since 2000 have both dampened or eliminated overall load growth and in many instances created surplus supplies for some utilities.[210] Consequently, some utilities are "long" on resources and do not need new supplies. In addition, the downturn in demand has depressed prices in the Western electricity market making it difficult for utilities to find markets for any surplus supplies.
- **Local Opposition** – By their very nature, distributed energy systems are located near where the electricity or thermal energy is to be used rather than in remote locations. Consequently, there can sometimes be vocal, local opposition to new facilities in populated and developed locations – "not in my backyard."
- **Not All Distributed Energy is the Same** – Distributed energy can range from small photovoltaic panels on household rooftops to larger biomass-powered district heating systems in urban core areas to CHP systems at industrial facilities. In addition, distributed energy technologies can be intermittent power sources or reliable baseload facilities. Depending on the characteristics of the source, there may be concerns about the aesthetic, environmental and technical impacts of distributed energy technologies.
- **Limitations on Financial Support** – Unlike many other states that offer distributed energy incentives, Washington is constitutionally limited in its ability to provide direct funding to the private sector and the current state budget situation severely constrains the state's ability to provide additional tax incentives for distributed energy.

5.2 Distributed Energy Policy Package

This chapter describes and recommends ways that the state might encourage and facilitate the further development of distributed energy, while at the same time acknowledging both the challenges of integrating such systems into existing energy (electric) infrastructure with minimal technical and financial impacts. Commerce proposes two overall approaches to strike that balance.

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[209] Section 215 of the Federal Power Act (16 U.S.C. 791-828c) imposes mandatory reliability standards on electric utilities and other electric system participants.

[210] Northwest Power and Conservation Council, Memorandum, Comparison of Regional Load Forecasts, September 1, 2011 available at http://www.nwcouncil.org/news/2011/09/p2.pdf **(R0209)**

Facilitating the Development of Distributed Energy – These are policy actions that will encourage the development of additional distributed energy including electricity only as well as CHP and thermal systems. As these policy options are developed it is important to recognize that they may have impacts on the state and local existing electricity infrastructure and operations. Those impacts should be fully analyzed and considered as part of the policy design.

Analyzing Current Distributed Energy Financial Incentives – Washington has a relatively complex and often uncoordinated collection of incentives that encourage distributed energy. Nonetheless, these incentives can be important drivers of distributed energy development. This policy package does not recommend any specific changes to these incentives but rather highlights the need to examine them in light of their current financial impacts on the state and their overall effectiveness in achieving their policy objectives. This is particularly important for those incentives that are scheduled to expire within the next few years.

	facilitating development of DE	financial incentives
5.3 near-term recommendations These are mature policy concepts, or pilot projects to test newer policy concepts	5.3.1 interconnection standards 5.3.2 net metering policies 5.3.3 streamlined permitting for distributed energy	
5.4 long-term policy options These are candidates for long-term policy, and require piloting or additional analysis before deployment.	5.4.1 DE-compliant power purchase agreements 5.4.2 distributed energy in I-937* 5.3.3 streamlined permitting for distributed energy	5.4.3 rationalize DE incentives • renewables sales tax • production incentives • biomass incentives • distributed energy credit in I-937* 6 carbon pricing

* All policy options related to the state's Energy Independence Act (I-937; RCW 19.285) are contingent on a separate legislatively driven process toward a revision of I-937. At this time, the Energy Strategy is neither endorsing nor opposing such an effort.

The last long-term option, *carbon pricing*, is an economy-wide approach to energy system management that would provide a strong economic signal for the development of low- and no-carbon resources, including many forms of distributed energy. It is discussed separately in 5.1.

Note on Jurisdictional Issues – Different levels of legal authority within the electricity sector were recognized when developing the analyses and recommendations in this chapter. The operations of investor-owned utilities are subject to state regulation by the UTC while the state's consumer-owned utilities – cooperatives, municipals and public utility districts - have elected governing boards. In addition, the Federal Energy Regulatory Commission (FERC) has authority in areas such as wholesale transactions and reliability. During the further development and implementation of these recommendations, it is important to include a thorough examination of jurisdictional responsibility and authority. For example, Recommendation 5.4.1, DE-compliant power purchase agreements, will require investigations of FERC authority over power purchase agreements.

5.3 Near-Term Recommendations

5.3.1 Interconnection Standards

Policy Description

In 2007, the UTC and a number of the state's consumer-owned electric utilities worked closely together to develop and adopt electrical interconnection standards for on-site electricity production. The rules, adopted by the UTC for its regulated investor-owned utilities and, in turn, voluntarily adopted by the governing boards of many of the state's consumer-owned utilities, established simplified interconnection standards for systems up to 300 kilowatts of capacity. This occurred in response to HB 5101 passed in the 2006 session.[211] There seems to be general agreement that the UTC and voluntary consumer-owned utility process worked well and that it could serve as a model for future interconnection efforts.[212]

In workshops and comments to the UTC on their distributed energy proceedings, both utilities and developers noted there have been improvements in interconnection technology since the 2007 process and that it was time to reexamine the standards. Specifically, it may no longer be necessary to require an external disconnect switch with smaller DG systems, insurance requirements may be decreased or waived and the overall limitation for simple system interconnection rules might be raised from 300 kW.

Previous Research and Experience

An excellent summary of the provision of Washington's interconnection standards is available from the Database of State Incentives for Renewables and Efficiency (DSIRE).[213]

New Analysis

It is not possible to estimate the quantitative impacts of changes to Washington's interconnection standards since those impacts will depend on what specific changes ultimately

[211] HB 5001 created a public utility tax incentive for consumer generated renewable power (RCW 82.16.130). The incentive did not take effect until "uniform standards for interconnection to the electric distribution system" were in effect for light and power businesses serving 80% of the total customer load in the state.

[212] Washington Utilities and Transportation Commission, *Report on the Potential for Cost-Effective Distributed Energy in Areas Served by Investor-Owned Utilities in Washington State,* Docket UE-110667, October 7, 2011. **(S0084)**

[213] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=WA07R&re=1&ee=1 **(R0147)**

are adopted into state and local requirements. Overall, increases in the upper limit for simplified interconnection procedures beyond the current limit of 300 kW should result in more rapid and less expensive deployment of larger distributed energy systems, and removal of the disconnect switch requirement and lower insurance requirements should decrease the cost of interconnection.

As the UTC and other parties consider changes to the interconnection standards, two documents can provide useful direction on the range and type of issues to consider – *Freeing the Grid* and *Connecting to the Grid.*[214] The *Freeing the Grid* report, for example, notes a number of items to examine related to interconnection. Some of these items, in whole or in part, are already incorporated in interconnection standards.

- Open standards to all customer-sited generation, not simply renewable energy
- Permit systems up to 20 MW if they are sized to meet on-site loads
- Create four size categories – 10 kW, 2 MW, 10 MW (non-exporting system), 20 MW or larger
- State requirements should take less time than the Federal Energy Regulatory Commission (FERC) process
- Recommendations related to interconnection fees
- Engineering fees should be fixed, e.g. hourly rate or cost per study
- No need for external discount switch since all IEEE systems must have auto shut off capability
- Certification tied to UL 1741 and IEEE 1547
- Use the FERC standard screens
- Network interconnection allows both spot and network interconnections
- Standard agreement with friendly clauses
- No additional insurance for non-inverter system below 50 kW and inverter systems to 1 MW
- Process for dispute resolution
- Rules apply to all utilities

Implementation

The UTC, working in close collaboration with Commerce and the WSU Energy Program, has determined that a rulemaking is in order to modify its existing interconnection rules focusing particularly on systems in the range up to two MW.[215] As in the previous process, consumer-owned utilities would be invited to actively participate and ultimately voluntarily adopt

[214] Freeing the Grid – Best Practices in State Net Metering Policies and Interconnection Procedures, December 2010 **(R0040)** and Connecting to the Grid – A Guide for Distributed Generation Interconnection Issues, 6th Edition, 2009, **(R0148)**, are available at http://irecusa.org

[215] Subsequent to efforts on these smaller systems, we should also consider processes for systems at the 10 MW and 20 MW levels.

comparable interconnection standards as those for the UTC. The rulemaking process should examine all of the items in the *Freeing the Grid* and *Connecting to the Grid* reports. That examination should include determination of which items are most important to both developers of projects and the utility community, and attempt to strike a balance between their needs.

5.3.2 Net Metering Policies

Policy Description

Washington is one of 43 states, plus Puerto Rico and the District of Columbia, with net metering laws. The law was originally adopted in 1998 with modifications in 2000, 2006 and 2007, and applies statewide.[216] Net metering is an electricity policy that allows an on-site generation system to "run the electric meter backwards" during periods when on-site electricity production exceeds load. The value to the on-site generator is two-fold; it values any excess electricity production at retail rates and obviates the need for on-site electricity storage. Although net metering can be applied to any type of DE generation including fossil fuels, most states, including Washington, limit the policy to renewable sources.[217]

Washington's net metering law is generally considered well-designed and effective. It received a B grade from the Interstate Renewable Energy Council in the 2010 and 2011 assessments of state net metering policies (*Freeing the Grid*).[218] However, there are several components that should be considered for possible changes.

Previous Research and Experience

An excellent summary of the provision of Washington's net metering law is available from DSIRE.[219]

The state does not collect data on the total number of net-metered systems in Washington. However, the WSU Energy Program does certify small, distributed energy systems that want to claim the state's production tax credit (Figure 5.1). Seattle City Light had 325 net-metered customers in 2010 with total generation of approximately 1,032 MWh compared to total utility sales of more than 9 million MWh per year.[220]

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[216] RCW 80.60

[217] Washington's net metering law applies to solar thermal electric, photovoltaics, wind, small hydroelectric, fuel cells and CHP/cogeneration using renewable fuels.

[218] Freeing the Grid – Best Practices in State Net Metering Policies and Interconnection Procedures, December 2011, page 70. **(R0040)**

[219] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=WA01R&re=1&ee=1 **(R0149)**

[220] Comment submitted on the State Energy Strategy by the City of Seattle, October 21, 2011. Note that many of the Seattle City Light systems may also be included in the Figure 5.1 statistics. **(S0085)**

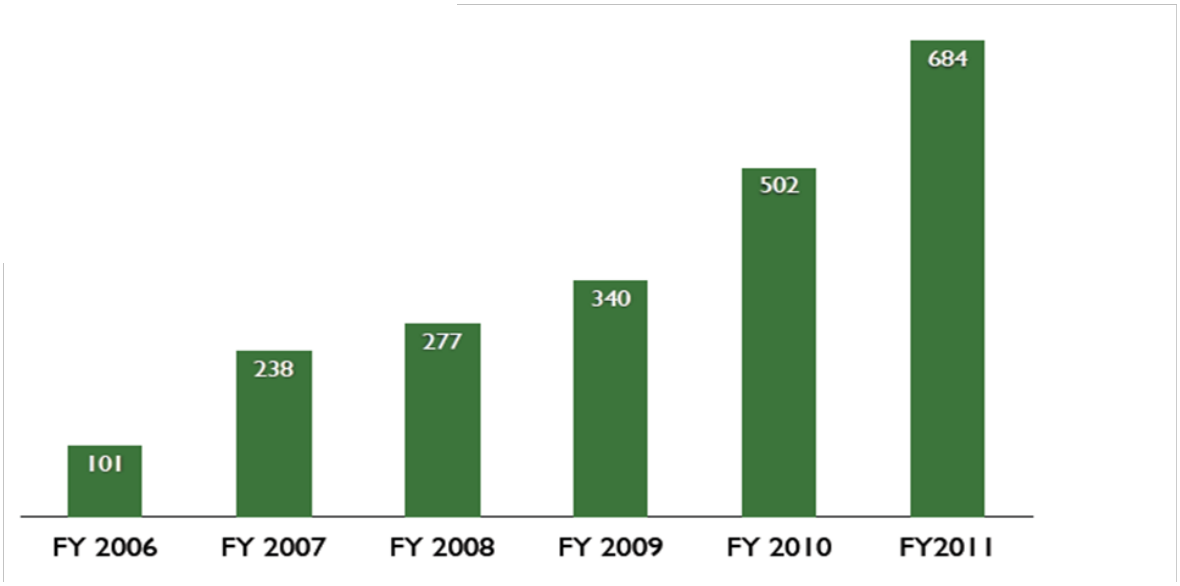

Figure 5-1: Distributed generation systems claiming the consumer-generated power tax credit (RCW 82.16.130).[221] Of 11,442 kW of capacity in the program, 10,576 kW are photovoltaics; 416 kW are wind and 450 kW are anaerobic digesters. (S0092)

New Analysis

As noted above, *Freeing the Grid* sets out some best practices for state net-metering laws and Washington does well under many of those criteria. Washington's current net metering law allows monthly accumulations of net metering production to be carried forward (with an annual limit in April of each year), and it applies to all customer classes (residential, commercial, industrial) and all electric utilities statewide.

However, there are three policy areas where Washington should consider making changes to the law:

- **Modify the Overall System Size Limit** – Of the states with net metering policies, two dozen either do not limit individual system size or have some limitation that exceeds the 100 kW Washington value. An essential purpose of net metering is to allow customers to provide for their on-site energy needs while decreasing or eliminating the need for on-site backup equipment through connection to the utility system. Thus in some ways establishing a hard limit of 100 kW for net-metered systems arbitrarily limits the ability of large residential complexes, or commercial or industrial facilities to install larger systems to meet their on-site needs with the net-metered assistance of their utility. Modifications to the current limitation might best be tied to the on-site load where the net-metered system is located. As an example, limiting net-metered systems to no more than 100 percent of the total electric load at a given location would directly encourage the design of systems tied to on-site need.
- **Increase Overall Utility Systems Limit –** Currently, the overall limit imposed on total net metering systems connected to a single utility is set at 0.25 percent of a utility's 1996-peak load, increasing in 2014 to 0.50 percent of the 1996 peak load. Based upon comments and

[221] Source – WSU Energy Program, November 2011.

the literature, overall utility level limitations of net-metered systems are less of an issue than the number and size of systems on individual feeders and local distribution systems. It should be examined whether any utilities are beginning to approach their limit, and if so, how the overall limit might be raised while still accommodating local electrical distribution safety, reliability and operational concerns.

- **Allow Carry Forward of Excess Generation Beyond One Year –** Currently, Washington law allows net- metered systems to carry forward their net excess generation from month to month, but at the end of a 12-month billing period net excess generation is granted back to the utility without additional compensation to the customer.[222] Allowing net-metered customers to carry forward their net excess generation beyond 12 months but not receive payment from the utility could make DE development more attractive. If limits on individual net-metered systems are tied directly to on-site loads and utilities are not required to pay for net excess generation at the end of one year, the overall impact on utility operations should be manageable.

Implementation

Consider legislation to raise the net-metering limit with particular focus on tying that limit to customer load, e.g. no more the 100 percent of total load rather than an absolute kilowatt value. Alternatively consider raising the limit to two megawatts. Consider raising the limit on the percentage of net-metered load required to be accommodated on a utility's existing system while at the same time recognizing the need to accommodate limitations that may occur at the distribution level. Allow net-metered systems to roll over excess generation credits beyond the current limit of one year, but do not require utilities to pay for excess credits.

5.3.3 Streamlining Permitting for Distributed Energy

Policy Description

The 2011 Energy Strategy Update specifically called for an investigation of streamlined permitting for combined heat and power systems (including district energy systems).[223] In addition, the 2011 SES Update included several recommended actions that would streamline permitting for clean and advanced energy systems, including development of energy overlay

[222] RCW 80.60.030

[223] *Energy Strategy Update and 2011 Biennial Energy Report with Indicators,* December 2010, page 10.

"Streamlined permitting of combined heat and power (CHP) projects. Various studies have indicated a large quantity of industrial waste heat available that could be used to generate electricity in combined heat and power (CHP) or 'cogeneration' installations. If the industrial entity financing the CHP installation is able to sell the resulting electricity into the grid a project often appears profitable, but permitting, regulatory or economic barriers can pose an insurmountable hurdle to implementation. Meanwhile, the U.S. EPA is developing a Waste Energy Recovery Registry according to requirements of the 2007 Energy Independence and Security Act, and Washington may benefit from preparing to respond to the CHP potentials revealed by the Registry. In this initiative, Commerce will research the barriers to CHP deployment during calendar year 2011, and recommend a set of remedies that may include programmatic, regulatory or legislative solutions to be deployed in 2012. The research will be conducted in conjunction with regulatory streamlining research described under *Streamlined Permitting for Clean and Advanced* Energy Technologies below." **(S0029)**

zones, non-project and planned action State Environmental Policy Act (SEPA) reviews, accelerated permitting of pilot projects, and energy technology test zones.[224] These latter recommendations chiefly focused on large, utility-scale projects but some of the items developed have relevance to the deployment of distributed energy systems.

New Analysis

Renewable Energy Siting: Model ordinances are used by several states to provide a guideline for local governments to refer to when considering development of their own ordinances. Commerce staff reviewed and compared them for applicability in Washington. Commerce prepared a discussion brief.[225]

Streamlined Permitting: What opportunities exist for streamlining permitting of infill development or renewable energy facilities? Commerce staff prepared a brief report highlighting opportunities and actions local governments could take to streamline permitting for both infill and renewables, while maintaining the same level of environmental review and protection.[226]

Implementation

Currently, local governments may opt to address renewable energy facilities in policies or development regulations; however, there is no requirement to do so. As a result, most jurisdictions have little to no mention of renewable energy facilities in plans or codes. While there does appear to be an increase in the number of local governments that are addressing renewables and, to a less extent distributed energy systems, directly, there is no specific guidance from the state on issues to consider or provision of examples. Because the State Energy Office, and the Local Government and Infrastructure Division are both in the Department of Commerce, that agency is uniquely situated to help local governments address renewable energy facilities and deployment of distributed energy in their communities.

Commerce proposed the following implementation steps related to permitting and siting:

- Commerce will develop a website with connections to tools for local governments to use in the development of local siting ordinances, best practices and models for distributed energy. An example of the type of information that might be included could be a technical brief on Energy Aware Communities that includes discussion of development and siting of small local energy generation.
- As local communities consider issues and develop codes regarding renewables and DE, they should consider type (wind, solar, geothermal), location (primary use on vacant parcels, freestanding, or as an on-building accessory use) and scale. Concerns can then be discussed in a public forum. Any mitigation measures or design standards can be

[224] Ibid, pages 12-15 **(S0029)**

[225] Department of Commerce, *State Model Ordinances for Renewable Energy Facilities – A Report Prepared to Support the 2010/2012 State Energy Strategy*, Department of Commerce, 2011. **(S0062)**

[226] Department of Commerce, *Streamlining Local Government Project Review and Permitting of Renewable Energy Facilities and Infill Development*, Department of Commerce, 2011. **(S0063)**

determined, and codes can be written that would allow for more efficient permitting when proposed projects are designed to meet those adopted provisions.

- During the last several legislative sessions, there has been legislation proposed that would give the state broader authority to permit renewable energy facilities in instances where a local government did not have its own adequate regulations in place. Commerce should convene developers, local government, state agencies and other interested parties to review those legislative proposals, fully identify jurisdictional issues, determine permitting and siting concerns, and examine government resource limitations. Based on that effort, Commerce would consider developing state or local model processes and ordinances.
- Perhaps the greatest opportunity to streamline permitting lies with the integration of the SEPA and the Growth Management Act (GMA). Commerce is developing suggested recommendations on how this may be done. For example, a Planned Action could be developed that addresses siting, operation and mitigation of certain renewable energy facilities (by type and scale) so that future projects within the scope of the Planned Action can be permitted more quickly and efficiently. Other options include Energy Overlay Zones, development of criteria for energy facilities allowed by conditional use permit, or development regulations that allow residential scale energy facilities in new and existing neighborhoods.

5.4 Long-Term Policy Options

Note: Policies discussed in Section 5.3.3 also include long-term options discussed in their primary entry above.

5.4.1 DE-Compliant Power Purchase Agreements

Policy Description

Washington has a long and successful history in the development of combined heat and power systems, particularly in the pulp and paper industry. In fact, the existence of CHP capabilities at some of those industrial sites has been an important element in maintaining their economic viability. Currently, Washington has nearly three dozen CHP sites with a capacity of over 1,200 MWe, concentrated in the wood products, paper and petroleum refining industries.[227] However, since 2004 only 152 megawatts of new CHP systems have been built in Washington. Numerous studies over the last 10 years have pointed to the significant potential available from expansion of CHP systems in Washington and the Pacific Northwest, perhaps as much as 4,000 megawatts (electric) of additional capacity.[228]

From a policy perspective, the terms and conditions of power purchase agreements between developers and electric utilities are critical to the viability of CHP and other renewable energy projects of several megawatts or greater. Changes to power purchase agreements are a

[227] NW Clean Energy Applications Center, *State of Washington Clean Energy Opportunities: Technical Potential for CHP, August 2010.* **(R0210)**

[228] Washington State University Energy Program, *Washington Efficient Energy Roadmap,* 2011. **(S0064)**

complex and sometimes contentious process. Developers are looking for long-term, economically attractive contracts that allow them to acquire the financing needed to build while utilities must weigh such agreements against the need to maintain system reliability and integrity, meet their overall need (or lack of need) for new supply resources, and determine the potential costs and rate impacts of these new generation additions.

Because of these complexities, Commerce proposes that this work be a long-term rather than a short-term endeavor to allow sufficient time to fully research and understand the implications of any proposals.

Previous Research and Experience

The Northwest Clean Energy Application Center[229] is an excellent source of detailed information on state and regional CHP, district heating and waste heat recovery technologies, potentials studies and projects.

New Analysis

The WSU Energy Program is conducting an analysis and road mapping effort examining energy efficiency tied to the combined heat, power and district energy components of distributed energy. Their analyses together with work underway by the UTC will inform this process and will be available at the end of 2011.

Next Steps

Power purchase agreements generally apply to a wide range of CHP systems (from 400 kW anaerobic digesters to 25 MW pulp and paper mills). Obviously, the larger of these systems will have a greater impact on both the technical and economic operation of utility systems. Utilities, especially those that are long on resources, have raised legitimate concerns about the costs that these systems might impose on other customers. On the other hand, developers of larger scale distributed energy systems have suggested several changes that they believe would improve the economic viability of their projects. These include:

- Adding formal consideration of thermal energy (thermal recovery, CHP) opportunities into electric utility Integrated Resource Planning (IRP) documents.
- Investigating the feasibility of setting purchase prices under power purchase agreements at the delivery point instead of the entry point, requiring calculations of and credit for line-loss savings, and offering a portion of those savings to the generator.
- Extending the term of power purchase agreements to 15 to 20 years to allow for greater investment certainty for project developers.
- Increasing the limit of basic power purchase agreements to 10 megawatts.
- Considering changes to the process for determining standby rates for CHP systems.

[229] http://www.chpcenternw.org **(R0150)**

- Examining existing utility tariffs, such as Puget Sound Energy's Cogeneration and Small Power Production Schedule 91 and Snohomish PUDs solar incentive program, as potential models for utility tariffs or purchase agreements.

Given these differing perspectives, Commerce recommends a longer-term investigation of the impacts of current power purchase agreements on DE development and utility operations The goal of this work would be to identify specific opportunities to make power purchase agreements more streamlined and consistent throughout the state.

Much of the work in this area falls under the auspices of the UTC. Commerce and the WSU Energy program would work closely with the UTC and other interested parties on possible modifications to power purchase agreement policies and procedures. This process would also involve careful review of federal requirements under purview of the FERC.

5.4.2 Distributed Energy in I-937

Policy Description

Initiative 937, the Energy Independence Act (the Act), require the state's largest electric utilities to acquire both cost-effective energy efficiency and new renewable resources.[230] The Act specifically recognizes the benefit of distributed energy by providing a double credit against utility renewable energy obligations for systems rated at five megawatts or less.[231] As a result, I-937 has increased interest in and development of new distributed generation. Since the passage of the Act by voters in 2006, there have been discussions of and efforts to amend provisions of the law. To date, none of the proposed changes has been adopted but discussions continue. Based on strong advice from the Energy Strategy Advisory Committee, this Strategy does evaluate a range of proposals for changes to the law. However, there is a separate legislative process underway to examine possible changes to I-937 either in 2012 or subsequent sessions. If that process provides an opportunity to change provisions of the law, several changes could enhance the development of additional distributed energy.

Previous Research and Experience

Additional information on the Energy Independence Act, its associated implementation rules for consumer-owned utilities.[232] and investor-owned utilities[233], plus other background materials are available on Commerce's website.[234]

[230] RCW 19.285

[231] RCW 19.285.040 (2) (b)

[232] WAC 194-37

[233] WAC 480-109

[234] http://www.commerce.wa.gov/ **(S0065)**

New Analysis

No new analysis was undertaken. During the course of previous legislative deliberations on the Energy Independence Act, much analysis was produced. If legislation is proposed for 2012 or a subsequent session, Commerce will work closely with the Governor's Office, UTC, and other public and private stakeholders to analyze the implications of any changes.

Without specific details on what changes would occur to the law, it is not possible to provide any quantitative estimate impacts of I-937 changes on distributed energy development, greenhouse gas emissions or potential price impacts

Next Steps

Distributed energy related changes to I-937 to consider include:

- Establishing a process for prequalification of the eligibility of renewable and high-efficiency cogeneration energy technologies. The Energy Independence Act does not allow for utilities and project developers to receive absolute certainty that either the Washington State Auditor or the UTC will approve their investment in some types of renewable technologies projects.[235] Based on a recommendation from the 2011 Energy Strategy Update, Commerce, the UTC and the Auditor's office have established an advisory process to provide non-binding interpretations of I-937 eligibility. However, lack of a binding formal process as part of statutory language can limit the development of certain distributed energy technologies and projects, especially those that do not conform precisely to definitions of eligible renewables now in statute.
- Revising the definition of biomass to include additional biogenic sources. As currently written, the definition of biomass in the Act limits the ability to include power produced from high-solid biomass wastes as a "qualified renewable resource."[236] Addition of high-solids materials to such technologies as anaerobic digesters can significantly increase net energy production. Neither the UTC nor Commerce can alter that definition via rulemaking.
- Improving the definition of cogeneration technologies (combined heat and power) to clarify what systems qualify under the Act. There is general agreement that the definition of cogeneration in the Act is not sufficiently detailed to include all types of cost-effective opportunities, especially situations where electricity efficiency improvements may be small but overall energy efficiency increases, such as thermal energy savings, are significant.
- Providing clarification on the five megawatt limit for distributed energy systems. As written, it is unclear if the five megawatt limit applies to the capacity or the average annual output of a system, and whether it is for direct current or alternating current output of the system. This may create uncertainty for some CHP system projects, in particular.

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[235] There is an exception to this limitation for investor-owned utilities subject to the jurisdiction of the UTC. They may request a formal declaratory order from the UTC on a renewable technology/project. See UTC Docket UE-111016, *Policy statement regarding processes for determine whether projects are "Eligible Renewable Resources" under RCW 19.285 and WAC 480-109,* June 7, 2011 for details. **(S0066)**

[236] High-solids digesters use the organic fraction of municipal solid waste (primarily post-consumer food waste and yard waste) to produce methane.

- Considering allowing anaerobic digesters to "unbundle" their greenhouse gas emissions reduction credits (methane reduction) from their renewable energy credits to improve the economic viability of such systems.

There may be additional proposed changes to I-937 that might benefit the development of distributed resources. As proposals are being considered and evaluated, they should also be assessed in light of their potential impact on distributed energy development.

5.4.3 Rationalize Distributed Energy Incentives

Policy Description

Washington has a number of tax and policy incentives that are all or in part designed to improve the economic viability of distributed energy systems. These incentives have been developed over time with only limited coordination or consideration of their overall impacts on the development of distributed energy or impacts on the existing state energy infrastructure.

If the state has a goal to support distributed energy in general, a specific technology or some combination, what are the appropriate mechanisms for that support? What are the implications of choosing such a mechanism? In addition, what are the impacts?

Tax Type	Description	RCW	Program Adopted	Expiration Date
Business and Occupation Rate Reductions	Manufacturing of Solar Energy Systems and Components	82.04.294	2005	6/30/14
Business and Occupation/PUT Credits	Consumer Generated Power (PUT Credit)	82.16.130	2005	6/30/20
Business and Occupation/PUT Exemptions/Deductions	Business and Occupation Tax Credit for the Sale of Forest Derived Biomass Used to Produce Electricity, Steam, Heat or Biofuel	82.04.4494	2009	6/30/15
	PUT exemption for electricity generated by light and power businesses using cogeneration or renewable energy	82.16.055	1980	Applies only to facilities constructed between 1980 and 1990
Sales/Use Tax Exemptions, Deferrals	RST Exemption for Anaerobic Digester Construction and Operation	82.08.900, 82.12.900	2001	None
	RST Remittance (75 percent) for Renewable Energy Production Equipment	82.08.962, 82.08.963, 82.12.962	2009	6/30/13
	RST Exemption for Hog Fuel Used to Produce Electricity, Steam, Heat or Biofuel	82.08.956, 82.08.957, 82.12.956, 82.12.957	2009	6/30/13
	RST exemption for cogeneration equipment integrated into manufacturing	82.08.02565, 82.12.02565,		None
Property Tax	Property/leasehold tax exemption for anaerobic digester land, buildings and equipment for six years,	82.29A.135, 84.36.635, 84.36.640		12/31/12
Energy Independence Act (non monetary)	Double credit toward renewable targets for distributed generation of 5 megawatts or less	19.285.040	2006	None
Net Metering	See Section 5.3.2	80.60	1998	None

Previous Research and Experience

See the Washington State Department of Revenue website for a detailed description of energy-related tax incentives.[237]

An excellent and up-to-date summary of most of the local incentives related to renewable energy is available at DSIRE,[238] primarily for electric utilities.

[237] http://dor.wa.gov/content/findtaxesandrates/taxincentives/incentiveprograms.aspx#Energy **(S0067)**

[238] http://www.dsireusa.org/incentives/index.cfm?getRE=1?re=undefined&ee=1&spv=0&st=0&srp=1&state=WA **(R0151)**

New Analysis

No new analysis was undertaken for this recommendation.

Next Steps

Conduct a review and analysis of the impacts and costs of the state's current financial incentives for distributed energy. Focus that analysis particularly on the Retail Sales and Use Tax Remittance for Renewable Energy Production Equipment, which will expire in June 2013, the Property Tax Exemption for biodigesters that expires in 2012, and the Public Utilities Tax Exemption for Consumer Produced Power. These merit particular attention because they appear to have had a significant impact on the development of new renewable and distributed energy systems while at the same time impacting overall state revenue.

5.5 Future Trends for Distributed Energy

As a final note in this chapter, it is important to recognize there are a number of external factors that could have a major influence on the overall deployment of distributed energy systems. A few of these key trends include:

- The development of low-cost storage systems such as inexpensive battery systems. Commerce has agreed to examine energy storage issues and policies in future work prior to and during the 2015 Strategy.
- Continuation of the relatively rapid decline in the price of photovoltaic systems.
- The success or failure of the California effort to develop up to 12,000 MW of distributed electricity generation by 2020.[239]
- Improvements in power system electronics that enhance the ability of new technology to more seamlessly and safely integrate with the electricity grid.
- Improvements in the electricity infrastructure driven by smart grid development that permits improved integration and control of increasing amounts of distributed generation into the grid.
- New developments in production and distribution technologies for combined heat and power systems and district energy systems.
- The impacts of climate change on the supply and demand for energy.

[239] See the California Energy Commission *IEPR Committee Workshop on Distribution Infrastructure and Smart Grid Solutions to Advance 12,000 MW of DG, June 22, 2011 at* http://listserver.energy.ca.gov/mobile/m_details.php?eID=1436 **(R0146)**

Chapter 6 – An Integrated Pricing Approach

6.1 Carbon Pricing

On both federal and regional (interstate) levels, various carbon pricing schemes have been discussed, all of them variants of either a carbon tax or a cap-and-trade system. Most carbon tax proposals apply a fee for every ton of carbon delivered in fossil fuels, sacrificing control over the total emissions for the benefit of price certainty to the market. Cap-and-trade systems control the total emissions by allocating a fixed number of allowances to emitters and allowing them to trade those allowances at whatever prices develop in the market. Cap-and-trade systems sacrifice price certainty for the benefit of precise control of the emissions.

Neither Commerce nor the Advisory Committee was able to conclusively identify a preferred method of carbon pricing. However, in order to scale the impact of any carbon pricing option on the state energy system, Commerce chose to quantify costs and impacts of a revenue-neutral carbon tax option, following British Columbia's policy design.

6.2 Analysis of a Revenue-Neutral Carbon Tax Option

6.2.1 Introduction

A revenue-neutral carbon tax applies to all fossil fuels consumed in the state, both direct fuel consumption, such as building heat and motorized transportation, and electrical generation. British Columbia (BC) introduced the first revenue-neutral carbon tax in the region in 2008, aimed at reducing fossil fuel consumption by sending price signals to consumers to incentivize more efficient fuel use. Its primary advantages are to provide: 1) price certainty for consumers and businesses so that they can make efficient energy investment and purchasing decisions;[240] 2) completeness as an economy-wide policy program that targets fuel consumption in all sectors and consumers; and 3) welfare improvement by reducing dead weight loss, which is an economic term describing inefficiency caused by overconsumption of products where the cost of associated pollution is not incorporated into the products retail price.[241] Although a carbon tax does result in higher energy prices, consumers and businesses need not be adversely affected if the revenues from a carbon tax are used to offset other state taxes. A carbon tax can potentially impose greater burden to low-income households and small businesses as the share of energy-related expenditures for these subgroups is generally higher. However, it is possible to mitigate this effect by providing various mechanisms in the revenue recycling package, such as an additional low-income tax credit, such as is used in the BC carbon tax program.[242] When

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[240] Ian W.H. Parry and William A. Pizer, "Emissions Trading Versus CO2 Taxes Versus Standards," *Assessing U.S. Climate Policy Options*, Resources for the Future, November 2007: pp. 81-82, www.rff.org/rff/Publications/upload/31809_1.pdf **(R0153)**

[241] Lawrence H Goulder, *Environmental Taxation and the "Double Dividend:" A Reader's Guide*, NBER Working Paper No. 4896, National Bureau of Economic Research, 1994. **(R0154)**

[242] British Columbia Ministry of Environment, *BC Climate Action Plan*, 2008, www.livesmartbc.ca/attachments/climateaction_plan_web.pdf: pp. 16. **(R0155)**

designed carefully, this revenue neutrality can therefore maintain or improve economic competitiveness and improve social welfare by reducing fuel consumption and pollution.

Specific parameters and design elements for a carbon tax are subject to further discussion, but for this modeling exercise the 2012 Energy Strategy generally assumes that Washington will model its carbon tax after BC's in the following ways. A carbon tax will be collected in the same manner as existing fuel taxes. It does not apply to marine and aviation fuels for interstate and international trips to prevent leakage effects, which is a diversion of refueling events (fuel consumption) caused by geographic price differentials, and imported electricity will be exempted from this taxation to avoid potential legal issues. Matching the BC carbon tax policy, the baseline rate would start at $10 per metric ton of carbon dioxide equivalent ($MTCO_2e$) with an incremental rate at $5/$MTCO_2e$ per year, with the tax rate eventually capped at $30/$MTCO_2e$. This cap rate roughly equates to a price increase of 30 cents per gallon for regular motor gasoline. Carbon tax revenues are assumed to be returned to the taxpayers primarily in the form of rate cuts for existing state taxes.

6.2.2 Previous Research

Carbon Tax Center, a national nonprofit advocacy group, developed an elasticity-based spreadsheet model to estimate the impacts of a national carbon tax.[243] This model demonstrates the potential impacts of a tax, but does not account for complex energy-related dynamics such as its effect on fuel mix for electric generation. In contrast to this elasticity-based approach, upon introducing the first economy-wide carbon tax, BC used a general equilibrium model called the CIMS to estimate the societal impacts of the carbon tax.[244] The primary advantage of general equilibrium models is that they can account for substitution effects and predict economy-wide impacts along with fiscal and environmental impacts. This feature was demonstrated in several research papers, such as *Analysis of Policies to Reduce Oil Consumption and Greenhouse-Gas Emissions from the US Transportation Sector*,[245] which used a U.S. general equilibrium energy model called the NEMS to predict its impacts on the transportation sector. This approach, however, requires substantial financial resources and staff time to complete due to the complexity of general equilibrium models.

For economic analysis, the results from Washington Western Climate Initiate Economic Impact Analysis,[246] provides a useful estimate of potential economic impacts for Washington. This study used an energy equilibrium model called Energy 2020 to analyze the economic impacts of regional cap-and-trade. The study concluded that the effects on employment and total output could vary from one sector to another but are likely to be net positive when implemented with other efficiency measures. Another study by Morgenstern *et al* found that using the past data

[243] "Effectiveness," Carbon Tax Center, www.carbontax.org/issues/energy-demand-how-sensitive-to-price/, (accessed on May 11, 2010). **(R0156)**

[244] BC Ministry of Environment, *BC Climate Action Plan, Appendix I: A Quantitative Analysis of British Columbia's Climate Action Plan*, 2008, www.env.gov.bc.ca/cas/pdfs/climate_action_21st_century.pdf **(R0157)**

[245] Ross W. Morrow, Kelly Sims Gallagher, Gustavo Collantes, and Henry Lee, "Analysis of policies to reduce oil consumption and greenhouse -gas emissions from the US transportation sector," *Energy Policy* 38 (2010): 1305–1320, doi:10.1016/j.enpol.2009.11.006 **(R0158)**

[246] ECONorthwest, *Washington Western Climate Initiate Economic Impact Analysis*, Feb 15, 2010 www.ecy.wa.gov/climatechange/docs/20100707_wci_econanalysis.pdf **(S0024)**

and general equilibrium model, the effects on manufacturing is negligible except for a few energy intensive industries, and the impacts on these industries can be minimized with mitigation measures such as a border tax and revenue offset for the U.S. as a whole.[247]

6.2.3 New Analysis

Commerce developed an elasticity-based spreadsheet model called the Carbon Tax Analysis Model (C-TAM). This model is an open-source model based on three major elements: 1) carbon tax rates, 2) the EIA's energy price and demand forecasts,[248] and 3) price elasticities of demand (indicators of how consumer demand responds to price changes). Due to its dependency on the EIA forecast, C-TAM predicts the impacts on a production basis, meaning that the fuel used in another state to generate electricity consumed in Washington is not included in the forecast. C-TAM is designed to account for the effects of complex price changes for each fuel type and likely fuel mix change for electric generation. The elasticity selection is based on a thorough literature review covering a wide array of fuel products, ranging from transportation fuels to sector-by-sector electricity consumption. The analysis results are disaggregated for each fuel source and sector (residential, commercial, industrial and transportation).

The primary advantage of C-TAM over more sophisticated models such as the NEMS is to provide policy makers the ability to better understand the model and to change various assumptions and parameters to explore the impacts of various carbon tax designs. Furthermore, C-TAM is far less resource intensive, yet produces detailed projections for each sector and fuel source, and accounts for the complex interaction of energy price and demand.

The model forecasts that with the baseline parameters described earlier, a carbon tax can reduce energy-related emissions by 8.4 percent from the projected level in 2035, with $2.1 billion of carbon tax revenues for the same year. The impacts on fossil fuel consumption are highest for the electricity sector, with far smaller impacts on transportation fuel consumption. A carbon tax has a greater impact on electrical generation because of the high carbon intensity of coal-fired electric generation.

Further analysis was pursued to examine the impacts of using alternative cap rates. Figure 6-1 summarizes the results of this sensitivity analysis, and it suggests that a carbon tax of $70 per $MTCO_2e$ is sufficient to stablize the energy-related emissions at 1990 levels in 2035. In addition, a carbon tax at $90 per $MTCO_2e$ would be able to retire all electricity generating plants using fossil fuel. In reality some of these plants would need to be preserved as backup power for certain conditions, such as low water years and very cold days.

[247] Richard D. Morgenstern, Joseph E. Aldy, Evan M. Herrnstadt, Mun Ho, and William A. Pizer, "Competitiveness Impacts of Carbon Dioxide Pricing Policies on Manufacturing, " *Assessing U.S. Climate Policy Options*, Resources for the Future, November 2007: 96-105, www.rff.org/rff/Publications/upload/31811_1.pdf **(R0159)**

[248] Energy Information Administration, *Annual Energy Outlook 2011*, Mar 2011, www.eia.gov/forecasts/aeo/ **(R0090)**

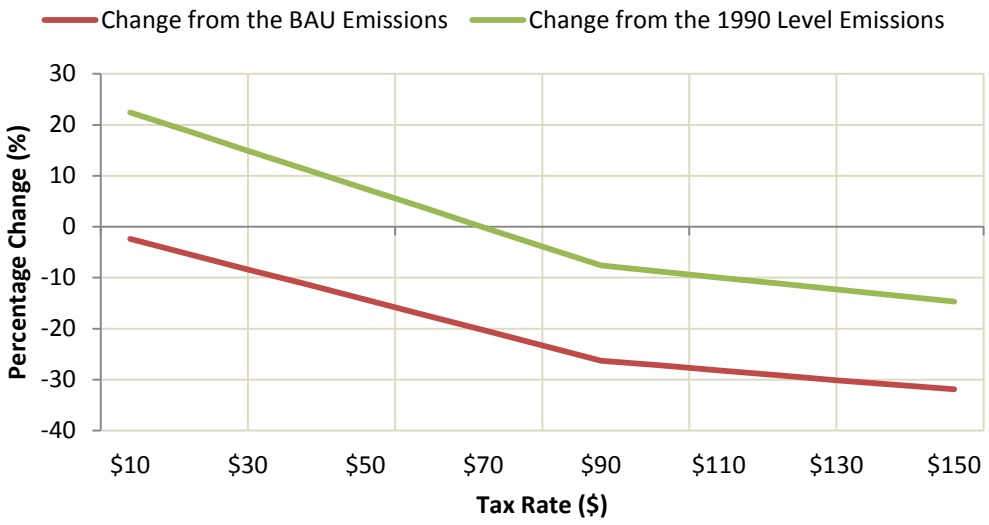

Figure 6-1: Emission Changes in 2035 with Various Rates

6.3 A Test for Scenario Planning

One of the objectives of the 2012 Energy Strategy was to model the effectiveness of different energy policy options under different scenarios. The prime variables used to differentiate the different scenarios were energy price and technology. The effectiveness of the carbon tax policy was examined under a reference scenario and four other scenarios that approximate the four future worlds described in Section 2.2. These four scenarios were selected from scenarios published in the EIA's Annual Energy Outlook 2011 and are *high oil price*, *low oil price*, *high technology* and *low technology*. The carbon tax model was run under the five scenarios (including the reference case), each time modeling a five-year phase-in of a $30 carbon tax, starting with $10 in 2012.

Reference: This scenario is derived from the EIA's reference scenario. The price for imported low sulfur oil rises to $125 per barrel in 2035 (constant 2009 dollars). Other energy prices also slowly rise in this scenario.

High oil price: This scenario is derived from the EIA's *high oil price* scenario. The price for imported low sulfur oil rises to $200 per barrel in 2035 (constant 2009 dollars). Other fuel prices are impacted as well, but to a much smaller degree. A reference level of technology is in place in the high oil price scenario.

Low oil price: This scenario is derived from the EIA's *low oil price* scenario. The price for imported low sulfur oil declines to $50 per barrel in 2035 (constant 2009 dollars).

High technology: In the *high technology* scenario, consumers have more options to shift away from various fuels as their price increases. The increase in energy prices follows the reference scenario forecast. To reflect a more innovative high technology world, the price elasticity values in the carbon tax model were increased by 20 percent, which corresponds to one standard deviation.

Low technology: To reflect a less innovative more stagnant low technology world, the price elasticity values in the carbon tax model were decreased by 20 percent, which corresponds to one standard deviation.

Table 6-1 illustrates the forecast 2020 and 2035 greenhouse emissions for the five scenarios following the imposition of a $30 carbon tax. The high and low technology scenarios have only minor impacts on greenhouse gas emissions. The oil price scenarios have much larger impacts on greenhouse gas emissions, with emissions down nearly 20 percent in 2035 in the high oil price case.

Scenario	2010	2020	2035	change 2020	change 2035
	MCO_2e	*MCO_2e*	*MCO_2e*	*%*	*%*
Reference	71.4	72.67	76.58	--	--
Reference: w/ tax	--	69.66	70.26	-4.1%	-8.3%
High Technology	--	69.23	69.71	-4.7%	-9.0%
Low Technology	--	70.55	70.82	-2.9%	-7.5%
High Oil Price	--	67.54	61.50	-7.1%	-19.7%
Low Oil Price	--	75.37	78.56	3.7%	2.6%

Table 6-1: Effect of a $30/$MgCO_2e$ carbon tax on energy greenhouse gas emissions under multiple future scenarios. (W0007, W0011)

Table 6-2 illustrates the forecast 2020 and 2035 energy consumption for the five scenarios following the imposition of a $30 carbon tax. The results show a similar trend between scenarios as noted above. Under the low oil price scenario, energy consumption increases significantly.

Scenario	2010	2020	2035	% change 2020	% change 2035
	MCO_2e	*MCO_2e*	*MCO_2e*	*%*	*%*
Reference: no tax	1.389	1.578	1.727	--	--
Reference: w/ tax	--	1.543	1.680	-2.2%	-2.7%
High Technology	--	1.537	1.672	-2.6%	-3.2%
Low Technology	--	1.549	1.689	-1.8%	-2.2%
High Oil Price	--	1.443	1.552	-8.6%	-10.1%
Low Oil Price	--	1.629	1.803	3.2%	4.4%

Table 6-2: Effect of a $30/$MgCO_2e$ carbon tax on Washington energy consumption under multiple future scenarios. (W0007, W0011)

6.4 Next Steps

- Apply Washington economic I/O model, or Washington REMI model, to refine modeling of economic impacts from various implementations of a revenue-recycling carbon tax.
- Energy Office to begin biannual reporting, in January of odd-numbered years, on status of carbon pricing policies worldwide and contemporary research on their economic impacts.

Focus on those political entities most relevant to Washington, e.g. British Columbia and California.

- Establish an annual forum on research in carbon pricing at the Washington Future Energy Conference, focusing on invitations to academic researchers both inside and outside Washington.

Chapter 7 – Initiative Status from the 2011 Update

7.1 The 2011 Energy Strategy Update

The *Energy Strategy Update and 2011 Biennial Energy Report with Indicators* recommended 17 specific action items.[249] Those recommendations fell into four broad categories:

- Residential and Commercial Buildings Efficiency;
- Industrial Energy Efficiency;
- Transportation Efficiency and Technology; and
- Streamlined Permitting for Clean and Advanced Energy Technologies.

Following is a review of the relevant portions of each of the 17 recommendations as well as a summary of their implementation status.

7.2 Residential & Commercial Buildings Efficiency

7.2.1 Improve Consumer Confidence in Energy Efficiency Retrofits

> *"We propose to develop and implement a streamlined program of contractor certification and registration, training standards, periodic third party inspection of contractors' work, and a complaint resolution system. Additional standardization such as standard contractor bid forms would clarify the work for consumers. The program will be designed to be compliant with the proposed, federal HomeStar program, or whichever national standard seems most likely to prevail at the time Washington's program moves forward."*

Status: Commerce staff has conducted additional research in this area. Based on that research we have included a new recommendation in the 2012 Buildings Efficiency Policy Near-Term Recommendations – 4.4.3 Marketing and Quality Assurance.

7.2.2 Financial Tools for Residential and Commercial Energy Efficiency Investments

> *"Commerce will research these available financial tools, identifying any legal, marketing or administrative barriers others have encountered in deploying them, and identify those that show the most promise for Washington State."*

Status – Commerce staff conducted additional research on financial tools for energy efficiency. Based on that research we believe that meter based financing is the most promising approach. The details of that recommendation are included in the 2012 Buildings Efficiency Near-Term Policy Recommendations – 4.4.4 Meter-Based Financing.

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[249] Each of the quoted sections in this chapter along with additional detail appear on pages 6 to 15 of the Update, http://www.commerce.wa.gov/Documents/State%20Biennial%20Energy%20Report%202011.pdf **(S0029)**

7.2.3 UTC Conservation Policy Support

"The UTC has just completed an inquiry on conservation incentives for investor-owned utilities, described above on page 5, and has produced a policy guidance document that describes how proposals decouple of electric and gas revenues from sales volume should be structured.

If the nature of those recommendations necessitates coordinated rulemakings or agency request legislation, the Department of Commerce will work together with the UTC to take those policy steps toward providing appropriate incentives for energy conservation."

Status: On November 11, 2010, the UTC issued a "Report and Policy Statement on Regulatory Mechanisms, Including Decoupling, to Encourage Utilities to Meet or Exceed the Conservation Targets."[250] Specific implementation of provisions in that policy statement will be through the individual investor-owned utility rate making proceedings.

7.2.4 Minimum Requirements for Rental Housing

"We propose to research and eventually advance policy toward increasing the energy efficiency of rental housing. Policies examined will include for example:

- *Disclosure requirements. The building owner is required to disclose typical energy consumption data or utility costs associated with each unit prior to lease signature.*
- *Minimum efficiency measures. Rental units must include certain minimum efficiency measures, for example a certain R-value of attic insulation. The minimum efficiency measures could be required at time of sale (change of ownership) of rental housing, or mandated by a date certain.*

Care will be taken to craft policy proposals in a way that do not threaten the availability or price of rental housing to low-income populations."

Status: Commerce conducted additional research on rental housing and energy efficiency. The 2012 Buildings Efficiency Near-Term Policy Recommendations – 4.4.6 Minimum Standards for Rental Housing proposes specific near-term actions for this item. In addition, Recommendation 4.4.2, Residential Disclosure, recommends making energy consumption data available for all households, not just rental properties.

7.2.5 Efficiency Programs for Non-Electric Fuels

"When homes are heated with electricity, the electric utility typically offers electric conservation programs that include retrofits of the building shell, as well as subsidies or financing for equipment. However, when homes are heated with wood, propane or oil, the consumer's access to similar programs may be limited. This same problem exists to a lesser degree for natural gas heated homes.

[250] UTC Docket U-100522 available at http://www.wutc.wa.gov/rms2.nsf/177d98baa5918c7388256a550064a61e/43eb29bd6e98d0e8882577d1007fea20!OpenDocument **(S0086)**

Commerce proposes to research policies that provide all households with access to energy conservation programs, regardless of heating fuel. Commerce will design and implement education and access programs to the extent possible without legislation during calendar year 2011, but if necessary may propose legislation to expand these programs in the 2012 legislative session."

Status: We do not anticipate proposing any legislation on this item in the 2012 session. During 2011, Commerce began discussions with Ecology on how non-electric efficiency measures might be incorporated into State Implementations Plans (SIPs) required for non-attainment areas under the federal Clean Air Act. Ecology anticipated that Washington would have non-attainment areas for ozone; however, those federal regulations were suspended. Washington does have some non-attainment areas for particulates where non-electric efficiency or fuel switching programs for sources such as wood stoves may be attractive. Commerce will continue to examine ways to increase support for non-electric efficiency efforts in areas such as air quality compliance, new efficiency program design, and, where appropriate, legislation.

7.3 Industrial Energy Efficiency

7.3.1 Federal-Coupled Recognition Program

"Federal programs such as the U.S. DOE's Save Energy Now and the EPA Energy Star for Industry provide resources and recognition for companies engaged in industrial energy efficiency. Meanwhile, the Washington State University Extension, Energy Program has developed a sophisticated industrial energy efficiency technical assistance program in Washington State.

We propose to develop a partnership among the Washington State Department of Commerce and the WSU Extension Energy Program to provide additional recognition for companies engaged with federal industrial initiatives like those through U.S. DOE and/or EPA. The partnership will provide a combination of technical assistance, administrative assistance, and public recognition for successful industrial participants. A special emphasis will be given to international marketing of participating companies' products or services. Possibly, firms complying with the new ISO 50001 Energy Management Systems standard will also be given special recognition."

Status: The WSU Energy Program is developing a recognition program for industrial customers. They have been discussing the program with electric and gas utilities and the utilities have shown strong support for the idea. The specific details of how to best design and deploy the program are still under development. We anticipate some type of recognition program will be underway in the first or second quarter of 2012.

7.3.2 Streamlined Permitting of Combined Heat and Power Projects

"Various studies have indicated a large quantity of industrial waste heat available that could be used to generate electricity in combined heat & power (CHP) or "cogeneration" installations. If the industrial entity financing the CHP installation is able to sell the resulting electricity into the grid a project often appears profitable, but permitting, regulatory or

economic barriers can pose an insurmountable hurdle to implementation. Meanwhile, the U.S. EPA is developing a Waste Energy Recovery Registry according to requirements of the 2007 Energy Independence and Security Act, and Washington may benefit from preparing to respond to the CHP potentials revealed by the Registry.

In this initiative, Commerce will research the barriers to CHP deployment during calendar year 2011, and recommend a set of remedies that may include programmatic, regulatory or legislative solutions to be deployed in 2012."

Status: The WSU Energy program is completing a report on opportunities for and barriers to CHP expansion (as well as district energy and industrial efficiency). The report, *Washington Thermal Energy Efficiency Opportunities* will be completed by the end of 2011.

7.4 Transportation Efficiency and Technology

7.4.1 Energy Aware Growth Management

"Commerce will integrate transportation energy reduction into GMA technical assistance provided to local governments, in particular by updating the GMA Transportation Guidebook to be consistent with the goals and principles of the State Energy Strategy. Updates to the GMA Transportation Guidebook will address issues related to the integrated effects of urban planning and development on transportation energy, as well as to the required issues listed above. Commerce may also develop one or more model land use ordinances that encourage low-energy transportation choices that could be adapted and deployed by local governments that have an interest in doing so."

Status: Commerce is on schedule to complete an extensive update to the GMA Transportation Guidebook by February 2012.[251] Commerce is also preparing the following series of discussion briefs on topics related to planning and developing energy aware communities:

- Brownfield Redevelopment
- Compact Communities
- Complete Streets
- Distributed Energy
- Economic Development
- Historic Preservation
- Mixed-Use Development
- Infrastructure
- Parking
- Sense of Place

[251] Draft information on the update is available at the Commerce GMA website - http://www.commerce.wa.gov/Services/localgovernment/GrowthManagement/Pages/default.aspx **(S0071)**

- Smart Growth
- Transfer of Development Rights
- Transportation

These technical assistance papers will be posted on the Commerce website in December 2011.

7.4.2 Electric Vehicle Charging Station Siting

"Under this initiative, Commerce will provide technical assistance to local governments, when requested, on interpretation and implementation of the electric vehicle siting guidance. Though the siting guidance was developed with a primary purpose of enabling electric vehicle deployment, Commerce assistance will also help local governments coordinate charging station siting with existing laws, protecting environmental and cultural resources that may be affected."

Status: In 2009, the Washington State Legislature passed and the Governor signed into law 2SHB 1481, an Act relating to electric vehicles.[252] The law addresses electric vehicle infrastructure, which are defined as the structures, machinery and equipment necessary and integral to support an electric vehicle, including battery charging stations, rapid charging stations, and battery exchange stations.

The law requires that local government develop regulations allowing electric vehicle infrastructure as a use in all zones except those zoned for residential, resource or critical areas. This guidance extends the permitted use to these zones as well, although with some restrictions and limitations. The requirements apply to local jurisdictions as follows:

- By July 1, 2010, municipalities greater than 20,000 in population in King County that are adjacent to Interstate 5, Interstate 90, Interstate 405, or State Route 520, and all municipalities adjacent to I-5 in Pierce, Snohomish and Thurston Counties, must allow electric vehicle infrastructure.
- By July 1, 2011, municipalities less than 20,000 in population in King County that are adjacent to these freeways, and all municipalities statewide adjacent to I-5 and I-90 statewide, are required to allow electric vehicle infrastructure.
- The remaining municipalities across the state are required to allow battery-charging stations by July 1, 2011.
- For unincorporated county lands, the law imposes similar 2010 and 2011 deadlines for electric vehicle infrastructure, but only within a one-mile buffer around these freeways. For battery charging stations, the entire area of the county is affected — except those zoned for residential, resource, or critical areas — by 2011.

In July 2010, the PSRC, with the assistance of Commerce, produced *Electric Vehicle Infrastructure – A Guide for Local Governments in Washington.*[253] By the fall of 2011, more than 100 jurisdictions had adopted electric vehicle infrastructure ordinances.[254]

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[252] RCW 43.21C.410

[253] Available at http://www.psrc.org/transportation/ev/model-guidance **(S0087)**

7.4.3 Uniform Regulatory Protection for Charging Stations

"Under current state law, operation by a private company of an electric vehicle charging station, which involves the sale or resale of electricity, may be subject to UTC regulation, including rates, terms of service, and consumer protection. The UTC is reviewing current law, rules, and tariffs to determine whether the current regulatory structure facilitates deployment of charging stations and encourages adoption of electric vehicles. If statutory changes are needed, the UTC will work with Commerce and Transportation to develop appropriate legislation.

Following any conclusions made by the UTC, Commerce may pursue rulemaking or legislation that provides vehicle charging stations in the service territories of public utilities (which are unaffected by UTC decisions) with protections or remedies equivalent to those recommended by the UTC for charging stations potentially under its jurisdiction."

Status: The 2011 Legislature unanimously passed and the Governor signed SHB 1571,[255], limiting the regulation of electric vehicle battery charging facilities. The legislation prohibits the UTC for regulation battery charging facilities for the public and allows regulation electric utilities to offer such facilities as part of their regulated service. Commerce determined that there was no additional legislation or rulemaking necessary for public utility service territories.

7.4.4 Amend Renewable Fuels Standard

"Commerce proposes to support reasonable legislation brought to the 2011 session that converts the existing, volumetric renewable fuels standard to the universal type that has been proven by the prior work of other states."

Status: Legislation to amend the state's renewable fuels standard was introduced in the 2011 legislative session (HB 1606 and SB 5478) but did not pass. The 2012 Advancing Transportation Efficiency Near-Term Recommendations – 3.4.2 Renewable Fuels Standard reiterates the recommendation to adopt legislation.

7.4.5 Compressed Natural Gas

"Compressed natural gas (CNG) can fuel gasoline internal combustion engines with only slight modifications, and has been deployed for that purpose for decades. CNG is currently embraced by a large number of commercial fleets to reduce greenhouse gas emissions, traditional pollutants, and costs, and to increase safety. Yet, there is comparatively little use of CNG in by Washington State fleets.

The Department of Commerce proposes to collaborate with other agencies to identify barriers to deployment of CNG in the state's fleet, and create a program accelerating its adoption."

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[254] For a summary of all Washington's plug-in electric vehicle legislation see www.electricdrive.wa.gov/policy.htm **(S0088)**

[255] RCW 80.28.320

Status: Washington has seen some key development of CNG fleets over the last 10 years. Pierce Transit completed conversion of its entire fleet to CNG in 2004.[261] Seattle Tacoma International Airport has all 166 taxicabs operated by the Seattle-Tacoma International Taxicab Association (STITA) fueled by compressed natural gas and the port has 47 natural gas vans, pickups and sedans in its fleet of 74 natural gas and hybrid vehicles. In some limited discussions with fleet managers by Commerce, the availability of fueling infrastructure is a key concern to the further deployment of CNG vehicles. Nonetheless, Commerce continues to believe that this is a promising avenue and will be looking for resources and partnership opportunities to encourage CNG, propane or other natural gas fueling, especially in fleet applications. In addition, Commerce has met with developers of CNG fueling facilities and they have indicated that heavy-duty vehicles may be a particularly good target for early deployment. The Department will continue to work with and encourage that development.

7.5 Streamlined Permitting for Clean and Advanced Energy Technologies

7.5.1 Energy Overlay Zones

"Energy Overlay Zones (EOZ) were formally acknowledged and protected by Senate Bill 5107 passed in 2009, which defines an EOZ as 'a formal plan enacted by the county legislative authority that establishes suitable areas for siting renewable resource projects based on currently available resources and existing infrastructure with sensitivity to adverse environmental impact.' In Klickitat County, an EOZ has been successful in promoting wind resource development in particular.

Fuels and Fleets

Besides CNG,[256] several other fuels compete for a niche of the transportation energy market. Some are relatively established, while others are highly experimental. They include electricity (see Section 3.4.1), propane,[257] methanol,[258] hydrogen,[259] even ammonia.[260] What they all do have in common, is that they are unsupported by the ubiquitous, roadside refueling infrastructure that gasoline and diesel enjoy. Hence, the best place to start with any of these fuels are fleets, where the expense of a new refueling station can be spread over multiple vehicles. It is for this reason that governments are often looked to, as a leader in introducing new fuels into the transportation system.

Choosing which *alternative fuels to deploy in the Washington state fleet is not easy, as each has unique signatures of price, price stability, emissions, vehicle availability, fueling equipment requirements, and so forth. In future energy strategies, Commerce will be working to deploy coordinated studies of all these factors that allow "apples to apples" comparisons among candidate fuels before fleet decisions are made.*

[256] The promising prospect for North American natural gas has generated some interest in other fuels derived from natural gas, not just CNG. For a description of some of these fuels and there relative performance on energy and emissions, see M Q Wang & H S Huang, *A Full Fuel-Cycle Analysis of Energy and Emissions Impacts of Transportation Fuels Produced from Natural Gas*, Argonne National Laboratory 1999. (**R0224**)

[257] M R Werpy, A Burnham & K Bertram, *Propane Vehicles: Status, Challenges, and Opportunities*, Argonne National Laboratory, May 2010 (**R0215**)

[258] L Bromberg & W K Cheng, *Methanol as an alternative transportation fuel in the US: Options for sustainable and/or energy-secure transportation*, MIT Sloan Automotive Laboratory 2010. (**R0216**)

[259] National Renewable Energy Laboratory, *Validation of Hydrogen Fuel Cell Vehicle and Infrastructure Technology*, U.S. Department of Energy 2007 (**R0217**).

[260] C Zamfirescu & I Dincer, "Using ammonia as a sustainable fuel," Journal of Power Sources 185 (2008) pp.459-465 (**R0218**).

[261] Pierce Transit's Clean Machines A breath of fresh air: Pierce Transit powers its bus fleet with compressed natural gas at www.piercetransit.org/cng.htm. **(R0211)**

For this initiative, Commerce will use the experience of Klickitat County and other local governments to create a guidance document to assist other counties with development of their own EOZs; and provide technical assistance when helpful."

Status: Commerce is preparing a report considering alternatives to promote establishment of Energy Overlay Zones. The report recommends provision of financial incentives to local governments for the purpose of developing and implementing an EOZ. The report will be available as part of the supporting documentation for the 2012 Strategy.

7.5.2 Non-Project and Planned Action SEPA Reviews

"New energy projects may require State Environmental Policy Act (SEPA) review. To save time at the project permitting phase, a non-project SEPA review may be undertaken earlier by a local government. The non-project SEPA review would focus on the planning, siting, and permits needed for energy projects before a specific project is proposed. The non-project review would apply to any project of a certain class, undertaken within a certain geographic area, with the class and area both being defined within the non-project review. Once complete, any project meeting the definitions and other requirements in the non-project review may rely on the review to streamline project-level SEPA and permitting.

Planned Action SEPA reviews go a step further by proactively writing an ordinance(s) that limit the impacts and ensure project conformance with the mitigation requirements associated with a non-project Environmental Impact Statement (EIS). Streamlining associated with planned actions may go beyond ordinance writing, for example Commerce could provide information that assists in creating mitigation banks.

As with the non-project SEPA review, Commerce will be able to offer technical assistance with Planned Action SEPA review and development of implementing mitigation regulations. Commerce will partner with Ecology, Department of Fish and Wildlife, and other state agencies to create comprehensive templates for successful non-project SEPA review. Prior legislation established a Planning and Environmental Review Fund (PERF) which was designed to assist local governments with planned action reviews. This fund is currently empty. Commerce may propose legislation to re-seed the PERF, but this time as a revolving loan rather than as a grant fund. To repay the loan, a local government may assess fees to parties developing projects that fall under the non-project SEPA review."

Status: Commerce developed a report highlighting opportunities for local government to streamline permitting of renewable energy facilities as well as infill development in urban areas.[262] The recommendations encourage greater use of Planned Actions as well as other streamlining strategies. The report will be available as part of the supporting documentation for the 2012 Energy Strategy.

[262] Department of Commerce, Streamlining *Local Government Project Review and Permitting for Renewable Energy Facilities and Infill Development, November 2011.* **(S0063)**

7.5.3 Prequalification of Advanced Technologies under I-937

"Initiative 937, voted into law in 2006, is the state's renewable portfolio standard. Power developers and utilities have raised questions about whether a particular technology is "an eligible renewable resource" under the law and how unusual cases should be treated. In the absence of a definitive method to determine eligibility, developers of innovative resources may have insufficient assurance of their project's benefits to proceed. To date, the UTC, the State Auditor's Office and Department of Commerce have informally spoken to individual utilities and developers on a case by case basis.

We propose that the UTC, the State Auditor's Office and Commerce develop a public procedure that could pre-determine whether a generating resource would likely be considered an eligible resource when submitted by a utility as part of its compliance documentation. The procedure would be set up through an MOU, an exchange of letters, or a coordinated rule making, depending on legal advice as to how much formality is needed. Developers and utilities would be assured that if their proposed project or technology is determined to be eligible, the after-the-fact review would focus on whether the generation resource is within the parameters described in the proposal for pre-determination."

Status: Commerce, the Auditor and the UTC have established a process for providing informal opinions on eligibility issues related to I-937. That process has formally responded to about one dozen requests for opinions.[263] In addition, the UTC issued a *Policy State Regarding Process for Determining Whether Projects are "Eligible Renewable Resources" under RCW 19.285 and WAC 480-109.* The UTC policy statement allows Investor-Owned Utilities (IOUs) regulated by the UTC to seek a formal declaratory order on proposed project eligibility.[264]

If the 2012 or 2013 legislative sessions do consider modifications to the I-937, we expect to develop a legislative proposal for pre-qualification.

7.5.4 Accelerated Permitting for Pilot Projects

"Pilot energy generation or energy infrastructure projects, though smaller in scale than conventional generation or infrastructure projects, often find themselves faced by the same, substantial permitting requirements as a full-scale undertaking. By nature of their smaller size pilot projects are usually (but not always) less likely to have significant impacts; and furthermore it is in the state's interest to support our innovators by providing them the regulatory space to test new concepts.

This initiative begins as a research project consisting of a thorough mapping of the permitting process a pilot energy project goes through at state agencies, including duration of each step. This mapping will be done in close collaboration with the Department of Ecology, the Department of Natural Resources, the Governor's Office of Regulatory Assistance, the Energy Facility Site Evaluation Council and other agencies typically

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[263] http://www.commerce.wa.gov/Programs/Energy/Office/Utilities/Pages/EnergyIndependence.aspx . **(S0065)**

[264] UTC Docket UE-111016 available at http://www.utc.wa.gov/docs/Pages/DocketLookup.aspx?FilingID=111016 **(S0066)**

participating in project review. Next, Commerce will identify those steps that can be streamlined in the case of pilot projects, once again with due respect for the special suite of possible environmental impacts associated with each class of technologies. Finally, in those cases where Commerce and the regulating agencies can come to agreement on adjustments appropriate for pilot projects, Commerce will lead administrative, regulatory or legislative steps necessary to enable an appropriate, streamlined process. Any legislation called for would be introduced in 2012 at the earliest."

Status: Work in this area is currently underway and a report is forthcoming. Many variables have been discovered (especially for in stream and marine applications) and need to be worked through in order to propose potential solutions. Some applications will also require partnerships with federal agencies.

7.5.5 Energy Technology Test Zones

"The permitting load associated with energy technology pilot projects could be vastly reduced by designating one or more energy technology test zones in which pilot projects under a maximum size and within a certain class of technologies may be deployed with limited permitting requirements that would still ensure environmental compliance. Recently, for example, the federal government opened a Solar Demonstration Zone located on Bureau of Land Management lands in Nevada. The concept is also similar to "energy parks" established at a few locations around the world that co-locate various energy research & development firms both to fertilize innovation among the inventors, as well as to allow easier deployment of test facilities.

Given the relatively few examples in the United States, this initiative would also begin as a research project examining prior attempts to create energy test zones, the policies leading to failure or success, and the landscape of local, state and federal laws in which such a test zone would need to be deployed. Commerce will simultaneously reach out to county and municipal governments to see if there is a willing, small-government partner, and reach out to firms innovating in the energy field who would have a strong interest in utilizing such a zone. Outcomes of this research will lead to a more concrete policy recommendation in next year's Full Revision of the State Energy Strategy."

Status: Work in this area is currently underway and a report is forthcoming. Commerce identified many variables (especially between land and water facilities) that need to be worked through in order to propose potential alternatives. An upland location could be pursued by the state through use of a planned action or energy overlay zone approach. Projects that would fall within the scope of the predetermination could then proceed quickly. Projects that do not fall within the scope of the predetermination would require additional review, but only for the portions of the proposal not previously addressed. Some applications, especially for in-stream or marine projects, will require partnerships with federal agencies.

Chapter 8 – Summary and Conclusion

8.1 Near-Term Recommendations Summary

Table 8-1 summarizes the twenty near-term recommendations of the 2012 Washington State Energy Strategy.

transportation	buildings	distributed energy
3.4.1 electric vehicle support	4.4.1 non-residential disclosure	5.3.1 interconnection standards
3.4.2 RFS	4.4.2 residential disclosure	5.3.2 net metering policies
3.4.3 diesel engine fuel efficiency improvements	4.4.3 marketing and quality assurance	5.3.3 streamlined permitting for distributed energy
3.4.4 Commute Trip Reduction program expansion	4.4.4 meter-based financing	
3.4.5 smart growth and transportation planning	4.4.5 energy efficient property conversions	
3.4.6 transportation systems management	4.4.6 minimum standards for rental housing	
3.4.7 Regional Mobility Grants	4.4.7 sustaining investment in low-income weatherization programs	
3.4.8 electric vehicle mileage pricing pilot	4.4.8 prevailing wage class for weatherization	
3.4.9 car sharing and mileage based insurance		

Table 8-1: Near-term recommendations in the state Energy Strategy.

The State Energy Office, with assistance from the Technical Experts Panel, was able to quantify the impacts on energy consumption, price and greenhouse gas emissions for several of these policies, as described in detail in the "Previous Research and Implementation" and "New Analysis" sections associated with each recommendation, above. Figure 8-1 through Figure 8-4 illustrate the combined impact of several of those near-term recommendations for which all forecast impacts were quantifiable through the 2035 analysis horizon.

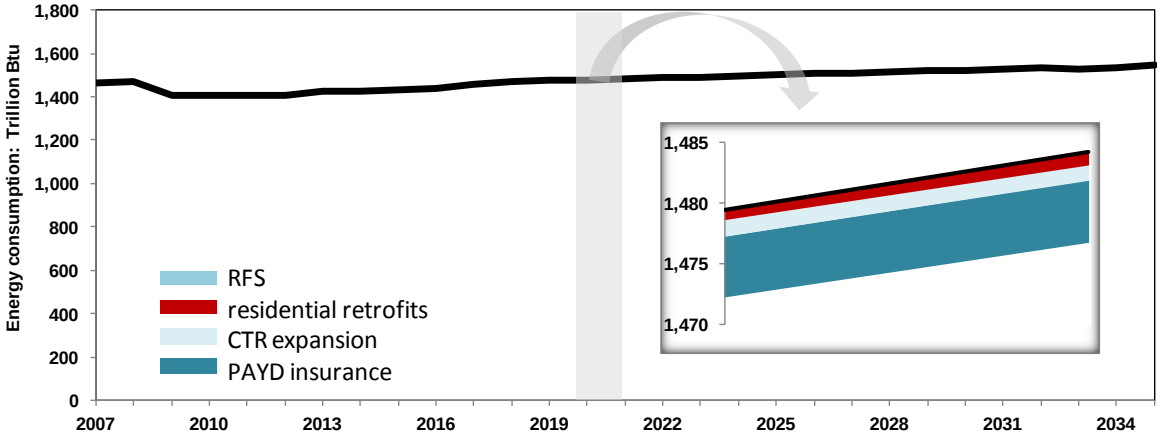

Figure 8-1: Reduction to forecast total energy consumption induced by the Energy Strategy near-term recommendations. CTR impact assumes doubling of number of affected employees; PAYD Insurance impact assumes a 7.5 cents/mile premium and 50 percent penetration into the insurance market by 2035; residential retrofits impact assumes an annual residential efficiency retrofit rate of 2 percent of housing stock versus status quo rate of 0.5 percent, and realized annual household savings of 23 mmBtu. (W0010)

In each figure, impacts of recommendations 3.4.2 *renewable fuels standard*, 3.4.4 *Commute Trip Reduction program expansion*, and 3.4.9 *car sharing and mileage-based insurance*, are depicted separately. The impacts of several buildings items from Chapter 4 are combined in a single category, *residential retrofits*, in order to account from overlap and interactions of the multiple buildings retrofit activities that affect the same market. There are also interaction effects between the other items included in the four figures, but these were not calculated for this report.

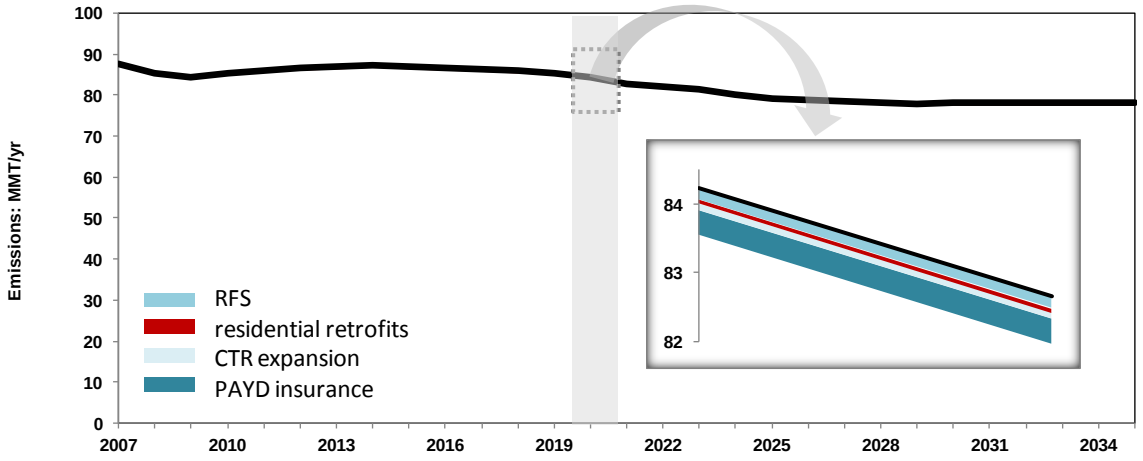

Figure 8-2: Reduction to forecast greenhouse gas emissions induced by the Energy Strategy near-term recommendations. (W0010)

Notable in all the figures, is the very small impact of near-term recommendations on the state's vital energy statistics. In the cases of gross energy, prices and greenhouse gases alike, the impact of any one near-term recommendation is well under one percent of the total for the state.

None of the calculations revealed significant, adverse impacts (increases) to these variables[265] so there is no reason not to do them, especially considering that in many cases they are important enabling steps for more ambitious, long-term options.

That said, even the near-term recommendations deserve an in-depth cost-benefit analysis as a last analytic step before the various implementation steps are followed. Though Commerce feels confident that the near-term recommendations all have relatively positive impacts on the four indicators mentioned here, those indicators do not always fully reflect the implementation cost. For recommendations that would likely be enacted through legislation, the fiscal note generated by the legislative process would likely be the core of such a cost-benefit analysis. For non-legislative measures, the lead agency would need to take the initiative to estimate costs prior to deployment.

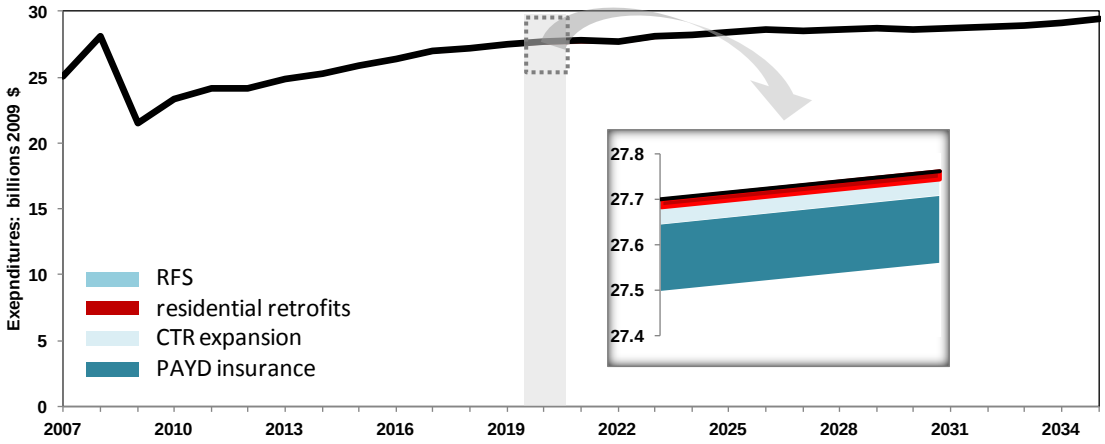

Figure 8-3: Reduction to forecast energy expenditures induced by the Energy Strategy near-term recommendations. (W0010)

Figure 8-4 shows the impacts of proposed policies on the Washington average household energy bill. Commerce expects residential energy expenditures to decline over the forecast horizon, driven almost entirely by the federal CAFE standards for vehicles, but also partly due to an expected decline in per-capita VMT during the forecast period.

[265] However, some did have small increases, for example residential energy bills in response to a Renewable Fuels Standard. In these cases, careful consideration was taken of the relative, positive impact on another metric (in this example, greenhouse gas emissions).

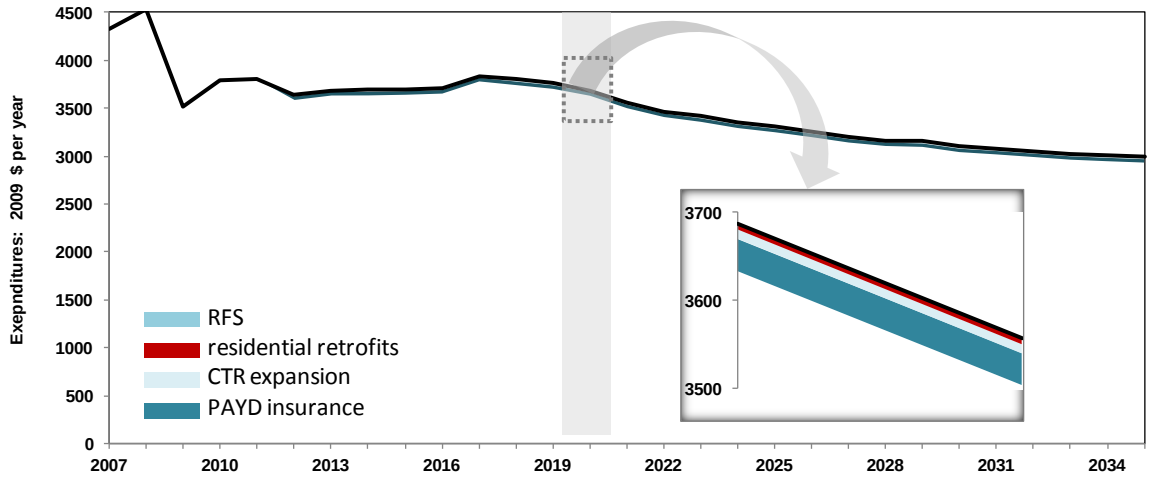

Figure 8-4: Reduction to residential energy expenditures induced by the Energy Strategy near-term recommendations. Policy assumptions are as described in Figure 8-1. (W0010)

Keeping in mind that not all the recommended policies were quantified through 2035, it is still worth noting that mileage-based insurance has a downward impact on residential energy expenditures larger than several other, substantive near-term policy options. Because mileage-based insurance is a voluntary financial mechanism that does not involve altering physical infrastructure, it can be deployed to a large fraction of the population very quickly in comparison. Also, mileage-based insurance applies a price signal to a large fraction of the household energy budget; its relative impact seems to demonstrate the power of pricing strategies in energy policy.

8.2 Comparing the Long-Term Policy Options

Table 8-2 summarizes long-term options discussed in this Energy Strategy.

transportation	buildings	distributed energy
3.5.1 revenue neutral feebate 3.5.2 low carbon fuel standard 3.5.3 advanced aviation fuels 3.5.4 improvements to railroads 3.5.5 comprehensive trip reduction program 3.5.6 energy efficient transportation choices 3.5.7 emerging pricing methods - congestion pricing - mileage pricing - cordon pricing		5.4.1 DE-compliant power purchase agreements 5.4.2 distributed energy in I-937* 5.4.3 rationalize DE incentives • renewables sales tax • production incentives • biomass incentives • distributed energy credit in I-937*
6 carbon pricing		

Table 8-2: Long-term policy options in the Energy Strategy.

While the majority of short-term recommendations have the capacity to be deployed together, the long-term policy options, in contrast, are essentially a menu and there is no guarantee that any two are likely to be deployed simultaneously. Figure 8-1 shows the nominal forecast of Washington's total energy consumption without any of this Strategy's policies deployed, and contrasts it with forecasts each adjusted by the impact of one of the long-term policy options. So unlike Figure 8-1 through Figure 8-4 where the short-term recommendations are illustrated as cumulative, here they are compared as if deployed in isolation.

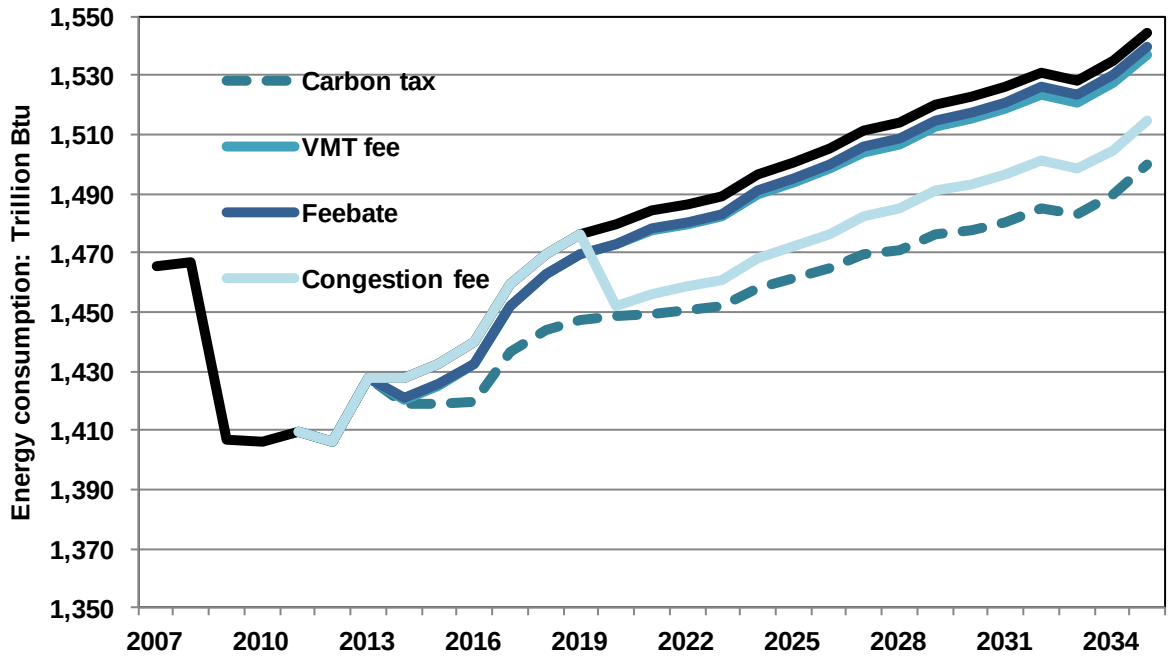

Figure 8-5: Adjusted total energy consumption forecasts for several long-term policy options. Note the vertical axis does not begin at zero. Carbon Tax impact assumes a BC-like revenue-neutral tax of $30/MT with five year phase-in; the VMT Fee impact assumes a 5 cents/mi fee; the Congestion Fee impact assumes a 15¢/mi rate applied to 10 percent of the highway system; the Feebate impact assumes duplication in Washington of the proposed California feebate program, but discounts energy savings by 50 percent due to more recent more rigorous CAFE standards. (W0011)

Not surprisingly, several of the long-term policy options have potential impacts larger than the short-term recommendations, because they are the more deeply cutting shifts in the state economy. In order to have significant impact on the state's energy outlook, state policymakers will need to continue to grapple with the more difficult, long-term policy options.

Figure 8-6 through Figure 8-8 complete the picture for long-term options, with projections for changes to energy expenditures, CO_2 emissions and average household energy bills.

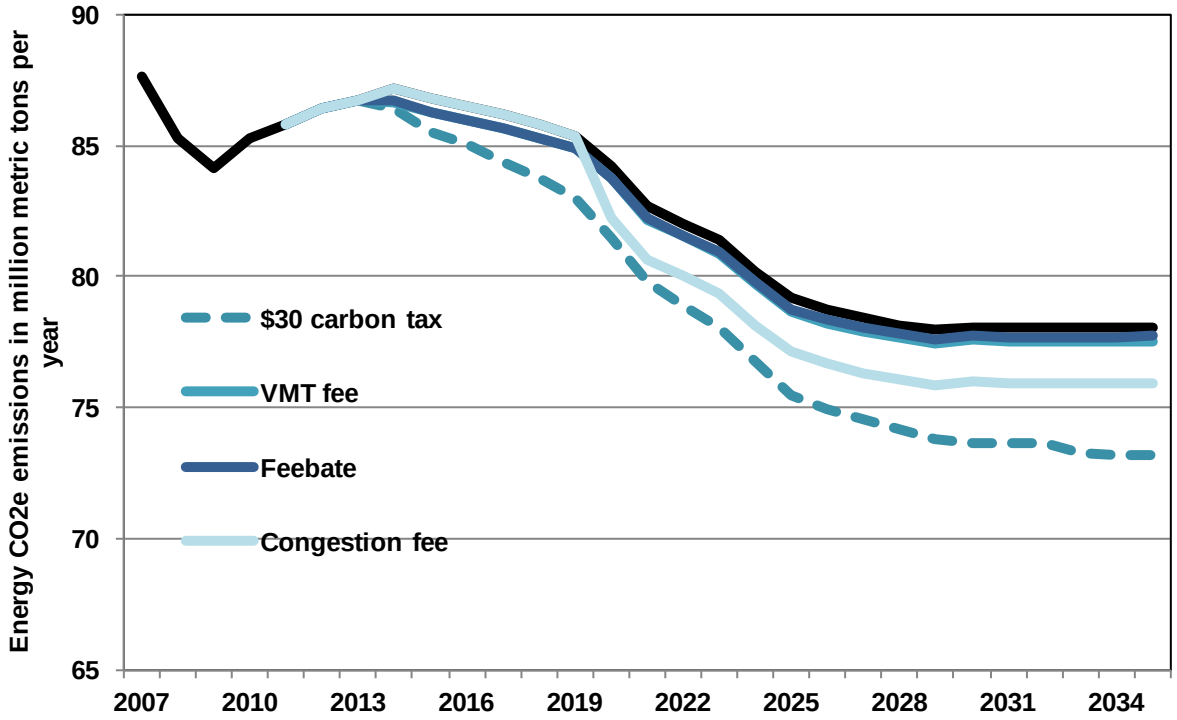

Figure 8-6: Adjusted energy-related CO_2 emissions forecasts for several long-term policy options. Note the vertical axis does not begin at zero. (W0011)

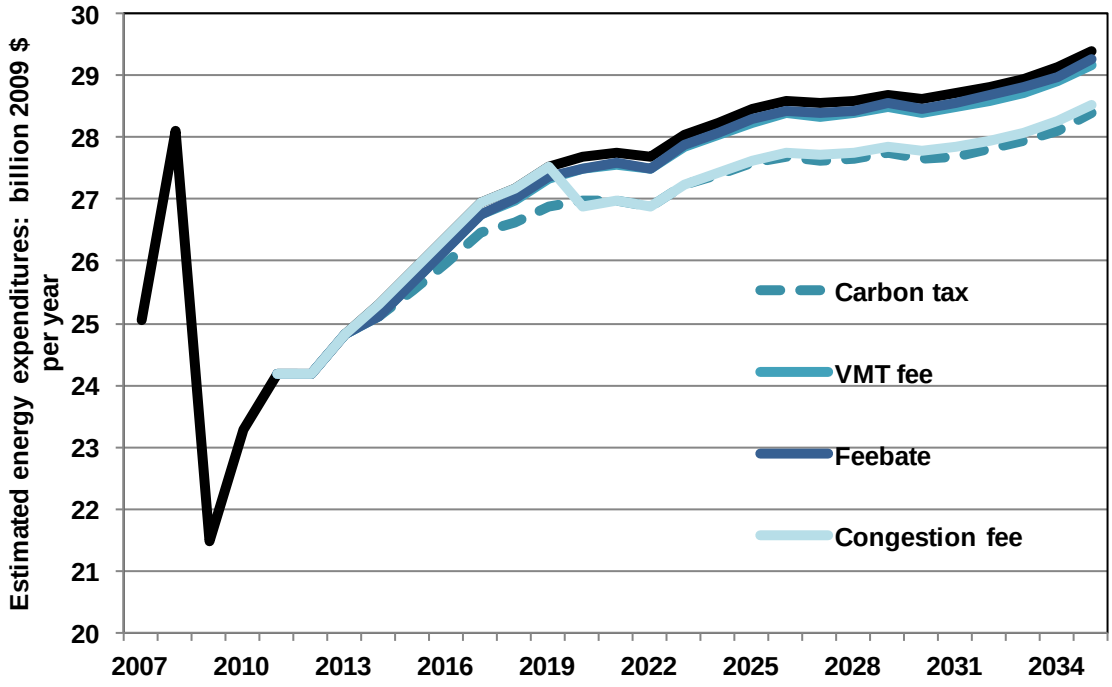

Figure 8-7: Adjusted energy expenditure forecasts for several long-term policy options. Note the vertical axis does not begin at zero. (W0011)

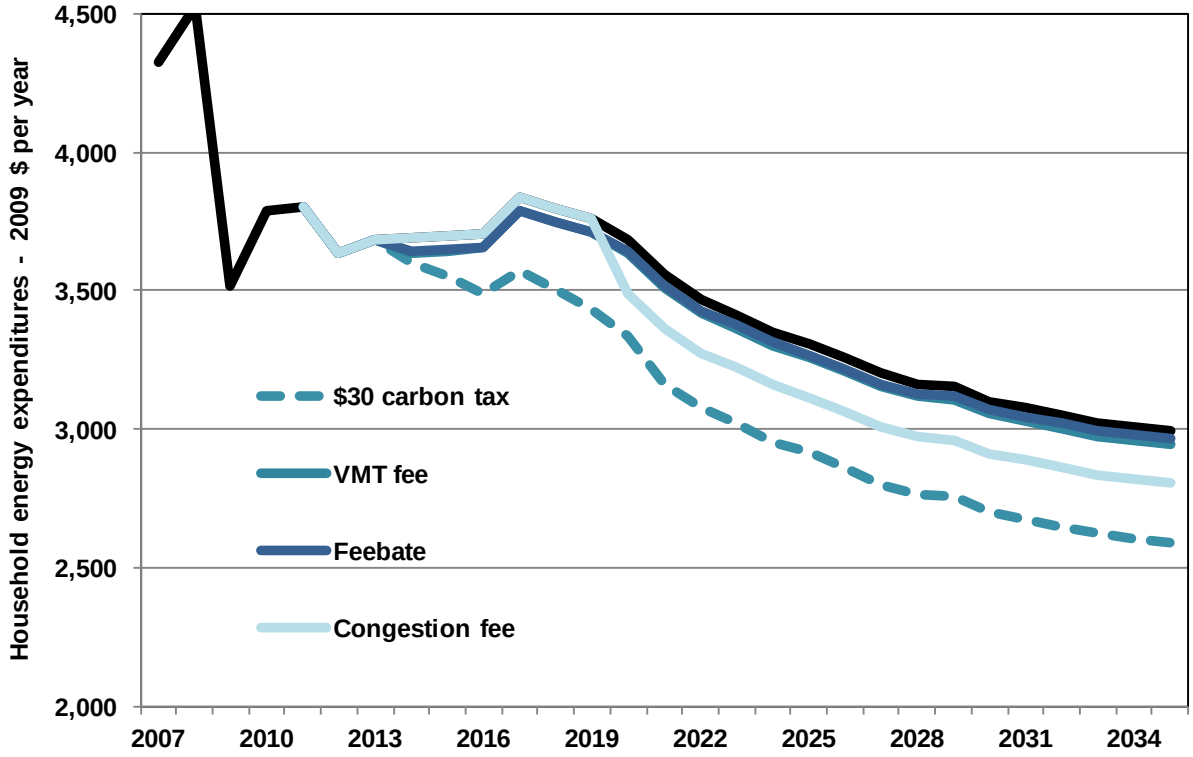

Figure 8-8: Adjusted residential energy expenditures forecasts for several long-term policy options. Note the vertical axis does not begin at zero. (W0011)

8.3 Toward the 2015 Energy Strategy

8.3.1 Analytic Framework

Commerce and the Technical Experts Panel have developed an analytic framework representing the flow of calculations and information necessary to arrive at estimates of energy price, price volatility, jobs impacts and greenhouse gas emissions associated with any given package of policies (Appendix D). The analytic framework represents an integrated process suitable to testing nearly any energy policy option, and stands as a long-term goal toward sophisticated, regular analysis of the energy system in future Energy Strategies. As consecutive Energy Strategies are released, Commerce will gradually work toward developing an integrated analysis system, but for this first Energy Strategy since 1993, the agency has depended heavily on existing analyses on a policy-by-policy basis, new analysis at the Energy Office, or on assistance provided by Technical Experts Panel members.

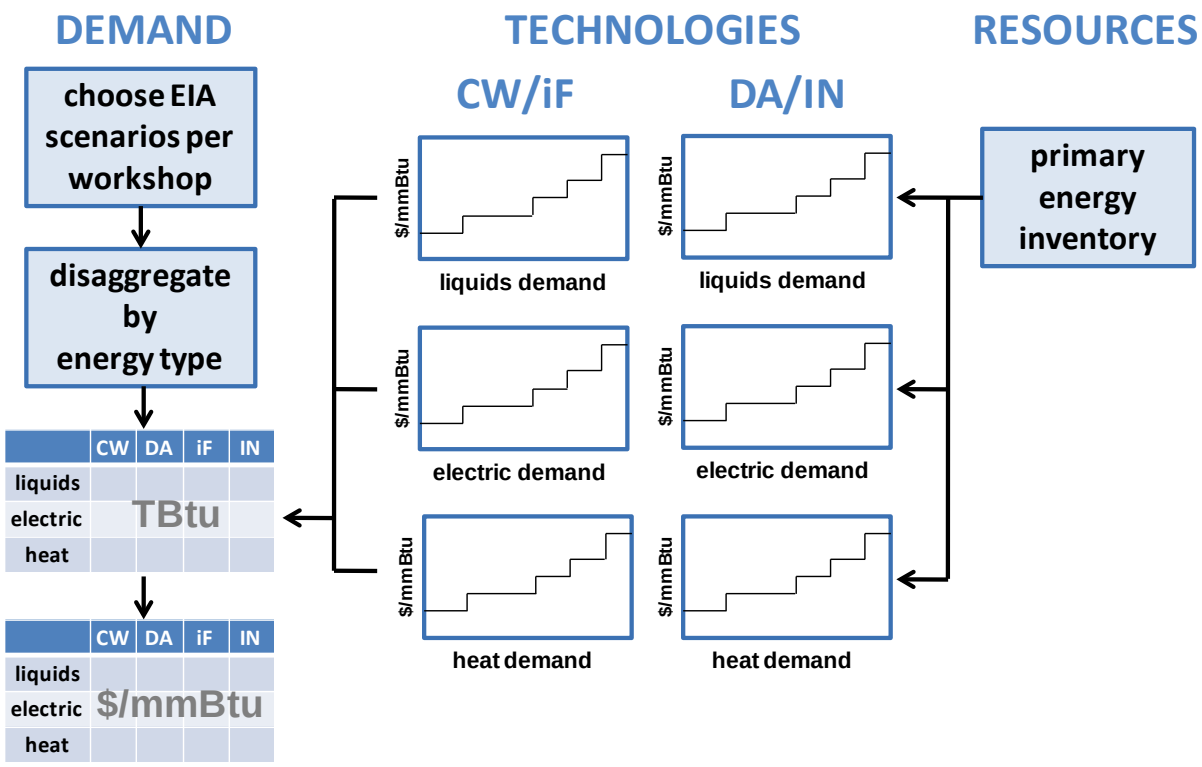

Figure 8-9: Washington Energy Modeling System (WEMS) in development. CW, iF, DA and IN are the four scenarios Corporate World, iFuture, Dark Age and Inertia developed in the scenario planning process.

During the period of work leading up to the 2012 Energy Strategy, the Energy Office at the Commerce has begun development on a Washington Energy Modeling System (WEMS, Figure 8-9). WEMS follows the fundamental structure of the Analytic Framework shown in Appendix D, dividing energy forecasting into three primary streams of projections: projections of *demand* describing the level of energy Washington is expected to need, based on estimates of future population, wealth, business activity and so forth; projections of *resources* describing the types of energy available according to Washington's specific geographic location and capacities for importing resources from elsewhere; and projections of *technologies*, most importantly those responsible for converting the primary energy resources into useful forms like electricity or heat.

The resource and demand projections are made by standard methods of economic projections and resource inventories. There are four versions of the demand projections, one complying with each of the future scenarios developed during the scenario planning workshop. In future energy strategies, the quantities and costs for the resource projections will be adjusted to account for expected physical effects from climate change and tested against future federal greenhouse gas regulation scenarios.

The projections of technologies are the core, unique character of WEMS: they require the input from expert panels[266] to estimate costs and potentials of candidate technologies. For every

[266] There is an extensive literature on methods for eliciting quantitative estimates from expert panels; in most cases this is done with a variant of the Delphi method, see *e.g.* H A Linstone & M Turoff, *The Delphi Method: Techniques and Applications*, New Jersey Institute of Technology 2002, available at www.is.njit.edu/pubs/delphibook/delphibook.pdf **(R0212)**

candidate conversion technology, the experts panel forecasts the quantity and price of that technology likely to enter the energy system under both a pessimistic technology scenario (identified with the *Dark* Age or *Inertia* world developed in the Scenario Planning process) and an optimistic technology scenario (identified with the *Corporate World* or *iFuture* scenarios). The experts estimates are compiled in WEMS, and then WEMS generates "supply curves" by ordering the conversion technologies in price order, so that marginal costs of liquid fuels, electricity and heat are plotted against the total quantity of each demanded.

Finally, for each of the four demand scenarios, WEMS walks up the three relevant supply curves (liquids, electricity and heat) to estimate the average and marginal prices for the three fundamental energy products.

8.3.2 The Effect of Energy Policy on Revenue Generation

About 10 percent of the state's tax revenue is tied to energy consumption, primarily through fuel taxes (Table 8-3). It is impossible to consider energy policy without weighing impacts that policy shifts may have on the state's ability to fund the services it provides to citizens, including in part the very infrastructure of the energy system, for example state highways.

Tax	RCW	2009 Collections ($000)	% of Total State Taxes
Brokered Natural Gas Use Tax	82.12.022 and 82.14.230	$46,730	0.3
Special Fuel Tax	82.38 and 70.149	$213,699	1.4
Aircraft Fuel Tax+	82.42	$1,999	<0.1
Motor Vehicle Fuel Tax	82.36	$965,761	6.2
Public Utility Tax*	82.16	$304,248	2.0
Petroleum Products Tax	82.23A	$609	<0.1
Public Utility District Privilege Tax	54.28	$19,073	0.3
	totals	$1,552,119	10.2

\+ Aircraft fuel is also subject to retail sales/use tax – not included in 2009 collections

* The Public Utility Tax represents revenues from electricity and natural gas sales only

This table does not include any business and occupation taxes on energy related business activities, excise taxes on energy using equipment or other taxes where energy use is a minor contributor to total revenue.

In 2009 total revenues for all state government funds amount to $30.7 billion. Taxes accounted for $15.billion of that total.

Table 8-3: Energy related taxes in Washington. Source: Washington State Department of Revenue - *Tax Reference Manual 2010*. (S0093)

For each tax in the table, the amount of revenue produced is directly related to the amount of petroleum, natural gas, electricity or other fuel or energy sources used. Increases in energy efficiency and changes in the overall fuel mix will have impacts on the amount of collections coming to the state. For example, the federal CAFE standards discussed in Section 3.2.4 will significantly improve the overall fuel economy of the state and national vehicle fleets. This will mean decreased sales of motor fuels and a decline in revenue from the motor vehicle fuel tax. Similarly, major improvements in building and industrial efficiency may result in declines in both natural gas and electricity sales with similar revenue reductions.

Energy purchases consume 6.5 percent of all spending in Washington,[267] so several of the deeper-reaching, long-term policy options have the capacity to shift the revenue picture offered by the current suite of energy taxes substantially (Figure 8-10).

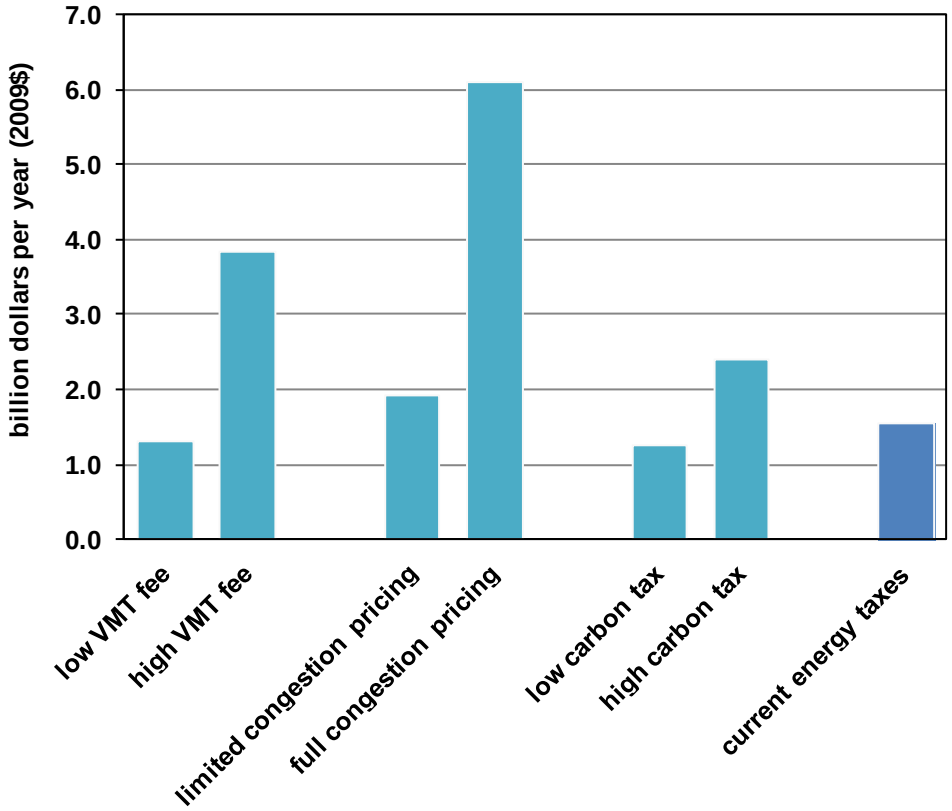

Figure 8-10: Revenue potential associated with several long-term policy options, and revenue produced by the current suite of energy related taxes. Revenue potentials are calculated against the estimated demographic and economic background for calendar year 2020. The low and high VMT fees were modeled as 2.5 cents/mi and 7.5 cents/mi respectively; limited and full congestion pricing was modeled on highways in the Puget Sound region or on all roads in the Puget Sound region respectively; and low and high carbon taxes were modeled as $20/MTCO$_2$e and $30/MTCO$_2$e respectively. Calculation methodologies are as described in Section 3.5.7 (VMT and congestion fees) and 5.1 (carbon tax). (W0004)

As efficiency continues to improve in the energy system and energy related tax revenues become constrained, long-term policy options like mileage pricing or congestion pricing could move pricing to the services or infrastructure that are actually valuable to the consumer, and away from the fuel. Alternatively, policy options like a carbon tax or low carbon fuel standard encourage fuels with lower environmental or social impacts in a more nuanced way than the existing energy related taxes. As the 2015 Energy Strategy is developed, and long-term policy options are compared to each other, multiple state agencies will need to negotiate the relationship between energy policy and state revenue generation carefully.

A key point of debate in these discussions will be the degree to which revenue generated in one energy system may or may not be applied to other energy-related systems, or outside the

[267] Direct spending on energy in the gross state product.

energy system entirely. Can congestion fees on roads be used to fund transit systems that relieve the congestion? Can carbon taxes be returned to consumers, and, if so, how should those returns be allocated? Can mileage fees be used to displace other revenue sources of the state's general fund, e.g., sales taxes? All of these are difficult questions, but they must be faced head-on if the state is to make significant cuts in energy costs or emissions beyond the incremental steps made in the short-term recommendations. This is a volatile political issue, as evidenced by the existence of an amendment to the Washington State Constitution prohibiting the use of certain fuel and vehicle taxes for non-road uses.[268]

As this Energy Strategy goes to press the Governor's *Connecting Washington* task force is at work balancing these interests, and many others, to craft transportation financing recommendations for the 2012 Legislature.[269]

8.3.3 Special Topics

Several special topics have received interest from the Advisory Committee and other stakeholders, but did not receive significant attention in the three focus areas chosen for the 2012 release of the Energy Strategy. Commerce will consider, among many other topics, these for extended attention in 2015:

- **Safety and Security –** Protection of Washingtonians' safety and security was suggested by several stakeholders as a presumptive goal for the Energy Strategy; it was not included in the three goals or nine principles cited in the enabling legislation. Energy security is already handled separately in the Washington State Energy Assurance and Emergency Preparedness Plan and in the Washington State Sector Specific Plan for Critical Energy Infrastructure.[270] Still, members of the Advisory Committee and staff at Commerce found safety and security to be a very reasonable additional goal for the Energy Strategy, and Commerce will attempt to include analyses of safety and security among the supporting work in future energy strategies.
- **Nuclear Energy –** Washington's long and complex history with nuclear energy makes the state rich with nuclear energy boosters and opponents alike, so Commerce has heard strong words about nuclear energy from both sides during the 2012 Energy Strategy process. Research at Pacific Northwest National Laboratory and a few private firms such as TerraPower and, of course, Energy Northwest's operating nuclear plant, support a healthy population of topic experts with which Washington may be able to make some well-considered policy decisions regarding nuclear energy. The topic was not considered in detail for the 2012 Energy Strategy as it did not fall within any of the three areas (Transportation, Buildings, Distributed Energy) chosen for deeper treatment.
- **Renewables Integration and Energy Storage –** With new, large contributions from wind to the state's electric generation, integration of intermittent renewable energy into the grid has become a topic of intensive interest and discussion. It was not treated in the 2012 Energy

[268] Const. art. II, § 40. Art.II §40 was approved as Amendment 18 to the state constitution in November 1944.

[269] http://www.governor.wa.gov/priorities/transportation/connectwa.asp

[270] Documents at http://www.commerce.wa.gov/Programs/Energy/Office/Topics/Pages/EnergyEmergencies.aspx. **(S0089) (S0090)**

Strategy because the Clean Energy Leadership Council launched an effort on this front separately and it did not fall into one of the three focus areas. Pacific Northwest National Laboratory is an important research center of energy storage,[271] and many businesses in Washington are developing energy storage and related technologies. Recent new laws in Texas[272] and California[273] will serve as important learning experiences on which Washington can build sound energy storage policy in the future.

- **Smart Grid –** Smart grid refers to the application of modern technologies to the electric generation, delivery and demand infrastructure. A few possible components of smart grid are:
  - support for demand response technologies;
  - grid resilience through sophisticated design and monitoring (*e.g.* synchrophasors);
  - support for distributed energy;
  - real-time consumer price signals; and
  - increased energy storage.

  Many definitions of "smart grid" exist, and other components besides those listed may be considered essential by some parties. Washington has a strong reputation for technology development, so it is considered an excellent candidate for smart grid technology research and business development, as well as for deployment.
- **Comprehensive Amendment of I-937 –** Washington's renewable portfolio standard, I-937, has been the subject of much debate since its passage in 2006. Topics of contention range widely, including among others defining which renewables count toward the portfolio target; mechanisms to ease financial pressures on utilities with flat or declining load growth; and rules surrounding awarding and trade of renewable energy credits. The Advisory Committee acknowledged that many of these difficult issues were being addressed by negotiations preceding the 2012 legislative session, and deferred legal recommendations to those forums. Some clarification of definitions was possible without statutory changes, and these have been tackled in the 2011 Energy Strategy Update, using the pre-qualification process described in Section 7.5.3 of this report. If solutions to the deeper issues surrounding I-937 do not appear out of the legislative negotiations, a future Energy Strategy may undertake to propose a comprehensive amendment to the renewable portfolio standard.
- **Waste-to-Energy –** Exciting opportunities to integrate waste management with clean energy production, transportation and food systems are beginning to emerge. Many of these offer significant reductions in greenhouse gas emissions, creative solutions to air and water quality concerns, and additional revenue streams, especially in rural economies. Growing collaborations between research institutions, private technology providers and public

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[271] See, *e.g.*, Z Yang et al, "Electrochemical Energy Storage for Green Grid," *Chemical Reviews* 111 (2011) pp.3577-3613 and M Kintner-Meyer et al, *Energy Storage for Power Systems Applications: A Regional Assessment for the Northwest Power Pool (NWPP)*, Pacific Northwest National Laboratory 2010. **(R0161)**

[272] Senate Bill 943, 2011 regular session. Rulemaking is being handled by the Public Utility Commission of Texas, see http://www.puc.state.tx.us/industry/projects/rules/39657/39657.aspx. **(R0213)**

[273] Assembly Bill 2514, 2010 regular session. Rulemaking is being handled by the California Public Utilities Commission, see http://www.cpuc.ca.gov/PUC/energy/electric/storage.htm. **(R0214)**

infrastructure managers are identifying pathways uniquely tailored to Washington State feedstocks and process technologies. From advanced drop-in biofuels for aviation and other forms of transportation to nutrient recovery and high-value precursor chemicals, waste-to-energy projects are realizing greater efficiencies in electrical and thermal generation while also displacing fossil fuel-based products throughout many sectors of the state's economy. With ongoing efforts at many state and federal research institutions, Ecology's ongoing review of solid waste rules, and strong interest in the emerging field of green chemistry, development of waste-to-energy projects will require ongoing coordination and a comprehensive review of related state regulatory and incentive programs to realize their full potential.

- **System Benefit Charge –** Several states levy a system benefit charge to utility customers. The revenues from the charge are pooled in a dedicated fund that can be used, depending on the law that created it, to provide assistance to low-income customers, implement energy efficiency measures, deploy demand side management measures, or find other ways to improve the energy system that accrue to energy customers on a statewide basis. Since a system benefit charge is simply a financing mechanism, any proposal for one in a future Energy Strategy will need to be tied to a concrete proposal for directing the funds received in a way constructive to the Energy Strategy goals.

The topics listed in this section highlight those that received particularly high Advisory Committee or stakeholder attention. Of course, the Policy Options document (Appendix C) lists well over 100 additional policy focuses that will be given renewed attention in the early phases of the 2015 Energy Strategy.

8.4 Conclusion

Washington has a reliable and cost-effective system of producing and delivering energy for its homes, businesses, factories and vehicles. Citizens of the state can rightfully take pride in the energy resources developed here by industry and government. Whether it's as big as the Grand Coulee Dam or as small as an electric vehicle charging station along Highway 2, Washington has met the need for energy resources as its economy has developed and prospered. However, as strong as this foundation is, it will not be enough to meet the energy needs of the future. The state must squeeze more out of its energy resources in order to meet the need for clean energy job growth, fair and competitive energy prices, and a substantial reduction in greenhouse emissions.

This 2012 Washington State Energy Strategy provides guidance for this necessary transformation, starting with transportation, the state's biggest and least efficient energy consumption sector. The Energy Strategy shows how Washington can make progress by building the infrastructure for significantly more efficient vehicles, by improving motor fuels to lower their greenhouse gas impact, and by helping citizens accomplish more with fewer trips and travel miles. In the residential and commercial sectors, the Energy Strategy offers measures to transform the way energy is used in buildings. Greater energy efficiency requires information and investment. It brings jobs, especially in the construction industry, more disposable income and a stronger local economy.

On the energy supply side, this strategy guides Washington toward a less centralized and more diverse energy portfolio. There is currently great interest in small-scale renewable energy projects and that interest will grow with technological breakthroughs and fossil fuel price increases.

As the state implements the 2012 Washington State Energy Strategy, it would be easy to focus exclusively on the near-term action items. The near-term recommendations present an ambitious agenda, one that requires the concerted effort of many stakeholders in the public and private sectors. However, there are fundamental policy questions raised in this strategy that should be answered if the state is to maintain progress over the long-term. Examples include carbon pricing, land use planning and utility resource portfolio requirements. What must Washington do to ensure a future with clean energy jobs, fair energy prices, and a stable climate?