Thurston County Board Briefing

DEPARTMENT: **PLANNING DEPARTMENT**

BRIEFING DATE: January 26, 2011, 2:00 to 4:00 p.m.

STAFF CONTACT: Planning Department
Scott Clark, Director
Jeremy Davis, Associate Planner

SUBJECT: Biomass Moratorium State Agency and ORCAA Informational Briefing

PURPOSE: **The purpose of the briefing is to allow state agencies and ORCAA to provide information to the Board regarding biomass facilities, including incineration and gasification.**

BACKGROUND:

On December 21, 2010, the Board of County Commissioners adopted a moratorium on new biomass facilities and interim regulations, Ordinance No. 14449. Biomass facilities generally include two types including conversion (incineration) and gasification. Each type has its own processes and impacts. The moratorium was passed in response to increasing citizen concerns in western Washington regarding environmental and siting issues for these facilities and because these facilities are not addressed in the Thurston County Code. A series of briefings have been arranged to provide information for the Board of County Commissioners. In addition, the Board scheduled a public hearing for February 7, 2011 as required by RCW 36.70A.390 for moratoria and interim regulations.

Meeting Dates (Subject to Change):

- January 26, 2011 – State Agency and Olympic Region Clean Air Agency Briefing
- February 1, 2011 – Board of Health Meeting
- February 2, 2011 – The Evergreen State College briefing
- February 3, 2011 – Concerned Citizens of Thurston County briefing
- February 7, 2011 – Public Hearing on Ordinance No. 14449 (Room 152)
- February 9, 2011 – Post-public hearing briefing

Briefing Agenda:

Today's briefing will include presentations from various state agencies knowledgeable about biomass facilities and from the Olympic Region Clean Air Agency. The subject areas to be covered by each agency are shown in general terms below.

Department of Commerce:

Peter Moulton – Washington State Bioenergy Coordinator

- Statewide biomass policy
- Overview of statewide bioenergy policy issues
- Biomass Facilities – Types and Differences

Website: http://www.bioenergy.wa.gov/Default.aspx

Olympia Region Clean Air Agency:

Fran McNair, Executive Director

Gordon Lance, Engineer II

Mark Goodin, Professional Engineer

- Woody Biomass Emissions Study
- Process Technolgies
- Air Quality ORCAA Permitting Process
- Air Emissions Cycle

Website: http://www.orcaa.org/woody-biomass-emissions-study

Washington Department of Natural Resources:

Craig Partridge, Policy Director and/or

Rachel Jamison, Climate Policy Specialist

- Source Material and Forest Practices
- Carbon Neutrality
- Forest Biomass Initiative

Website:
http://www.dnr.wa.gov/ResearchScience/Topics/OtherConservationInformation/Pages/em_biomass.aspx

Washington Department of Ecology:

Sally Toteff, Regional Director, Southwest Regional Office

- Industrial Stormwater
- Water Quality

ANALYSIS:

Moratorium and Interim Regulations:

The moratorium, Ordinance No. 14449, prohibits biomass facilities as a permitted use in Thurston County. This includes conversion (incineration) and gasification plants. There are two circumstances where the moratorium may not prohibit siting such facilities, which include:

- Essential public facilities as defined by the Growth Management Act (Section 36.70A.200 RCW) may not be precluded.
- Facilities that fall under the jurisdiction of the Washington State Energy Facility Site Evaluation Council energy facility certification process pursuant to Chapter 80.50 RCW. Chapter 80.50 RCW permits the council to preempt local zoning regulations.

Essential public facilities are still subject to the applicable permitting process in the Thurston County Code. This process is outlined in the special use permit chapter of each zoning code.

The interim regulations adopted by Ordinance No. 14449 define biomass facilities as follows:

- "Bio-mass facility" means a facility which uses a bio-mass conversion or bio-mass gasification process for the production of electricity, steam, or heat.
- "Bio-mass conversion" or "bio-mass energy production" means the controlled combustion, when separated from other solid waste and used for producing electricity, steam, or heat, of (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat. Bio-mass conversion does not include the controlled combustion of solid waste materials such as sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste.
- "Bio-mass gasification" means a technology that uses a non-combustion process to convert solid waste such as (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat to a fuel for the purpose of generating electricity, steam, or heat.

Comprehensive Plan Docket and Work Plan

In addition, the 2010-11 Official Docket of Comprehensive Plan Amendments would need to be amended to add an item addressing the biomass issue in case there are any amendments proposed for the Thurston County Comprehensive Plan. If the issue is added to the official docket, then it would be referred to the Planning Commission for review and study for any development code or comprehensive plan changes.

Biomass Based Energy

Biomass is generally understood to be a mass of living organisms in an ecosystem. It can also mean the mass of organically bound carbon that is present. In the present context, the term biomass is intended to be used to indicate a renewable energy resource from living or recently living organisms. This excludes fossil fuels. Biomass based energy is energy and energy products produced from organic biomass.

There are generally a couple of methods to produce onsite biomass based energy including conversion (incineration) and gasification. Biomass conversion generally includes the incineration of biomass in industrial boilers to produce energy to be used onsite, or be sold. According to the Department of Natural Resources website, gasification includes several methods to create energy and energy based products. These include:

- "Slow pyrolysis" means the process of exposing forest biomass to heat over time to create bio-char. Bio-char can be used as a soil amendment on agricultural lands.
- "Fast pyrolysis" means the process of exposing forest biomass to high heat (450-550 degrees C) in oxygen-deprived environments at a rapid pace to produce bio-oil. Bio-oil can be used in co-firing or further refined to a bio-fuel.
- "Reforming forest biomass" includes reactions such as cracking, dehydrogenation, and isomerization into hydrogen-containing gases called syngas. Syngas can be further processed to a bio-fuel.
- "Fischer-Tropsch" means the process of converting syngas to liquid fuels and other forest biomass based liquids.
- "Hydrolysis/fermentation" means the extraction of cellulose and hemicelluloses, which can be treated with enzymes to produce ethanol, bio-diesel, and other energy products. (Source: Washington Department of Natural Resources)

General Impacts:

The primary impacts from these facilities appear to include air quality, health, carbon emissions, and sustainability of the resource material. Other impacts include traffic, land use compatibility/conflicts, and other impacts related to development. These would be studied during the work plan provided in Ordinance No. 14449. Balanced Thurston County policy and development regulations need to be developed for biomass facilities.

An article from the Union of Concerned Scientists website on "How Biomass Energy Works" is attached. The summary goes over basic issues with biomass, material sources, types of facilities, emissions, sustainability, air quality, carbon emissions and so on. It is also available at:

http://www.ucsusa.org/clean_energy/technology_and_impacts/energy_technologies/how-biomass-energy-works.html

OPTIONS:

This is an informational briefing for the Board of County Commissioners. Options for the Biomass Moratorium, Ordinance No. 14449, will be provided at the February 7, 2011 public hearing.

STAFF RECOMMENDATION:

Go forward with a public hearing to take public testimony. Following the public hearing, hold a work session on February 9, 2011 to discuss the public comments received at the hearing and give staff direction on how to proceed with this issue.

ATTACHMENTS:
Ordinance No. 14449
Union of Concerned Scientists article "How Biomass Energy Works"
Washington Department of Ecology information about forest biomass in Washington
Washington State Department of Natural Resources Forest Biomass Initiative, Update to the 2011 Washington State Legislature

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Ordinance No. 14449

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ORDINANCE NO. 14449

AN ORDINANCE ADOPTING A MORATORIUM ON NEW BIO-MASS FACILITIES AND INTERIM REGULATIONS AMENDING THE THURSTON COUNTY CODE, INCLUDING THE THURSTON COUNTY ZONING ORDINANCE (TITLE 20 TCC), THE ZONING ORDINANCE OF THE LACEY URBAN GROWTH AREA (TITLE 21 TCC), THE TUMWATER UGA ZONING ORDINANCE (TITLE 22 TCC), AND THE OLYMPIA UGA ZONING ORDINANCE (TITLE 23 TCC) TO ADD NEW DEFINITIONS REGARDING BIO-MASS FACILITIES BY AMENDING SECTIONS 20.03.040 AND 23.02.180(B), ADDING SECTIONS 21.06.145, 21.06.146, 21.06.147, 22.04.050, 22.04.051, AND 22.04.052, ESTABLISHING A ONE (1) YEAR WORK PLAN TO STUDY LAND USE AND ENVIRONMENTAL ISSUES RELATED TO BIOMASS FACILITIES, AND TO DETERMINE FINAL APPROPRIATE REGULATIONS.

WHEREAS, pursuant to RCW 36.70A.390 and other lawful authority, the Board of Thurston County Commissioners (Board) has the authority to enact interim zoning controls and moratoriums; and

WHEREAS, pursuant to RCW 36.70A.390 the Board shall hold a public hearing on this interim zoning control and moratorium within sixty (60) days of its adoption; and

WHEREAS, bio-mass facilities include both bio-mass conversion and gasification facilities; and

WHEREAS, bio-mass conversion or bio-mass energy production means the controlled combustion, when separated from other solid waste and used for producing electricity, steam, or heat, of (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, (6) peat; and

WHEREAS, bio-mass conversion does not include the controlled combustion of solid waste materials such as sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste; and

WHEREAS, bio-mass gasification means a technology that uses a noncombustion process to convert solid waste to a fuel for the purpose of generating electricity, steam, or heat; and

WHEREAS, due to environmental concerns surrounding bio-mass facilities, including the source of bio-mass material, the release of particulate matter, volatile organic compounds, carbon monoxide, solid waste, and other airborne emissions, the Board finds additional investigation is warranted; and

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WHEREAS, the Board finds that the Thurston County Code, including the Thurston County Zoning Ordinance, the Zoning Ordinance of the Lacey Urban Growth Area, the Tumwater UGA Zoning Ordinance, the Olympia UGA Zoning Ordinance, and other applicable sections, does not adequately address siting, fugitive odors, and other nuisance concerns in regards to bio-mass facilities; and

WHEREAS, due to the above reasons, additional investigation for appropriate regulations is warranted; and

WHEREAS, the Thurston County, County-Wide Planning Policies agreed to by Thurston County and each of the seven cities and towns within Thurston County on September 8, 1992, as amended, requires that Thurston County consult with each of the seven cities and towns and act in tandem with the affected city(s) when establishing land use and development policies within a city's respective Urban Growth Area; and

WHEREAS, Thurston County will need time to consult with each of the seven cities and towns to address bio-mass facilities in their Urban Growth Areas; and

WHEREAS, the Board has received public comments at its meetings expressing concerns regarding bio-mass facilities in Thurston County due to the development of such facilities in nearby jurisdictions in western Washington; and

WHEREAS, the Growth Management Act (RCW 36.70A) does not permit Thurston County to prohibit essential public facilities as defined by the Growth Management Act and the Thurston County Code; and

WHEREAS, at this time the Board finds it is unnecessary to include bio-mass facilities as essential public facilities in the Thurston County Code in addition to the environmental and zoning issues stated herein; and

WHEREAS, essential public facilities as defined by the Growth Management Act and the Thurston County Code will not be affected by this moratorium; and

WHEREAS, the Board finds that certain bio-mass facilities may fall under the jurisdiction of the Washington State Energy Facility Site Evaluation Council energy facility certification process pursuant to Chapter 80.50 RCW preempting Thurston County zoning regulations; and

WHEREAS, a solution to the issues for regulating bio-mass facilities may include an amendment to the Thurston County Comprehensive Plan and associated development code; and

WHEREAS, the Board approved the 2010-11 Official Docket of Comprehensive Plan Amendments on September 28, 2010, with an expected project completion date in June 2011 or soon thereafter; and

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WHEREAS, this issue is not currently on the 2010-11 Official Docket of Comprehensive Plan Amendments, and the Board will either have to amend the docket or wait until the next docket cycle; and

WHEREAS, Chapter 36.70A RCW only permits Thurston County to amend the Thurston County Comprehensive Plan once per year in consideration of all proposed amendments to the plan, and the June 2011 completion date for the 2010-11 comprehensive plan work program is longer than six months away; and

WHEREAS, the Thurston County Code and its associated zoning ordinances will have to be amended to be consistent with the Thurston County Comprehensive Plan; and

WHEREAS, more time will be necessary following the June 2011 completion date for the 2010-11 Official Docket of Comprehensive Plan amendments to develop final regulations; and

WHEREAS, the moratorium will remain in place for one (1) year while the County works with its citizens and interested parties to devise appropriate measures to address the environmental and land use concerns related to biomass power production and gasification, and consider amendments to its comprehensive plan and the Thurston County Code; and

WHEREAS, it is the intent of the Board to lift the moratorium following the completion of the work; and

WHEREAS, if a moratorium is not placed on new bio-mass facilities it may foreclose viable options for requiring appropriate mitigation and environmental protection measures; and

WHEREAS, the Board believes adopting the moratorium is necessary for the preservation of the public health, safety, and general welfare of Thurston County residents.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF THURSTON COUNTY, AS FOLLOWS:

SECTION 1. MORATORIUM. A moratorium is established on new bio-mass facilities, including but not limited to bio-mass conversion and bio-mass gasification. Such facilities shall not be permitted or approved by Thurston County in any zoning district established under the Thurston County Zoning Ordinance (Title 20), the Zoning Ordinance for the Lacey Urban Growth Area (Title 21), the Tumwater UGA Zoning Ordinance (Title 22), and the Olympia UGA Zoning Ordinance (Title 23).

SECTION 2. ESSENTIAL PUBLIC FACILITIES. This ordinance shall not preclude the siting of essential public facilities as defined by the Growth Management Act (RCW 36.70A), nor to essential public facilities defined by the Thurston County Zoning Ordinance (Title 20), the Zoning Ordinance for the Lacey Urban Growth Area (Title 21), the Tumwater UGA Zoning Ordinance (Title 22), and the Olympia UGA Zoning Ordinance (Title 23).

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SECTION 3. THURSTON COUNTY ZONING ORDINANCE (TITLE 20 TCC). Thurston County Code Section 20.03.040 is hereby amended to add new subsections 8.5, 8.6, and 8.7 regarding bio-mass facilities, bio-mass conversion, and bio-mass gasification, to read as follows:

Section 20.03.040 Definitions

8.5 "Bio-mass conversion" or "bio-mass energy production" means the controlled combustion, when separated from other solid waste and used for producing electricity, steam, or heat, of (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat. Bio-mass conversion does not include the controlled combustion of solid waste materials such as sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste.

8.6 "Bio-mass facility" means a facility which uses a bio-mass conversion or bio-mass gasification process for the production of electricity, steam, or heat.

8.7 "Bio-mass gasification" means a technology that uses a non-combustion process to convert solid waste such as (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat to a fuel for the purpose of generating electricity, steam, or heat.

SECTION 4. ZONING ORDINANCE FOR THE LACEY URBAN GROWTH AREA (TITLE 21). Thurston County Code Chapter 21.06 is hereby amended to add new sections 21.06.145, 21.06.146, and 21.06.147 to add definitions regarding bio-mass facilities, bio-mass conversion, and bio-mass gasification, to read as follows:

A. Add to the table of contents of Chapter 21.06 TCC Definitions as follows:

Chapter 21.06 – DEFINITIONS

...

21.06.145 – Bio-mass conversion.

21.06.146 – Bio-mass facility.

21.06.147 – Bio-mass gasification.

...

B. Add new sections to Chapter 21.06 TCC to read as follows:

21.06.145 – Bio-mass conversion.

"Bio-mass conversion" or "bio-mass energy production" means the controlled combustion, when separated from other solid waste and used for producing electricity, steam, or heat, of (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat. Bio-mass conversion does not include the controlled

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combustion of solid waste materials such as sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste.

21.06.147 – Bio-mass facility.

"Bio-mass facility" means a facility which uses a bio-mass conversion or bio-mass gasification process for the production of electricity, steam, or heat.

21.06.146 – Bio-mass gasification.

"Bio-mass gasification" means a technology that uses a non-combustion process to convert solid waste such as (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat to a fuel for the purpose of generating electricity, steam, or heat.

SECTION 5. TUMWATER UGA ZONING ORDINANCE (TITLE 22 TCC). Thurston County Code Chapter 22.04 is hereby amended to add new sections 22.04.050, 22.04.051, and 22.04.052 to add definitions regarding bio-mass facilities, bio-mass conversion, and bio-mass gasification, to read as follows:

A. Add to the table of contents of Chapter 22.04 TCC, Definitions as follows:

Chapter 22.04 – DEFINITIONS

...

22.04.050 – Bio-mass conversion.

22.04.051 – Bio-mass facility.

22.04.052 – Bio-mass gasification.

...

B. Add new sections to Chapter 22.04 TCC to read as follows:

22.04.051 – Bio-mass conversion.

"Bio-mass conversion" or "bio-mass energy production" means the controlled combustion, when separated from other solid waste and used for producing electricity, steam, or heat, of (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat. Bio-mass conversion does not include the controlled combustion of solid waste materials such as sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste.

22.04.050 – Bio-mass facility.

"Bio-mass facility" means a facility which uses a bio-mass conversion or bio-mass gasification process for the production of electricity, steam, or heat.

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22.04.052 – Bio-mass gasification.

"Bio-mass gasification" means a technology that uses a non-combustion process to convert solid waste such as (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat to a fuel for the purpose of generating electricity, steam, or heat.

SECTION 6. OLYMPIA UGA ZONING ORDINANCE (TITLE 23). Thurston County Code Section 23.02.180(B) is hereby amended to add new definitions for bio-mass facilities, including bio-mass conversion and bio-mass gasification, to read as follows:

...

"Bio-mass conversion" or "bio-mass energy production" means the controlled combustion, when separated from other solid waste and used for producing electricity, steam, or heat, of (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat. Bio-mass conversion does not include the controlled combustion of solid waste materials such as sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste.

"Bio-mass facility" means a facility which uses a bio-mass conversion or bio-mass gasification process for the production of electricity, steam, or heat.

"Bio-mass gasification" means a technology that uses a non-combustion process to convert solid waste such as (1) Agricultural crop residues, (2) Bark, lawn, yard, and garden clippings, (3) Leaves, silvicultural residue, and tree and brush pruning, (4) Wood, wood chips, and wood waste, (5) pulp or paper materials, or (6) peat to a fuel for the purpose of generating electricity, steam, or heat.

...

SECTION 7. AMENDMENT TO OFFICIAL DOCKET. Thurston County shall reopen its 2010-11 Official Docket of Comprehensive Plan Amendments to consider the addition of one item to include consideration of amendments to address bio-mass facilities, bio-mass conversion, and bio-mass gasification.

SECTION 8. WORK PLAN. The work plan established by this ordinance is as follows:

1. Propose Amendment to 2010-11 Comprehensive Plan Docket
2. Study Environmental and Siting Issues
3. Propose Amendments to Thurston County Comprehensive Plan, if necessary
4. Propose Amendments to the Thurston County Code

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SECTION 9. DURATION. This ordinance shall expire twelve (12) months after the effective date of this ordinance, *or earlier by Board action.*

SECTION 10. SEVERABILITY. If any section, subsection, sentence, clause, phrase or other portion of this Ordinance or its application to any person is, for any reason, declared invalid, illegal or unconstitutional in whole or in part by any court or agency of competent jurisdiction, said decision shall not affect the validity of the remaining portions hereof.

SECTION 10. EFFECTIVE DATE. This Ordinance shall take effect *immediately upon adoption.*

ADOPTED: December 21, 2010

ATTEST:

LaBonita L. Bowman
Clerk of the Board

APPROVED AS TO FORM:

EDWARD G. HOLM
PROSECUTING ATTORNEY

Jeffrey G. Fancher
Deputy Prosecuting Attorney

BOARD OF COUNTY COMMISSIONERS
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Union of Concerned Scientists: “How Biomass Works”

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Union of Concerned Scientists Skip to main content

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How Biomass Energy Works

To many people, the most familiar forms of renewable energy are the wind and the sun. But biomass (plant material and animal waste) is the oldest source of renewable energy, used since our ancestors learned the secret of fire.

Until recently, biomass supplied far more renewable electricity—or "biopower"—than wind and solar power combined.[1]

If developed properly, biomass can and should supply increasing amounts of biopower. In fact, in numerous analyses of how America can transition to a clean energy future, sustainable biomass is a critical renewable resource.[2]

Contents

Sustainable, low-carbon biomass can provide a significant fraction of the new renewable energy we need to reduce our emissions of heat-trapping gases like carbon dioxide to levels that scientists say will avoid the worst impacts of global warming. Without sustainable, low-carbon biopower, it will likely be more expensive and take longer to transform to a clean energy economy.

But like all our energy sources, biopower has environmental risks that need to be mitigated. If not managed carefully, biomass for energy can be harvested at unsustainable rates, damage ecosystems, produce harmful air pollution, consume large amounts of water, and produce net greenhouse emissions.

However, most scientists believe there is a wide range of biomass resources that can be produced sustainably and with minimal harm, while reducing the overall impacts and risks of our current energy system. Implementing proper policy is essential to securing the benefits of biomass and avoiding its risks.

Based on our bioenergy principles, UCS' work on biopower is dedicated to distinguishing between beneficial biomass resources and those that are questionable or harmful—in a practical and efficient manner—so that beneficial resources can make a significant contribution to our clean energy future.

Note: This page addresses using biomass to generate biopower. For more information on biofuels, go to the UCS Clean Vehicles Program's biofuels pages.

Biomass is a renewable energy source not only because the energy it comes from the sun, but also because biomass can re-grow over a relatively short period of time. Through the process of photosynthesis, chlorophyll in plants captures the sun's energy by converting carbon dioxide from the air and water from the ground into carbohydrates—complex compounds composed of carbon, hydrogen, and oxygen.

When these carbohydrates are burned, they turn back into carbon dioxide and water and release the energy they captured from the sun. In this way, biomass functions as a sort of natural battery for storing solar energy. As long as biomass is produced sustainably—meeting current needs without diminishing resources or the land's capacity to re-grow biomass and recapture carbon—the battery will last indefinitely and provide sources of low-carbon energy.

Types of Beneficial Biomass

Most scientists believe that a wide range of biomass resources are "beneficial" because their use will clearly reduce overall carbon emissions and provide other benefits. Among other resources, beneficial biomass includes

energy crops that don't compete with food crops for land
portions of crop residues such as wheat straw or corn stover
sustainably-harvested wood and forest residues, and
clean municipal and industrial wastes.[3]

Beneficial biomass use can be considered part of the terrestrial carbon cycle—the balanced cycling of carbon from the atmosphere into plants and then into soils and the atmosphere during plant decay. When biopower is developed properly, emissions of biomass carbon are taken up or recycled by subsequent plant growth within a relatively short time, resulting in low net carbon emissions.

Beneficial biomass sources generally maintain or even increase the stocks of carbon stored in soil or plants. Beneficial biomass also displaces carbon emissions from fossil fuels, such as coal, oil or natural gas, the burning of which adds new and additional carbon to the atmosphere and causes global warming.

Among beneficial resources, the most effective and sustainable biomass resources will vary from region to region and also depend on the efficiency of converting biomass to its final application, be it for biopower, biofuels, bioproducts, or heat.

Energy Crops
Energy crops can be grown on farms in potentially large quantities and in ways that don't displace or otherwise reduce food production, such as by growing them on marginal lands or pastures or as double crops that fit into rotations with food crops. Trees and grasses that are native to a region often require fewer synthetic inputs and pose less risk of disruption to agro-ecosystems.

Grasses
Thin-stemmed perennial grasses used to blanket the prairies of the United States before the settlers replaced them with annual food crops. Switchgrass, big bluestem, and other native varieties grow quickly in many parts of the country, and can be harvested for up to 10 years before replanting. Thick-stemmed perennials like sugar cane and elephant grass can be grown in hot and wet climates like those of Florida and Hawaii.


Switchgrass

Switchgrass is a perennial grass that grows throughout the Great Plains, the Midwest and the South. Switchgrass is a hardy species—resistant to floods, droughts, nutrient poor soils, and pests—and does not require much fertilizer to produce consistent high yields.[4] Today, switchgrass is primarily cultivated either as feed for livestock or, due to its deep root structure, as ground cover to prevent soil erosion. However, this prairie grass also has promise for biopower and biofuel production (see profile of Show-Me Energy below). If demand for switchgrass outstrips the capacity of marginal lands, it could, however, compete with other crops for more productive land.[5]

Crop Residues
Depending on soils and slope, a certain fraction of crop residues should be left in the field to maintain cover against erosion and to recycle nutrients, but in most cases some fraction of crop residues can be collected for renewable energy in a sustainable manner. Food processing also produces many usable residues.

Beneficial biomass: rice hulls in Arkansas
Riceland Foods and Riviana Foods built gasification facilities in Stuttgart and Jonesboro, which together process 650 tons of rice hulls per day to produce biogas for energy. Rice hulls, which make up about 20% of the whole grain, are rubbed off the grain in processing. Due to their high silica content, rice hulls should not be burned and cannot be fed to cattle, so gasification is a cleaner way to produce energy from something that would otherwise be a waste product. The gas produced at the Arkansas facilities is used to replace natural gas and to generate biopower.[6]

Manure
Manure from livestock and poultry contains valuable nutrients and, with appropriate management, should be an integral part of soil fertility management. Where appropriate, some manure can be converted to renewable energy through anaerobic digesters, combustion or gasification. The anaerobic digesters produce biogas which can either directly displace natural gas or propane, or be burned to generate biopower. For instance, dairy farms that convert cow manure with methane digesters to produce biogas can use the biogas in three ways (or in some combination of these end uses).

They can use the biogas on-site as a replacement for the farm's own natural gas or propane use, clean up the biogas and pressurize and inject into nearby natural gas pipelines, or burn it to produce steam that is run through a turbine to generate renewable electricity for use on-site and/or fed into the local energy grid. The best application of biogas from manure will be determined by the type of manure, opportunity to displace natural gas or propane use, local energy markets and state and federal incentives.

Poultry litter can be digested to produce biogas, or combusted to produce renewable electricity, either directly or through gasification, which improves efficiency and reduces emissions.

Woody biomass
Bark, sawdust and other byproducts of milling timber and making paper are currently the largest source of biomass-based heat and renewable electricity; commonly, lumber, pulp, and paper mills use them for both heat and power. In addition, shavings produced during the manufacture of wood products and organic sludge (or "liquor") from pulp and paper mills are biomass resources. Some of these "mill residues" could be available for additional generation of renewable electricity.

Beyond these conventional types of woody biomass, there are additional sources of woody biomass that could be used for renewable energy. With the proper policy (see below), these additional sources could be sustainably harvested and make a significant contribution to renewable energy generation.

Forest residues
It is important to leave some tree tops and branches, and even dead standing trees, on-site after forest harvests. Coarse woody debris left on the soil surface cycles nutrients, especially from leaves, limbs and tops, reduces erosion and provides habitat for invertebrates.

Dead standing trees provide bird habitat. Provided that appropriate amounts of residues are left in the forest, the remaining amounts of limbs and tops, which are normally left behind in the forest after timber-harvesting operations, can be sustainably collected for energy use. Often, limbs and tops are already piled at the "landing"—where loggers haul trees to load them unto trucks. Using these residues for biomass can be cheaper than making additional trips into the woods—and reduce impacts on forest stands, wildlife and soils.

Forest treatments
Many forest managers see new biomass markets providing opportunities to improve forest stands.[9] Where traditional paper and timber markets require trees to meet diameter and quality specifications, biomass markets will pay for otherwise unmarketable materials, including dead, damaged and small-diameter trees. Income from selling biomass can pay for or partially offset the cost of forest management treatments needed to remove invasive species, release valuable understory trees, or reduce the threat of fires, though the science behind fire reduction is very complex and site specific.[10]

Removing undesired, early-succession or understory species can play an important role in restoring native forest types and improving habitat for threatened or endangered species, such as longleaf forests in the Southeast.[11]

Beneficial biomass: food waste, forest residues and perennial grasses in Minnesota
In Minnesota, food industry and other byproducts are feeding a new combined heat and power (CHP) plant that generates renewable electricity and efficiently uses waste heat from the boiler. Rahr Malting Company and the Shakopee Mdewakanton Sioux partnered to form Koda Energy, which in 2009 began generating up to 22 megawatts of renewable electricity with oat hulls, wood chips, prairie grasses, and barley malt dust from Rahr Malting.

The Koda plant burns about 170,000 tons of these agricultural waste products a year, and is able to operate at over 70 percent efficiency because Rahr Malting also uses the waste heat from the boiler in their operations, displacing the need for additional natural gas. About half of the plant's renewable electricity is used to powering Rahr Malting, with the remainder purchased by Xcel Energy to supply to their customers. In the future, the

Thinned trees
Thinning plantations of smaller-diameter trees before final harvest can also provide a source of biomass. In addition, thinning naturally regenerating stands of smaller-diameter trees can also improve the health and growth of the remaining trees. With the decline in paper mills, some areas of the country no longer have markets for smaller-diameter trees. Under the right conditions, biomass markets could become a sustainable market for smaller-diameter trees that could help improve forest health and reduce carbon emissions.

Short-rotation trees
Under the right circumstances, there may be a role for short-rotation tree plantations dedicated to energy production. Such plantations could either be re-planted or "coppiced." (Coppicing is the practice of cutting certain species close to the ground and letting them re-grow.) Coppicing allows trees to be harvested every three to eight years for 20 or 30 years before replanting.

Short-rotation management, either through coppicing or replanting, is best suited to existing plantations—not longer-rotation naturally-regenerating forests, which tend to have greater biodiversity and store more carbon than plantations.

Policy is needed to ensure that the growing biomass industry will use these beneficial resources, and use them on a sustainable basis. See below for more on the policy needed to guide the biomass industry toward sustainable, beneficial resources.

Shakopee Mdewakanton Sioux Community hopes to use switchgrass grown on restored prairies to provide some of the biomass for Koda Energy.[7]

Beneficial biomass: bagasse in Florida
At its plant in South Bay, Florida Crystals burns 1 million tons of sugar cane stalks per year to produce up to 140 MW of electricity—enough to power the mill, refinery and 60,000 homes. Florida Crystals sells the surplus energy to Florida Power & Light and other utilities.[8]

Urban wastes
People generate biomass wastes in many forms, including "urban wood waste" (such as tree trimmings, shipping pallets and clean, untreated leftover construction wood), the clean, biodegradable portion of garbage (paper that wouldn't be recycled, food, yard waste, etc.). In addition, methane can be captured from landfills or produced in the operation of sewage treatment plants and used for heat and power, reducing air pollution and emissions of global warming gases.

Converting Biomass to Biopower

From the time of Prometheus to the present, the most common way to capture the energy from biomass was to burn it to make heat. Since the industrial revolution this biomass fired heat has produced steam power, and more recently this biomass fired steam power has been used to generate electricity. Burning biomass in conventional boilers can have numerous environmental and air-quality advantages over burning fossil fuels.

Advances in recent years have shown that there are even more efficient and cleaner ways to use biomass. It can be converted into liquid fuels, for example, or "cooked" in a process called "gasification" to produce combustible gases, which reduces various kinds of emissions from biomass combustion, especially particulates

In 1998, the first U.S. commercial scale biomass gasification demonstration plant based on the SilvaGas process began at the McNeil Power Station in Burlington, Vermont.

The SilvaGas process, a particular form of biomass gasification, indirectly heats the biomass using heated sand in order to produce a medium Btu gas.

The McNeil power station is capable of generating 50 MW of power from local wood waste products.

Direct combustion
The oldest and most common way of converting biomass to electricity is to burn it to produce steam, which turns a turbine that produces electricity. The problems with direct combustion of biomass are that much of the energy is wasted and that it can cause some pollution if it is not carefully controlled. Direct combustion can be done in a plant using solely biomass (a "dedicated plant") or in a plant made to burn another fuel, usually coal.

Co-firing
An approach that may increase the use of biomass energy in the short term is to mix it with coal and burn it at a power plant designed for coal—a process known as "co-firing." Through gasification, biomass can also be co-fired at natural gas-powered plants.

The benefits associated with biomass co-firing can include lower operating costs, reductions of harmful emissions like sulfur and mercury, greater energy security and, with the use of beneficial biomass, lower carbon emissions. Co-firing is also one of the more economically viable ways to increase biomass power generation today, since it can be done with modifications to existing facilities.

Repowering
Coal plants can also be converted to run entirely on biomass, known as "re-powering." (Similarly, natural gas plants could also be converted to run on biogas made from biomass; see below.)

Combined heat and power (CHP)
Direct combustion of biomass produces heat that can also be used to heat buildings or for industrial processes (for example, see textbox on Koda Energy above). Because they use heat energy that would otherwise be wasted, CHP facilities can be significantly more efficient than direct combustion systems. However, it is not always possible or economical to find customers in need of heat in close proximity to power plants.

Biomass gasification
By heating biomass in the presence of a carefully controlled amount of oxygen and under pressure, it can be converted into a mixture of hydrogen and carbon monoxide called syngas. This syngas is often refined to remove contaminants.

Equipment can also be added to separate and remove the carbon dioxide in a concentrated form. The syngas can then be run directly through a gas turbine or burned and run through a steam turbine to produce electricity. Biomass gasification is generally cleaner and more efficient that direct combustion of biomass. Syngas can also be further processed to make liquid biofuels or other useful chemicals.

Anaerobic digestion
Micro-organisms break down biomass to produce methane and carbon dioxide. This can occur in a carefully controlled way in anaerobic digesters used to process sewage or animal manure. Related processes happen in a less-controlled manner in landfills, as biomass in the garbage breaks down. A portion of this methane can be captured and burned for heat and power. In addition to generating biogas, which displaces natural gas from fossil fuel sources, such collection processes keep the methane from escaping to the atmosphere, reducing emissions of a powerful global warming gas.

Energy density
Another important consideration with biomass energy systems is that unprocessed biomass contains less energy per pound than fossil fuels—it has less "energy density." Green woody biomass contains as much as 50% water by weight. This means that unprocessed biomass typically can't be cost-effectively shipped more than about 50-100 miles by truck before it is converted into fuel or energy.

It also means that biomass energy systems may be smaller scale and more distributed than their fossil fuel counterparts, because it is hard to sustainably gather and process more than a certain amount of in one place. This has the advantage that local, rural communities will be able to design energy systems that are self-sufficient, sustainable, and adapted to their own needs.

However, there are ways to increase the energy density of biomass and to decrease its shipping costs. Drying, grinding and pressing biomass into "pellets" increases its energy density. Compared to raw logs or wood chips, biomass pellets can also be more efficiently handled with augers and conveyers used in power plants. In addition, shipping biomass by water greatly reduces transportation costs compared to hauling it by truck.

Thus, hauling pelletized biomass by water has made it economical to transport biomass much greater distances—even thousands of miles, across the Atlantic and Pacific, to markets in Japan and Europe. In the last few years, the international trade in pelletized biomass has been growing rapidly, largely serving European utilities that need to meet renewable energy requirements and carbon-reduction mandates. Several large pellet manufacturers are locating in the Southern US, with its prodigious forest plantation resource, to serve such markets.[12]

Potential for Biopower

In the United States, we already get over 50 billion kilowatt-hours of electricity from biomass, providing nearly 1.5 percent of our nation's total electric sales. Biomass was the largest source of renewable electricity in the U.S. until 2009, when it was overtaken by wind energy. Biopower accounted for more than 35 percent of total net renewable generation in 2009, excluding conventional hydroelectric generation.[14] The contribution for heat is also substantial. But with better conversion technology and more attention paid to energy crops, we could produce much more.

Technical resource potential for developing biopower from beneficial biomass:

Renewable Resource	Electric Generation Capacity Potential (in gigawatts)	Electric Generation (billion kilowatt-hours)	Renewable Electricity Gnereation as % of 2007 Electricity Use
Energy Crops	83	584	14%
Agricultural Residues	114	801	19%
Forest Residues	33	231	6%
Urban Residues	15	104	3%
Landfill Gas	2.6	19	0.4%
Total	248	1,739	42%

(Source: DOE, 2005 [15])

Beneficial biomass: crop residues, switchgrass, wood waste in Missouri
Among new biomass pelletizing facilities, Show Me Energy cooperative is pioneering a unique way to combine the community benefits of smaller-scale, locally owned biomass facilities with the efficiencies needed to serve the export market. Founded with the investment of its hundreds of farmer-members, Show Me is pelletizing crop residues, switchgrass and urban wood residues. In addition to selling pellets locally, Show Me is exporting pellets to Europe.

If successfully developed across the country, facilities like Show Me could create markets for farmers and jobs in rural communities, make biomass more economical to transport and easier for utilities to use and reduce carbon emissions by displacing coal and other fossil fuels with a variety of locally-available beneficial biomass resources. [13]

The growth of biopower will depend on the availability of resources, land-use and harvesting practices, and the amount of biomass used to make fuel for transportation and other uses. Analysts have produced widely varying estimates of the potential for electricity from biomass. For example, a 2005 DOE study found that the nation has the technical potential to produce more than a billion tons of biomass for energy use (Perlack et al. 2005).

If all of that was used to produce electricity, it could have met more than 40 percent of our electricity needs in 2007 (see Table above). In a study of the implementation of a 25 percent renewable electricity standard by 2025, the Energy Information Administration (EIA) assumed that 598 million tons of biomass would be available, and that it could meet 12 percent of the nation's electricity needs by 2025 (EIA 2007). In another study, NREL estimated that more than 423 million metric tons of biomass would be available each year (ASES 2007).

In UCS' Climate 2030 analysis, we assumed that only 367 million tons of biomass would be available to produce both electricity and biofuels. That conservative estimate accounts for potential land-use conflicts, and tries to ensure the sustainable production and use of the biomass. To minimize the impact of growing energy crops on land now used to grow food crops, we excluded 50 percent of the switchgrass supply assumed by the EIA.

That allows for most switchgrass to grow on pasture and marginal agricultural lands—and also provides much greater cuts in carbon emissions (for more details, see Appendix G of Climate 2030: http://www.ucsusa.org/assets/documents/global_warming/climate2030-app-g-biomass.pdf). The

potential contribution of biomass to electricity production in our analysis is therefore just one-third of that identified in the DOE study, and 60 percent of that in the EIA study.[16]

Distribution of biomass
Whether crop or forest residues, urban and mill wastes, or energy crops, biomass of one kind or another is available in most areas of the country. For information on the availability of various kinds of biomass resources in particular parts of the country, see the National Renewable Energy Labs's searchable biomass databases.

Environmental Risks and Benefits

Like all energy sources, biomass has environmental impacts and risks. The main impacts and risks from biomass are sustainability of the resource use, air quality and carbon emissions.

Sustainability
Biomass energy production involves annual harvests or periodic removals of crops, residues, trees or other resources from the land. These harvests and removals need to be at levels that are sustainable, i.e., ensure that current use does not deplete the land's ability to meet future needs, and also be done in ways that don't degrade other important indicators of sustainability. Because biomass markets may involve new or additional removals of residues, crops, or trees, we should be careful to minimize impacts from whatever additional demands biomass growth or harvesting makes on the land.

Markets for corn stover, wheat straw and other crop residues are common and considerable research has been done on residue management. In addition, participation in some federal crop programs requires conservation plans. As a result of established science and policy, farmers generally leave a certain percentage of crop residues on fields, depending on soil and slope, to reduce erosion and maintain fertility. Additional harvests of crop residues or the growth of energy crops might require additional research and policy to minimize impacts.

In forestry, where residue or biomass markets are less common, new guidelines might need to be developed. Existing best management practices (BMPs) were developed to address forest management issues, especially water quality, related to traditional sawlog and pulpwood markets, with predictable harvest levels. But the development of new biomass markets will entail larger biomass removals from forests, especially forestry residues and small diameter trees. Current BMPs may not be sufficient under higher harvesting levels and new harvests of previously unmarketable materials.

However, because woody biomass is often a low-value product, sustainability standards must be relatively inexpensive to implement and verify. Thankfully, we can improve the sustainability of biomass harvests with little added cost to forest owners through the use of existing forest management programs, including 1) biomass BMPs, 2) certification or 3) forest management plans.

Working with forest owner associations, foresters, forest ecologists, wildlife conservation experts and biomass developers, UCS helped develop practical and effective sustainability provisions that can provide a measure of assurance that woody biomass harvests will be sustainable.

State-based biomass Best Management Practices (BMPs) or guidelines. Missouri, Minnesota, Pennsylvania, Maine and Wisconsin developed biomass harvesting guidelines to avoid negative impacts of biomass removals. Other states and regions, including Southern states, are also developing biomass guidelines. Developed through collaborative stakeholder processes, BMPs are practical enough to be used by foresters and loggers.

Third-party forest certification. Certification can also be used to verify the sustainability of biomass harvests. Between them, the Forest Stewardship Council, the Sustainable Forestry Initiative, and Tree Farm have certified nearly 275 millions of acres of industrial and private forestland in the U.S. Certification programs already address, or are being updated to address, many of the concerns related to biomass harvests.

Forest management plans written by professionally-accredited foresters. Foresters can help anticipate and therefore minimize impacts of additional biomass removals. Although a minority of smaller forest owners have management plans, forest owner associations have long recommended that more forest owners have them written to better achieve their financial and conservation objectives. Forest owners who have management plans stand to make more money than if they lacked such plans. To avoid out-of-pocket costs, proceeds from biomass sales could cover the cost of writing management plans.

Whether implemented through BMPs, certification or management plans, sustainability standards should minimize short-term impacts and avoid long-term degradation of water quality, soil productivity, wildlife habitat, and biodiversity—all key indicators of sustainability. Science and local conditions need to be used in determining the standards. For example, fire-adapted forests will likely require retention of less woody biomass than forests adapted to other disturbances such as hurricanes.

Sustainability standards should ensure nutrients removed in a biomass harvest are replenished and that removals do not damage long-term productivity, especially on sensitive soils. Coarse woody material that could be removed for biomass energy also provides crucial wildlife habitat; depending on a state's wildlife, standards might protect snags, den trees, and large downed woody material. Biodiversity can be fostered through sustainability standards that encourage retention of existing native ecosystems and forest restoration. Lastly, sustainability standards should provide for the regrowth of the forest—surely a requirement for woody biomass to be truly renewable.

Air quality
Especially with the emissions from combustion systems, biomass can impact air quality. Emissions vary depending on the biomass resource, the conversion technology (type of power plant), and the pollution controls installed at the plant. The table below from the National Renewable Energy Laboratory and Oak Ridge National Laboratory compares air emissions from different biomass, coal and natural gas power plants with pollution control equipment.

Because most biomass resources and natural gas contain far less sulfur and mercury than coal, biomass and natural gas power plants typically emit far less of these pollutants than do coal-fired power plants.[17] Sulfur emissions are a key cause of smog and acid rain. Mercury is a known neurotoxin.

Direct Air Emissions from Biomass, Coal and Natural Gas Power Plants, by Boiler Type

	SO_x	NO_x	CO	PM-10[1]	Comments
Biomass Technology					
Stoker Boiler, Wood Residues (1,4)	0.08	2.1 (biomass type not specified)	12.2 (biomass type not specified)	0.50 (total particulates) (biomass type not specified)	Based on 23 California grate boilers, except for SO_2 (uncontrolled)
Fluidized Bed, Biomass (4)	0.08 (biomass type not specified)	0.9 (biomass type not specified)	0.17 (biomass type not specified)	0.3 (total particulates) (biomass type not specified)	11 FBC boilers in California
Energy Crops (Poplar) Gasification (a,b)	0.05 (**suggested** value based on SOx numbers for Stoker and FBC, adjusted by a factor of 9,180/13,800 to account for heat rate improvement)	1.10 to 2.2 (0.66 to 1.32 w/SNCR, 0.22 to 0.44 w/th SCR)	0.23	0.01 (total particulates)	Combustor flue gas goes through cyclone and baghouse. Syngas goes through scrubber and baghouse before gas turbine. No controls on gas turbine.
Coal Technology					
Bituminous Coal, Stoker Boiler (f)	20.2 1 wt% S coal	5.8	2.7	0.62	PM Control only (baghouse)
Pulverized Coal Boiler (d)	14.3	6.89	0.35	0.32 (total particulates)	Average US PC boiler (typically baghouse, limestone FGC)
Cofiring 15% Biomass (d2)	12.2	6.17	0.35	0.32 (total particulates)	?
Fluidized Bed, Coal (f)	3.7 (1 wt% S coal Ca/S = 2.5)	2.7	9.6	0.30	Baghouse for PM Control, Ca sorbents used for SO_2
Natural Gas Technology					
4-Stroke NG Reciprocating Engine (g)	0.006	7.96-38.3 (depends on load and air:fuel ratio)	2.98-35.0 (depends on load and air:fuel ratio)	0.09-0.18 (depends on load and air:fuel ratio)	No control except PCC at high-end of PM-10 range
Natural Gas Turbine (e)	0.009 (0.0007 wt% S)	1.72	0.4	.09 (total particulates)	Water-steam injection only
Natural Gas Combined Cycle (c,e)	0.004	0.91 (0.21 w / SCR)	0.06	0.14 (total particulates)	Water-steam injection only

(Source: DOE, 2003 [18])

Similarly, biopower plants emit less nitrogen oxide (NOx) emissions than conventional coal plants. NOx emissions create harmful particulate matter, smog and acid rain that results in billions of dollars of public health costs each year. Biopower systems that use either fluidized bed or gasification have NOx emissions that are comparable to new natural gas plants.

Biopower facilities with stoker boilers do emit significant quantities of particulates (PM 10) and carbon monoxide (CO), but these emissions can also be significantly reduced with fluidized bed and gasification systems. Advanced coal gasification power plants also produce significantly lower air emissions than conventional coal plants.

Carbon Emissions

Burning or gasifying biomass does emit carbon into the atmosphere. With heightened interest in renewable energy and climate change, scientists have put biomass' carbon emissions under additional scrutiny, and are making important distinctions between biomass resources that are beneficial in reducing net carbon emissions and biomass resources that would increase net emissions. While our understanding of specific biomass resources and applications will continue to evolve, we can group biomass resources into three general categories, based on their net carbon impacts.

Beneficial biomass
As mentioned previously, there is considerable consensus among leading scientists that there are biomass resources that are clearly beneficial in their potential to reduce net carbon emissions. These beneficial resources exist in substantial supplies and can form the basis of increasing production of biopower and biofuels.

Harmful biomass
In contrast to these beneficial biomass resources, scientists generally agree that harmful biomass resources and practices include clearing forests, savannas or grasslands to grow energy crops, and displacing food production for bioenergy production that ultimately leads to the clearing of carbon-rich ecosystems elsewhere to grow food.[19] Harmful biomass adds net carbon to the atmosphere by either directly or indirectly decreasing the overall amount of carbon stored in plants and soils.

Navigating the path forward
We all should be concerned that biomass will be developed sustainably and beneficially—in ways that are cleaner and safer than our current energy mix, that are truly sustainable and that will reduce net carbon emissions. Beneficial biomass resources will in most cases be cleaner, sustainable and beneficial. Harmful biomass resources almost always will not. Marginal biomass resources may be cleaner, sustainable and beneficial—or not—depending on specific circumstances.

On the basis of the science, it would be unwarranted to support the use of all biomass resources, with any conversion technology and for any application. It would also be unwarranted to oppose all biomass on the basis that some biomass resources, conversion technologies or applications are not sustainable or beneficial.

Unfortunately, some biomass advocates and biomass opponents alike make just these mistakes—failing to distinguish beneficial from harmful biomass resources. Thus, all too often the debate about biomass is conducted in absolutist terms, either arguing that all biomass is "carbon neutral" or that "biomass" writ large will accelerate global warming, increase air pollution or lay waste to forests.

These absolutist approaches to biomass have led to two pitfalls in developing biomass policy. Absolute advocates have supported policy that would let almost any kind of biomass resource be eligible for renewable energy and climate legislation. On the other extreme, absolutist opposition has led to proposals to effectively

Marginal biomass: resources that could be beneficial—or harmful
Scientists think the carbon benefits and risks of some biomass resource range widely, depending on how and where they are harvested, how efficiently they are converted to energy, and what fossil fuels they replace. In other words, these resources might be beneficial or harmful depending on specific situations. The use of trees harvested especially for energy use is a good example.

Using trees that will quickly

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remove most kinds of biomass from policy, especially at the state level.

Both approaches pose challenges to the development of beneficial biopower generation. The "anything goes" approach risks the development of harmful biomass resources that will increase net carbon emissions and cause other harm. Such a path also risks undermining the confidence the public and policymakers can place in biomass as a legitimate climate solution—which could eventually threaten the inclusion of beneficial biomass as a renewable energy resource in policy.

In tarring biomass with too broad a brush, some biomass opposition lumps beneficial resources with harmful ones and risks not developing beneficial biomass at large enough scale to capture important benefits for the country and the planet. As a group of biomass experts, comprising both advocates and skeptics, noted in an article in Science, "society cannot afford to miss out on the global greenhouse gas reductions and the local environmental and societal benefits when biofuels are done right."[21]

To capture the benefits of beneficial biomass and avoid the risks of harmful biomass, federal and state policies should distinguish between beneficial and harmful biomass resources. Most policy related to biomass-based energy, be it for fuels, electricity or thermal, includes a definition of eligible biomass resources.

and certainly re-grow to efficiently displace more carbon-intensive fossil fuels may be beneficial. On the other hand, using trees that will re-grow slowly or maybe not be fully replaced in an inefficient facility or to displace less carbon-intensive fuels may not be beneficial, or may be beneficial only over unacceptably long time frames in comparison to other available resources.[20] Marginal resources should only be used when their use can be demonstrated to reduce net emissions.

This definition should make beneficial biomass resources eligible, exclude harmful biomass resources and practices, and include practical, reasonable sustainability standards to ensure that harvests of biomass do not degrade soils, wildlife habitat, biodiversity and water quality. UCS has developed practical, effective sustainability standards for inclusion in biomass definitions, especially at the federal level.

Conclusions

When done well, biomass energy brings numerous environmental benefits—particularly reducing many kinds of air pollution and net carbon emissions. Biomass can be grown and harvested in ways that protect soil quality, avoid erosion, and maintain wildlife habitat. However, the environmental benefits of biomass depend on developing beneficial biomass resources and avoiding harmful resources, which having policies that can distinguish between them.

In addition to its many environmental benefits, beneficial biomass offers economic and energy security benefits.[22] By growing our fuels at home, we reduce the need to import fossil fuels from other states and nations, and reduce our expenses and exposure to disruptions in that supply. Many states that import coal from other states or countries could instead use local biomass resources.[23]

With increasing biomass development, farmers and forest owners gain valuable new markets for their crop residues, new energy crops and forest residues—and we could substantially reduce our global warming emissions. For instance, a 2009 UCS analysis found that beneficial biomass resources could provide one-fourth of the electricity needed to meet a 25 percent by 2025 RES, while generating $12 billion in new biomass income for farmers, ranchers, and forest owners and reducing power plant carbon emissions as much as taking 45 million cars off the road.[24]

Growing our use of beneficial biopower will require policy to guide industry to the right kinds of resources, public confidence that biomass can be a sustainable and beneficial climate solution, and the use of appropriate biomass conversion technologies and applications.

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Focus on Forest Biomass

DEPARTMENT OF ECOLOGY
State of Washington

Air Quality Program **December 2010**

Information about forest biomass in Washington

The burning of forest biomass (wood waste from forests) has been used as an energy source in Washington for many years. Recently, forest biomass burning has drawn interest from the public, businesses and government agencies. Some see it as a potential source of renewable energy, jobs and economic development, and as a way to help decrease our reliance on foreign oil. Others see it as a possible source of pollution and a threat to the health of people, forests and the environment.

Several existing facilities burn forest biomass to produce heat and power for their own use and for sale. New, similar operations are proposed. This publication explains Ecology's views on some issues surrounding forest biomass.

What is forest biomass?

Forest biomass means the wood waste left on site as the result of forest management activities including:

- Thinning.
- Pruning.
- Logging.
- Management practices that improve forest health or reduce wildfires.

Forest biomass **does not include:**

- Wood treated with creosote and other chemicals.
- Wood from old growth forests.
- Wood required to be left on site under the state Forest Practices Act.
- Municipal solid waste.

Ecology's role with forest biomass

Ecology is responsible for air quality, waste management and water quality issues. Ecology's responsibilities include issuing or denying air quality permits and water discharge permits.

FOREST BIOMASS IN WASHINGTON

Forest biomass burning has both advantages (renewable energy) and disadvantages (some air pollutant emissions). The state of Washington supports the sustainable use of forest biomass for energy recovery as long as it does not cause unintended consequences.

- The Washington Department of Natural Resources can sell forest biomass from state lands, and permits its removal from state and private forest land.
- The Washington Department of Ecology has authority over air and water quality and waste management issues.
- The Washington Department of Commerce is responsible for the state's energy policy and leads the state's Bioenergy Team.
- Local clean air agencies have permitting authority for some forest biomass energy projects in their jurisdictions.

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Special accommodations:
If you need this publication in an alternate format, call Ecology's Air Quality Program at 360-407-6800. Persons with hearing loss, call 711 for Washington Relay Service. Persons with a speech disability, call 877-833-6341.

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Proposals to use biomass must meet appropriate regulatory standards. When permitting them, Ecology uses the most current standards and laws, which protect human health and the environment.

What about emissions caused by burning forest biomass?

Much like burning oil, coal or natural gas, burning wood in an industrial boiler releases pollutants. These air pollutants include:

- Carbon dioxide.
- Carbon monoxide.
- Nitrogen oxides.
- Fine particles.
- Small amounts of toxic air pollutants such as arsenic, lead and mercury.

However, burning a ton of forest biomass in a controlled boiler -- especially one with advanced controls -- releases far less air pollution than burning the same amount in a home wood stove or fireplace. Burning in a controlled boiler also produces less air pollution than a wildfire or the planned burning of forest slash on the ground.

As long as the region's forest resources stay the same or increase, state law does not consider carbon dioxide from industrial burning of forest biomass a greenhouse gas. (In the law, maintaining or increasing forest resources is called the region's "sequestration capacity.") This is because the Legislature recognized that standing trees absorb the carbon dioxide released by burning forest biomass. However, carbon dioxide emissions from forest biomass burning must be reported under the state's greenhouse gas reporting requirements. (See RCW 70.235.020.)

Washington's forest biomass

Forest biomass is seen as a source of renewable energy that reduces our dependence on fossil fuels, especially from foreign suppliers. It also may help Washington utilities meet requirements to produce a substantial percentage of their electricity from renewable sources like solar, wind and biomass. Washington voters approved this standard in 2006 as part of Initiative 937.

Forest biomass helps promote jobs in rural communities by creating a market for a material previously burned as slash or otherwise abandoned. For example, forest biomass is used, among other things, to:

- Make wood pellets for home and commercial heating.
- Produce power for industrial facilities and other consumers.
- Make biofuels as alternatives to gasoline or diesel fuel.

Policies on burning forest biomass are being debated around the country. In Washington, Ecology coordinates with other state agencies to ensure this burning does not lead to environmental problems.

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For more information

- Washington Department of Natural Resources: http://www.dnr.wa.gov/ResearchScience/Topics/OtherConservationInformation/Pages/em_biomass.aspx
- Washington Department of Commerce: http://www.commerce.wa.gov/site/526/default.aspx
- Find links to local clean air agencies: http://www.ecy.wa.gov/programs/air/local.html
- Washington Department of Fish & Wildlife: http://www.wdfw.wa.gov/index.html
- WSU Cooperative Extension: http://extension.wsu.edu/energy/Pages/default.aspx

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WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Forest Biomass Initiative

Update to the 2011 Washington State Legislature

December 2010

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EXECUTIVE SUMMARY

Upon taking office in 2009, Commissioner of Public Lands Peter Goldmark initiated the Department of Natural Resource's Forest Biomass Initiative to demonstrate the utility of forest biomass as an energy feedstock. Since then, the initiative has emerged as a significant contributor to Washington's renewable energy sector.

In Washington, forest biomass consists of residual branches, needles, and tree tops (slash) left over from ongoing logging operations; products of pre-commercial thinning (small saplings from overcrowded young forests); tree stems and tops thinned from forests that are at risk from wildfires, insects or diseases (forest health treatments) that are not currently utilized; clean, untreated wood construction and demolition waste (that would otherwise have gone to the landfill); and unused materials from lumber mills, such as sawdust, shavings, chips or bark.

Forest Biomass Pilot Projects

At Commissioner Goldmark's request, the 2009 Washington State Legislature passed into law HB 2165 which authorized the agency to move forward biomass-to-energy demonstration projects. Four projects were selected: Nippon Paper Inc. (Port Angeles), Atlas Pellets (Omak), Borgford Bioenergy (Colville), and Parametrix Inc. (Bingen). The four pilot projects selected demonstrate an array of forest biomass processing technologies, and each contributes uniquely to the state's energy sector. Additionally, the pilot projects were of a scale, facility efficiency, and location that both complied with the parameters set forth in the legislation and were consistent with the agency's sustainability goals.

After the pilot projects were selected, DNR convened multi-agency implementation teams to assist in each of the projects' success. Teams consisted of representatives from Washington Departments of Natural Resources, Ecology, Commerce and the Governor's Office of Regulatory Assistance, Washington State University, as well as NGO's, community groups, and city and county government representatives.

Nippon Paper, Inc. (combined heat and power) and Borgford Bioenergy (slow pyrolysis) are moving ahead. Both received State Energy Program (SEP) grants through the Washington Department of Commerce. Nippon is largely through their permitting process, currently awaiting approval on their Air Quality Permit. They plan to begin construction of the boiler by the end of the year. Securing reliable sources of forest biomass feedstock, including from DNR-managed lands will be critical for the Nippon project.

Borgford Bioenergy, through the pilot project process, has been able to bring the Springdale Lumber Mill back into operation (employing thirty people in Springdale, WA). Borgford is currently fabricating his slow pyrolysis system to be installed at the Springdale Lumber Mill. A lesson revealed by this project is the conundrum of permitting new technology that has no record of performance to use as a reference in the permitting process.

Two of the pilot projects have faced insurmountable challenges. Parametrix Inc. was unable to secure the funding that was necessary to bring fast pyrolysis technology off the laboratory bench and into a pre-commercialization phase. New funding pathways for projects of this nature and scale may need to be found to ensure that Washington continues to lead in technological innovation. Atlas Pellets, due to financial constraints of the parent company and economic pressure resulting from imported pellets, was forced to close their doors in November 2010, accentuating the problem of sustaining manufacturing infrastructure in this region of Washington.

Forest Biomass Supply

In order to secure project financing for major bioenergy facilities, long-term agreements for biomass supply are necessary. In 2010, the Washington State Legislature passed a second bill, 2SHB 2184. This

bill enables DNR to enter into long-term contracts for sale of forest biomass from DNR-managed lands, after completing supply inventories of the areas proposed for sale.

In 2010, DNR sought and ultimately received a $1M grant from the U.S. Forest Service, a portion of which has been allocated to a state-wide, all lands forest biomass supply assessment. The study, to be conducted by the University of Washington with TSS Consultants, will build on previous forest biomass supply analyses, using finer scale data and evaluating individual land managers' objectives, operational and economic factors for biomass availability, and environmental sustainability. The project will also produce a forest biomass supply calculator that can help project developers, landowners, and others estimate the availability of adequate supply of forest biomass in specific areas.

Forest Biomass and Carbon Neutrality

2SHB 2184 also required that DNR submit to the legislature a literature review on the "carbon neutrality" of forest biomass. While most observers understand that CO2 emissions from forest biomass combustion for energy, unlike fossil fuel combustion, recycles atmospheric carbon as part of the natural baseline global carbon cycle, the evaluation of carbon neutrality of forest biomass is determined by the boundaries in space and time considered most relevant to that evaluation. Four approaches to these boundaries are most commonly applied to the question, each yielding different conclusions about neutrality.

1. Nationwide scale, over time (taking the forest carbon cycle into account). This is the approach taken by the Intergovernmental Panel on Climate Change. In this approach, a determination of carbon neutrality for biogenic carbon emissions can be made so long as a nation's forest carbon stocks remain constant or increase over time.

2. Statewide scale, over time (taking the forest carbon cycle into account). This is the approach supported by Governor Gregoire and Commissioner of Public Lands Peter Goldmark. Neutrality exists so long as a state's forest carbon stocks remain constant or increase over time, as is the case in Washington State.

3. Facility supply circle scale, right now (at a single point in time, not fully taking the forest carbon cycle into account). With this approach, a determination of neutrality can be made only if the forests in a facility's supply circle are absorbing at least as much CO2 as that being released from the stack at the point of emission.

4. Right here (single site), right now (present to future time period, not fully taking the forest carbon cycle into account). This is the approach taken by the recent study by the Manomet Center for Conservation Sciences in Massachusetts. With this approach, a determination of neutrality can be made only after the site from with the biomass was harvested has re-absorbed through subsequent tree growth the amount of CO2 that may have been released at the bioenergy facility.

The Department of Natural Resources supports the approach wherein a neutrality determination for a state's greenhouse gas emissions from forest biomass energy production is made so long the state's forest carbon stocks are either stable or increasing. This is the case in Washington's forests. In addition, forest biomass energy production can have positive greenhouse gas results to the extent that it displaces energy production from fossil fuels. Combustion of fossil fuels releases new carbon into the atmosphere which has been stored in the earth's crust for millions of years.

Summary

Forest biomass can and should play a meaningful role in Washington's renewable energy sector. The Department of Natural Resources is moving forward with its forest biomass initiative thoughtfully in order to ensure sustainability as it continues to gain momentum in our state. To date, our work and the

work of our partners have demonstrated that a sustainable forest biomass-to-energy sector in Washington can:

- Reduce reliance on fossil fuels.
- Increase forest health and reduce fire hazards while protecting the forest environment.
- Reduce air emissions (utilizing the materials in a regulated environment as opposed to slash burns).
- Create green jobs and enhance rural economies.
- Increase industrial efficiency.
- Contribute to the development of drop-in replacement fuels.
- Reduce the risk of forest land conversion by providing land-owners with an additional revenue stream.

We look forward to continued partnership with the Washington State Legislature and other interested parties.

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Introduction

Upon taking office in 2009, Commissioner of Public Lands Peter Goldmark launched the Department of Natural Resources' (DNR) Forest Biomass Initiative to demonstrate the utility of forest biomass as an energy feedstock. Since then, the initiative has grown into a significant contributor to Washington's renewable energy sector.

Since the initiative's launch, the agency has become an active participant in state-wide discussions related to renewable bioenergy development, rural economic development and green jobs. As a result of Commissioner Goldmark setting the agency on an aggressive trajectory to identify and engage opportunities for our state's forests to contribute to the development of Washington's renewable bioenergy resources, the agency has come forward as a state and national leader in bioenergy development.

Today, the Department of Natural Resources:

- Actively participates in the Washington State Department of Commerce led State Bioenergy Team. The team consists of agencies and stakeholder groups that have a hand in bioenergy development in Washington, and works to promote sound policy, research, and other actions that affect the further success of this sector.

- Has provided critical input, based on the lessons learned through the forest biomass pilot projects (See Section 1), that has helped to shape recommendations in the State Energy Strategy Update being delivered to Governor Gregoire and the Washington State Legislature in December 2010.

- Encourages the Energy, Transportation, and Climate (ETC) agency directors' coordinating group to consider the unique energy needs and opportunities for renewable energy generation available in our State's rural communities.

- Has provided input on federal policy proposals that will have significant impacts on both the State's and the Nation's bioenergy sector (EPA's "Tailoring Rule," biomass related provisions of the Federal Farm Bill, and ARRA funding).

- Has assisted in the development of Washington's renewable energy standards and contributed to State Capital Budget discussions related to biomass.

- Was an organizer of Washington's Bioenergy Symposium and Future Energy Conference – an event that brought together governments, businesses, and NGO's working on issues related to bioenergy development and the continued expansion of the State's renewable energy sector.

Additionally, the agency launched its Strategic Plan: 2010-2014 in April 2010. The plan's fifth major goal is to: "Develop Renewable Energy Resources on State Lands, Address the Challenges of Climate Change, and Create Renewable Energy Jobs." Action items in this goal include:

- Developing a renewable energy program for state lands.

- Analyzing renewable resources and job creation potentials for state lands.

- Implementing the Biomass Pilot.

- Implementing an active forest health program, linked to the forest biomass energy initiative, especially in eastern Washington.

This report is intended to provide the 2011 Washington State Legislature with a comprehensive update on the agency's Forest Biomass Initiative. It includes, but is not limited to, updates and reports required in the two pieces of enabling legislation that have passed since the initiation of this effort.[1]

[1] SHB 2165 An act relating to authorizing the department of natural resources to conduct a forest biomass energy demonstration project; and, 2SHB 2481 Forest Biomass on State Lands.

Section 1. Forest Biomass Pilot Project Update (HB 2165)

In 2009, at Commissioner of Public Lands Peter Goldmark's request, the Washington State Legislature passed HB 2165 (See Attachment A), authorizing the DNR to implement forest biomass-to-energy pilot projects in order to demonstrate that "forest biomass can be used to generate clean, renewable energy" [HB 2165 (Section 1)].

Commissioner Goldmark and the legislature recognized that developing a forest biomass-to-energy project would involve numerous challenges. These challenges include supply availability (consistency and economic/ecological sustainability), product market development and incentive structures, and public policy. The pilot projects would be an opportunity to gain important information that is crucial to the long-term success of this emerging industry.

The legislation, in addition to authorizing demonstration pilot projects, asked that the Department of Natural Resources (the agency) submit a report in December 2010 detailing the information gathered and the lessons learned to date. This report will address the updates required in HB 2165 [Section 3 (1-5)].

In the summer after HB 2165 passed, the agency issued a Request for Letters of Interest seeking businesses or other entities that were interested in partnering with the agency as a biomass-to-energy pilot project. The DNR received responses from nearly 30 entities interested in working with the state to explore the opportunities in an expanding forest biomass market. Proposals covered a broad range of topics including:

- Co-producing electricity, bio-oil, and syngas using pyrolysis technology;
- Heating systems for public buildings and schools;
- Mobile units to produce bio-oil and bio-char;
- Pellet and bio-brick production for heating;
- Combined heat and power (CHP) systems at existing forest products manufacturing facilities.
- Production of electricity for sale to utilities to meet renewable portfolio standard requirements; and,
- Demonstration of in-forest biomass gathering systems to increase access/decrease transportation costs.

To select the projects that would move forward as pilots, the agency convened an advisory committee comprised of professionals with diverse expertise in the technology, research, conservation, forestry, and biomass energy fields in Washington and the region. Several key project attributes that were evaluated in the selection process included:

> ***Scale***. The selected pilots were truly of pilot scale. None required more forest biomass than the DNR was certain were available in the locations where they were located [HB 2165(1)(e)]. The agency recognized that until more comprehensive research has been conducted on ecologically and economically available supply, appropriate scale was critical to the success of the pilot program. Within this constraint, the agency aimed at demonstrating a range of scales.

Efficiency. The technologies selected as part of the pilots extracted the greatest energy value from the forest biomass. The agency is supportive of existing efforts in Washington to encourage facility efficiency. It was important to the evaluation committee that the systems being proposed not only demonstrate the utility of the feedstock, but were also examples of the state working to achieve industrial efficiency. As a package, the agency wished to demonstrate a diversity of biomass conversion technologies.

Location. In addition to the legislative provision prohibiting pilot sites that would interfere with supply areas for existing facilities, the agency wanted to place emphasis on siting the pilots in regions that both lacked processing infrastructure and were challenged by declining forest health. The agency also wanted to distribute selected pilots broadly across different regions of the state. The legislation required that at least one pilot be east and one west of the Cascades [HB 2165 Section 2(1)].

In January 2010, four projects were selected to move forward in the first phase of DNR's Forest Biomass Initiative: Nippon Paper, Inc.; Atlas Pellets; Borgford Bioenergy; and, Parametrix Inc.. The projects selected highlighted the Department's support of innovative and emerging biomass harvesting and processing technologies that can contribute to the most efficient use of the forest resource (with an emphasis on fuel production). Although HB 2165 indicated selection of two pilot projects, one in eastern and one in western Washington, DNR selected four pilots to provide a wider diversity of project types and to hedge against project failure.

Upon selection of the pilot projects, DNR convened implementation teams for each project to foster inter-agency collaboration and to provide partner agencies with an opportunity to highlight the work being done in their agencies to foster the expansion of the state's renewable energy portfolio. Each team had representatives from the following agencies: Department of Commerce, Department of Ecology, Governor's Office of Regulatory Assistance, and Washington State University. Teams also included representatives from local governments, NGO's supporting the projects, community organizations, consultants, air agencies, and others.

Pilot Project 1: Nippon Paper. Port Angeles, WA.

Project Summary

Nippon Paper is replacing its existing boiler with a biomass boiler to power the plant and to generate 20MW (megawatts) of renewable energy to be sold to local PUD's. The project is expected to create over 100 jobs during construction and at least 20 permanent jobs during the operation of the boiler. The company is scheduled to begin on site construction of the new boiler in June 2011, and will take advantage of federal incentive programs that sunset in January 2011.

Nippon submitted an Air Quality Permit application and is currently waiting air permit approval from the Olympic Region Clean Air Agency (ORCAA). The design of the new boiler must demonstrate compliance with all State and EPA air quality and health regulations. Nippon's designers have proposed an oversized particulate control device that will achieve the proposed EPA standards and provide 99.3% efficiency in removing particulates. In addition, Nippon will be installing a second pollution control device for particulate and acid gas removal. This device, a wet scrubber, will use direct contact water to remove additional pollutants. Additionally, the scrubber will help capture and recycle heat from the flue gas of the cogeneration process. This will improve the thermal efficiency for the project (bringing it above 68%) and further reduce fossil fuel consumption.

Since 2000, Nippon reduced fossil fuel usage by 88%. With this project they will reduce oil usage to virtually zero. The company's greenhouse gas emissions (GHG) are already below the 1990 baseline that was proposed by the Climate Change Conference in Kyoto in 1997. In 2001, Nippon installed a $2

million dollar heat recovery unit on their existing boiler that made the mill more efficient and had the added benefit of reducing particulate emissions by 45%. With the new emission control devices proposed for this boiler, the mill will again significantly reduce particulate releases as well as provide the ability to reduce open slash burn emissions in a significant and positive manner.

Nippon submitted a 200+ page Environmental Impact Assessment (EIA) to the City of Port Angeles. The City approved the package.

Nippon Paper, Inc. plans to source its biomass from a combination of public and private landowners on the Olympic Peninsula. DNR is currently working with the company on a Letter of Intent articulating the agency's intent to enter into a long-term contract (See Section 2.) for forest biomass from DNR-managed lands on the Olympic Peninsula. Nippon will likely be a company with whom the agency pilots the newly granted authority to enter into long-term biomass supply contracts.

Total Project Budget: $71M

Grants Received During Pilot Phase:

$2M State Energy Program (SEP) Grant/Loan. The SEP grant that Nippon received was a critical step, demonstrating Washington State support to the parent company financing the remainder of the project.

Biomass Supply Need: 160,000 BDT/year

Supply Source: Public and private lands on the Olympic Peninsula.

Outcomes/Recommendations

Support efforts to streamline permitting of combined heat and power (CHP) projects.

CHP is one of the most efficient methods of utilizing forest biomass as an energy feedstock. Nippon Paper, Inc's CHP project, in particular, demonstrates the tremendous efficiency that can come from cutting edge CHP systems. DNR supports the proposal in the Department of Commerce's "2011 Biennial Energy Report with Indicators and Energy Strategy Update" for Efficiency programs for non-electric fuels:

"Industrial Energy Efficiency

7. **Streamlined permitting of combined heat & 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 & 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."

Identify Incentives Programs for Highly Energy Efficient Facilities

The DNR supports efforts to identify and implement incentive programs for high efficiency CHP and other renewable energy projects. These could include creating a 1.2 multiplier for renewable energy certificates (RECs) produced from projects that have a high efficiency rating (e.g. > 60%), prioritizing

available grant funding for renewable energy projects to those that achieve efficiency goals, and streamlined permitting (see above).

Develop and implement a multi-agency biomass education and outreach effort.
The Nippon Paper project, supported by multiple state agencies as a prime example of positive renewable energy development, industrial efficiency, and climate change adaptation, has received both community support and some expressions of concerns related to air emissions and in-forest effects of biomass recovery. DNR, through the Interagency Biomass Coordination Team that was convened to move this initiative forward, will initiate an education/outreach effort to ensure that local community and Washington residents have access to accurate scientific information on bioenergy CHP projects in construction and being planned for the state.

Pilot Project 2: Atlas Pellets. Omak, WA.
Project Summary
Atlas Pellets proposed to update the existing pellet mill in Omak, install a new debarking and chipping system that can process products from forest health treatments and thinning activities, and produce pellets to be used by residents living in the Okanogan area. The pellet mill previously received sawdust from Precision Pine (now closed) and was forced to stop operations in July 2010 (laying off 12 employees). Without the new equipment and without a supply of their traditional feedstock, they could not continue to operate.

Concurrent to the Atlas Pellet mill looking to update their facility, three cities in the area applied for a Community Energy Grant intended to work in harmony with the updated mill. The cities of Omak, Oroville, and Okanogan, through the Institute for Washington's Future applied for and received a Community Energy Grant to develop a trade-out program to replace traditional woodstoves for high efficiency pellet stoves. Through the grant, the team is developing the tools (both educational and practical) to implement the program. Until the mill is updated, however, there will not be a local supply of pellets for residents currently dependent on wood heat in their homes. The costs of pellets that have been shipped from elsewhere is too high to induce residents to move away from their inefficient wood stoves to high efficiency pellet stoves.

Due to the significant lack of timber sector activity in North Central Washington and economic instability of the parent company, the mill was put up for sale in November 2010. DNR is waiting to see if a potential purchaser would be interested in continuing a relationship as a pilot project under DNR's Forest Biomass Initiative. If so, the project will continue as planned with the new mill owner; if not, the pilot will be concluded.

Total Project Budget: $750,000.00

Grants Received During Pilot Phase: None. The project did not produce energy in the form of electricity (currently favored by existing funding programs). Because the parent company was struggling financially, they did not qualify for federal or state loan and/or loan guarantee programs.

The 2010 Washington State Legislature allocated $750,000.00 in capital funding for forest biomass conversion equipment in regions needing both forest health treatments and rural economic development. Atlas could have competed for that funding and, if successful, could have used the funding to purchase the equipment needed to move the project forward. However, the legislature appropriated the funds from DNR's Natural Resources Equipment Revolving Fund, which is legally dedicated for use to purchase agency equipment on a reimbursable basis. Legal research by DNR concluded that this fund source is not authorized for use by private businesses.

DNR recommends the legislature shift the appropriation to the more suitable State Building Construction Account in the 2011 supplemental budget.

Biomass Supply Need: 24,000 BDT/year

Supply Source: Precision Pine Mill (closed) and local forest land-owners and residues from forest thinning/forest health treatments.

Outcomes/Recommendations

Ensure that rural energy needs are being addressed.

Atlas Pellets provided an opportunity to explore and expand a greenhouse gas reducing, non-grid based energy product (pellets) that could reduce the GHG and other air emissions produced in communities reliant on wood heat. It is unlikely that these residents will switch to electric heat, for economic and cultural reasons. Further exploration of climate friendly and culturally acceptable energy options will be an important next step in the State's efforts to reduce greenhouse gas emissions, increase energy independence, and promote renewable energy.

Focus funding on energy needs of rural communities and on rural energy development projects.

Atlas Pellets applied for a State Energy Program grant and was not awarded funds. The grant program focused on projects that would increase energy efficiency and/or produce energy for the grid. These are critically important elements of meeting the State's clean energy goals; however, they may not sufficiently apply to innovative rural energy entrepreneurs. A major lesson learned through the Atlas Pellets pilot project is that sufficient attention has not been paid to the needs of rural communities in Washington in addressing how policies and incentives can more effectively apply to their circumstances. The agency supports the proposal in the Department of Commerce's "2011 Biennial Energy Report with Indicators and Energy Strategy Update" for Efficiency programs for non-electric fuels (Residential and Commercial Buildings Package (17), pg. 15-16).

Identify opportunities for forest products infrastructure expansion in North Central Washington.

North Central Washington is facing significant forest health issues. It is important opportunities for reinvigorating existing and developing new forest product manufacturing infrastructure are thoroughly explored. Emphasis should be placed on projects that both expand infrastructure and address renewable energy needs of rural communities. USFS engagement will be critical to ensure that this goal be met.

Pilot Project 3: Borgford Bioenergy. Springdale/Kulzer, WA.

Project Summary

Borgford Bioenergy, based in Colville, Washington, has developed a slow pyrolysis system that converts forest residuals to biochar, bio-oil (that could be further refined into a liquid transportation fuel), and power (1 MW/pyrolysis unit). Recent studies by Washington State University (WSU) suggest that opportunities exist for biochar to be used as a soil amendment and a medium for carbon sequestration in agricultural applications. Borgford Bioenergy is collaborating with WSU and Pacific Northwest National Laboratory (PNNL) to do crop application analyses of the biochar that will be produced by this project.

The project consists of two sites: one in Kulzer, one in Springdale, Washington. To date, no work has occurred on the Kulzer site. Eventually, Borgford would like to install seven pyrolysis units at that site. Since being selected as a pilot, Borgford was able to purchase and re-open the Springdale Lumber Mill (which had been closed for 5 years). The mill is now operational and employs approximately 30 residents of Springdale, WA. The biomass burner to be installed at the Springdale Mill is being fabricated and is awaiting completion of the air permit process.

After being selected as a pilot project, Borgford Bioenergy had the support of multiple state agencies, local governments and universities. This network facilitated successful application for a State Energy Program (SEP) loan in the amount of $750,000. The group has also been central in helping begin the process of securing the necessary permits the project will need. The Office of Regulatory Assistance provided Borgford with information about local engineering contractors to work on the project, to help him navigate the permitting process.

Because the technology being applied by the Borgford Bioenergy project is new (with no comparable technology having been permitted in the State of Washington, to date), much has been learned about the challenges that currently face businesses wanting to site their cutting edge technology in Washington. It has been challenging for the interagency project team and Borgford to collectively identify an effective path forward toward obtaining the necessary permits this project requires. These challenges have been effectively addressed in proposed actions contained in the Washington Department of Commerce's State Energy Strategy Update (See Outcomes/Recommendations).

The Borgford Bioenergy project tells a compelling story of rural entrepreneurship and rural economic development. Stevens County, home of the project, is an economically distressed community in Washington. A former Stevens County Commissioner said that Borgford's ability to bring the Springdale Mill back on-line helped prevent the town from un-incorporating. In a town with a population of around 200 people, the mill is currently employing over 30. The Borgford Bioenergy project is a tremendous example of a rural entrepreneur helping to keep his local economy vibrant.

Total project budget: $16.4M
Grants Received During Pilot Phase:
$4M United States Forest Service Stimulus Grant
$750K State Energy Program (SEP) Loan

Biomass Supply Need: 70,000 BDT
Supply Source: Springdale Mill Residues

Outcomes/Recommendations

Tailor permitting processes for projects that utilize new and emerging technologies, while ensuring environmental protection.

Among lessons learned as part of this project, the requirements for air permitting appear to the interagency project team to be better matched to large traditional emission sources than to innovative and emerging technologies in small projects. Pre-construction characterization of emissions can be a challenge for small entrepreneurs introducing new technology. Up-front efforts to develop common expectations for critical process steps and for applicant capacity for engineering analyses are especially important. Because there is no other system like the Octoflame Burner (slow pyrolysis unit), identifying a path toward successfully obtaining an air quality permit has been challenging. As of publication, Borgford Bioenergy and its air quality consultant are preparing supplemental information to its air permit application for the Springdale lumber mill chipper/grinder. Borgford and its consultant are preparing to submit an air permit application for the Springdale slow pyrolysis unit after the chipper/grinder application is complete, and Ecology will process the application when it is submitted.

DNR supports the proposal in the Department of Commerce's "2011 Biennial Energy Report with Indicators and Energy Strategy Update" for Streamlined Permitting for Clean and Advanced Energy Technologies:

"Streamlined Permitting for Clean and Advanced Energy Technologies
When new generation does need to be deployed in Washington State, clean energy technologies should be preferred over conventional resources. This assists with meeting greenhouse gas targets, and furthers Washington's global leadership in advancing energy technologies. Likewise, advanced energy efficiency solutions need to be preferred over low-efficiency construction or equipment. The initiatives below can encourage renewables or other clean energy technologies by streamlining the permitting process associated with their deployment. All such streamlining will be done with due respect for the practical limits dictated by the grid's ability to accept intermittent generation. Streamlining also will never be deployed in a way that circumvents protections for the environment and cultural resources, which are primary purposes of the permitting regimes to begin with, and will be developed in close collaboration with the Department of Ecology, Department of Fish & Wildlife, and other agencies responsible for protecting those resources.

Washington innovators wishing to deploy pilot projects of new, experimental technologies find their projects must meet the same permitting requirements as a full-scale, conventional generating plant, despite the much smaller size of the pilot. The last two of the initiatives below focus on Washington's role as a leader in emerging energy technologies, by launching additional streamlining efforts for advanced technology pilot projects.

In Washington State, land use decisions are primarily in the hands of local governments. None of the initiatives below are intended to change this; they merely provide tools, authority or technical assistance to local governments to apply the streamlining concepts discussed; or they streamline state-level permitting steps that are already in place.

16. **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 timeframe associated with 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 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.

17. **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. [State Energy Strategy, pgs. 17-20]"

Continue to facilitate stimulus and renewable energy grant funds going toward projects in rural communities in Washington.
Residents in Washington's rural communities are some of our country's most innovative. Borgford Bioenergy is an example of this grass roots innovation. This project would not have been possible without the assistance of stimulus dollars that had been passed through to Washington State. If additional funds are made available, it is important to facilitate a portion of these funds assisting local projects in our rural communities.

Recognize Rural Entrepreneurs Creating Jobs in their Communities
As Washington continues to move ahead with stimulus and clean energy projects, it is important to recognize the local people making a difference in the economic health of the state. One idea to explore is the possibility of establishing a recognition program for rural entrepreneurs engaging their communities in Washington's emerging clean energy and green technology sectors.

Pilot Project 4: Parametrix Inc. Bingen, WA.
Project Summary
Parametrix Inc., an environmental consulting firm headquartered in Auburn, Washington, partnered with Organix, Renewable Oil International and SDS Lumber to install a mobile fast pyrolysis unit on the SDS lumber site in Bingen, Washington for a 90-day trial of bio-oil production. Parametrix Inc. planned to explore refining and marketing options for the oil to determine if the system could be commercialized, with eight mobile units ultimately planned.

Parametrix Inc. convened a strong team that intended to explore the opportunities for liquid bio-fuel production through fast pyrolysis technology. Throughout the course of the project, the question emerged as to whether the technology had matured to the point that it was ready for commercialization. WSU researchers indicated that the technology would likely not be ready for commercialization until refining capacity in the state was expanded. Until then there is no market for the bio-oil that is produced.[2]

Parametrix Inc. applied unsuccessfully to several state and federal grant programs. They did not receive funding because they were neither a research and development project, nor were they of sufficient scale to be considered a commercial project. Because the project was unable to secure funding to move the project forward, it was concluded in November 2010.

[2] Currently, there is only one company, ENSYN (in Canada), commercially producing bio-oil from pyrolysis technology. They are using the oil as a food flavoring.

Total project budget: $3.1M

Grants Received During Pilot Phase: None. The project was not classically an R&D project, nor was it ready for commercialization. As a result, it was in a 'valley of death' from a funding perspective: unable to obtain research dollars, unable to obtain build-out funds.

Biomass Supply Need: 1,900 BDT over a 90-day test period

Supply Source: Parametrix Inc. intended to use mill residuals from the SDS lumber mill during the course of the pilot.

Outcomes/Recommendations

Identify/create funding opportunities for projects currently in a transitional status from research to commercialization.

If Washington is to be a global leader in renewable energy technology development, we must ensure that funding is available to bring technologies not quite mature enough for commercialization into the stage of development that follows research. This pilot demonstrated that although we have tremendous research capacity in the state, we could improve our ability to bring those technologies to pre-commercialization.

Implement and Enforce a Renewable Fuel Standard in Washington State.

Market demand is central to the success of bio-fuel projects in the state. Until we have an enforceable renewable fuel standard in the State, it is unlikely that we will see significant investment in the necessary production/refining infrastructure. The agency supports the proposal in the Department of Commerce's "2011 Biennial Energy Report with Indicators and Energy Strategy Update" to amend Washington's existing Renewable Fuel Standard:

> **"Transportation Efficiency and Technology**
> Several efforts to directly address the energy demand and greenhouse gas emissions associated with transportation are under way at the Washington Department of Transportation, Department of Ecology, and elsewhere. However, a few aspects of enabling transitions in transportation can benefit from Commerce's unique capacities in growth management and energy policy.
>
> 11. **Amend Renewable Fuels Standard**. In 2006 the Washington State Legislature passed a renewable fuels standard requiring gross diesel fuel sales statewide to consist of at least 2% biodiesel before December of 2008.[3] This mandate has not been achieved due in part to a lack of legislated enforcement authority, but also due to the high administrative burden associated with a volumetric requirement such as that legislated in 2006, versus the universal requirement that has been much more successfully legislated in other states.[4] Washington State is home to an innovative and motivated, nascent biodiesel industry; a more successful biodiesel standard would encourage further development of this industry in the state.
>
> 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. [Transportation Package (11), pg. 13]."

Utilization of the state's forest biomass resources for energy production can generate revenue and increase asset values of state forest lands, protect forest land of all ownerships from severe forest health problems, stimulate Washington's economy, create green jobs, and reduce Washington's dependence on foreign oil.

[3] ESSB 6508. The renewable fuels standard also sets targets for ethanol in gasoline sales, but these targets have been rendered moot by more recent, aggressive federal targets.

[4] 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.

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Section 2. Long Term Supply Contracts and Statewide Supply Assessment

Long Term Supply Contracts for Forest Biomass from DNR-Managed Lands

DNR has heard from numerous potential forest biomass project developers about their needs, including the need for a reliable supply of biomass feedstock. As the pilot projects moved ahead and the Forest Biomass Initiative gained momentum, the need to contract forest biomass through long-term contracts became evident. To obtain financing, project developers stated a need for a guarantee of at least 10-20 years of supply. Where forest biomass supply was envisioned to come from state owned forest land managed by DNR, DNR's typical two-year timber sales contract and spot sales of forest residuals were identified as a barrier. In response to this feedback, DNR requested that the Washington State Legislature authorize the agency to use longer term contracts for biomass sales. In 2010, 2SHB 2481 passed both chambers almost unanimously (See Attachment B).

The bill authorizes the agency to enter into contractual agreements with businesses to convey forest biomass from public lands in five ways:

- The agency may authorize the separate sale of biomass within timber sale contracts or outside of those contracts.
- The agency may enter into long-term competitive contracts for forest biomass for an initial term of up to five years with the opportunity for three additional five-year contract renewals.
- The agency may enter into direct sales contacts without public auction based on procedures adopted by the Board of Natural Resources to ensure market pricing and accountability.
- The agency may enter into a fifteen year initial contract term for biomass with contracting entities making a qualifying capital investment of at least $50M under certain circumstances.
- The agency may lease state lands for the purpose of the "sale, exploration, collection, processing, storage, stockpiling, and conversion of biomass" into energy and energy products.

The effects of the legislation are significant in that long-term contracts provide investors with the necessary information to secure funding for commercial-scale forest biomass-to-energy projects where state-owned forest lands are to be a significant source of supply. These authorities also provide a clear framework for DNR to contribute to renewable energy development in a way that is environmentally sustainable, generates new revenue for trust beneficiaries, creates jobs and helps maintain working forests.

Since the bill's passage, a number of businesses have expressed interest in long-term contractual arrangements for forest biomass from DNR managed state trust lands. Each option for transacting biomass authorized under the bill requires critical development work by the agency. DNR is working to complete steps necessary to exercise this new authority, although significantly reduced staff and budget resulting from declining DNR timber sale revenues have slowed progress.

The legislation requires that DNR complete the following steps prior to exercising the authority to enter into long-term contracts for biomass from DNR lands. Below is a summary of these steps and an update on the agency's progress toward completion:

1. Prior to entering into long-term contracts for biomass from public lands, the agency must "complete an inventory of the available biomass in the area that will be subject to the agreement" [2SHB 2481 Section 2(1)]. Note: This requirement does not apply to the pilot projects.

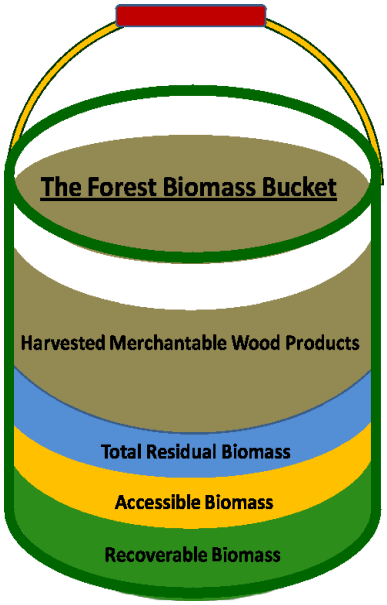
2. Develop new contract documents, new clauses for existing contracts and new contracting methods.

3. Allow for differentiation between timber and forest biomass products to sell biomass under existing timber contracts.

4. Develop the procedures required for biomass contracts. The procedures must: Ensure that biomass being harvested from public lands is done so in a manner that "retains organic components of the forest necessary to restore or sustain forest ecological functions;" include "utilization standards and operational methods in recognition of the variability of on-site conditions;" authorize the agency to "unilaterally amend the volume to be supplied" with six months notice to the contracting party.

5. Develop procedures for Board of Natural Resource adoption, for direct sales of forest biomass without public auction; that ensure a competitive market price and accountability.

The agency, through a combination of funds from the United States Forest Service (See below) and land management funds hired a project staff to do the work necessary to exercise our new authority to enter into long-term supply contracts. New contract documents are being developed for specific biomass-only harvests. Current timber sales procedures and contracts are being evaluated for the potential application of biomass contract sales. The new documents and procedures will allow for differentiation between timber and forest biomass products under existing timber contracts. The procedures for direct sales without public auction are currently being developed. The DNR is also evaluating long-term contracts for pilot projects. New staff resources will continue to help progress in developing the procedures for biomass contracting authority. Biomass long-term contracts and direct sales procedures will continue development in 2011.



Of the total biomass available in our forests, only a small portion is recoverable for use as an energy feedstock. (Oneil, pg. ii)

Statewide Forest Biomass Supply Assessment

As mentioned above, prior to entering into long-term contracts for forest biomass from state managed lands, DNR must first assess the available supply of biomass in the contract area (See 2SHB 2481, Section 2). In 2010, DNR sought and ultimately received a $1M grant from the U.S. Forest Service (USFS), a portion of which has been allocated to a statewide forest biomass supply study (See HB 2164, Section 4).

The study will help assess forest biomass availability and sustainability throughout Washington State on all forest land ownerships, including state-owned lands, as well as fulfill specific legislative requirements. The grant will, in addition to the supply study, enable DNR and partners to test methods for making forest biomass material available from broad, multi-landowner areas with the aim to improve the economic feasibility of protecting forests from wildfire and restoring forest health.

The forest biomass supply assessment will build on previous biomass supply analyses, refining and improving upon them by using finer-scale data and evaluating individual land managers' objectives, operational and economic factors for biomass availability, and environmental sustainability. A range of supply estimates will be developed encompassing all forestland owners statewide, and will further break down these estimates within a series of logical supply tributary areas.

The study approach will include the following methodological elements to determine what volume of biomass from Washington forests is both economically and ecologically available:

- Stratification of the relevant components of the supply assessment by landownership categories (federal, state, tribal, large private industrial, large private non-industrial, small private), forest ecosystem type, species (or, at a minimum, hardwood and softwood), logical supply areas across the state, and time periods in decades.
- Recent trend and projected acres and volume of timber harvest used to determine estimated residuals left on-site and the physical characteristics of harvest residuals.
- Projections of biomass that could result from pre-commercial thinning, forest health and fire fuel reduction treatments, salvage operations, and other origins.
- Estimated volume, physical characteristics, and distribution of material, live and dead, under a reasonable range of on-site retention levels to protect soil productivity, water quality, fish and wildlife habitat, and other ecological functions. These shall, at a minimum meet current Washington State rules under the Forest Practices Act (RCW 76.09).
- Analysis and estimate of the operationally feasible volume, cost, and quality of removed biomass under a range of reasonable removal scenarios.
- An estimate of the cost of various modes and distances of transportation to the given processing facility locations.
- An estimate based on currently available information, of a range of the prices in $/ton for delivered biomass matched to various biomass physical quality characteristics.
- Summary estimates of the volumes, origins, and physical characteristics of biomass, which could be ecologically and economically removed from forest lands in Washington on a long-term sustainable basis, including any key trade-offs involved, based on the preceding analysis results..
- Results will be aggregated to statewide estimates by biomass origin and landowner category.

The project will also result in the development of a biomass calculator tool that allows for customized biomass availability estimates based on user-defined inputs. This tool will be made available to the public and will be utilized by the agency in developing long-term supply contracts for forest biomass from DNR-managed lands.

Because 2SHB 2481 requires DNR to complete a biomass supply assessment before entering into long-term contracts for biomass supply from DNR managed lands, an aggressive timeline for the project has been developed. After a competitive Request for Proposals and careful analyses of proposals and bids received, in November DNR selected the University of Washington, School of Forest Resources (who will be working with TSS Consultants) to conduct the research. The project is scheduled for completion by August 2011, with interim reports provided to the agency throughout the research process.

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Section 3. Ecological Implications of a Forest Biomass-to-Energy Sector

Since the passage of HB 2165, and as public awareness of forest biomass as a potential renewable energy feedstock has grown, concerns have been raised about the effects a forest bioenergy sector will have on Washington's forest ecosystems and the environment generally. These concerns range from the greenhouse gas implications of the utilization of forest biomass as an energy feedstock (See Section 4. Carbon Neutrality Analysis) to concerns that forests will be harvested down to bare soil to 'feed' the facilities that are using or that intend to use forest biomass as an energy feedstock.

Washington State has included forest biomass in its statutory definition of 'renewable resource,' for purposes of qualifying for renewable energy credits:

> "Renewable resource" means:
>
> > (i)…solid organic fuels from wood, forest, or field residues… that do not include (i) wood pieces that have been treated with chemical preservatives….; (ii) black liquor byproduct from paper production; (iii) wood from old growth forests….(RCW 19.285.030 (18))"

In order for energy projects to utilize forest biomass as a feedstock and count their energy towards the State's Renewable Portfolio Standard (RPS) requirements, those limitations will need to be met. Additionally, economics currently do not support the use of whole logs for energy production. Currently, a truck-load of biomass is valued at approximately $20/green ton; timber is approximately $70/green ton.

Understanding both the state's definition and the economics supporting the industry are central to clarifying what types and origins of biomass will and what will not be used in bioenergy production.

Forest biomass will most typically consist of:

- Residual branches, needles, and tree tops (called "slash") left over from ongoing logging operations.
- Products of pre-commercial thinning (small saplings from overcrowded young forests).
- Tree stems and tops thinned from forests that are at risk from wildfires, insects, or diseases (forest health treatments) that are not currently utilized.
- Clean, untreated wood construction and demolition waste that would otherwise have gone to a landfill.
- Unused material from lumber mills, such as sawdust, shavings, chips or bark.

Forest biomass will not typically consist of:

- Traditional timber or whole trees that would otherwise be made into lumber, paper, or other products by existing industry. It's possible that small numbers of low quality logs could be utilized by biomass facilities, pulp and paper mills, or other facilities, depending on cyclically changing market prices.
- Downed logs and standing dead trees (snags) required to be left on site by forest practice regulations; material incorporated into the forest floor; stumps.
- Wood products treated with chemical preservatives, such as creosote or "green-treated" lumber.
- Wood and wood products from old growth forests.

The utilization of forest biomass is helping to generate energy from a product that had previously been seen as waste and either burned on-site in a "slash-burn" or left to biodegrade in a slash pile.[5] In so

[5] Lee, Carrie et. al. "Greenhouse gas and air pollutant emissions of alternatives for woody biomass residues." Stockholm Environmental Institute. Olympic Region Clean Air Authority. November 2010.

doing, rural jobs are being created, rural economic vitality is being enhanced, and renewable energy is being produced.

To further ensure that forest biomass removal does not negatively impact the forest ecosystems from which it is being drawn, Washington's Forest Practices Board, in August 2010, asked for "forest biomass removal" to be added to the definition of "forest practice" in rules adopted by the Board under the authority of the State's Forest Practice Act. Rule making is currently underway. The proposed revised definition reads as follows:

> "'Forest practice' means any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing timber or removing other forest biomass, including but not limited to:
>
> Road and trail construction;
> Harvesting, final and intermediate;
> Precommercial thinning;
> Reforestation;
> Fertilization;
> Prevention and suppression of diseases and insects;
> Salvage of trees; and
> Brush control.
>
> 'Forest Practice' shall not include: forest species seed orchard operations and intensive forest nursery operations; or preparatory work such as tree marking, surveying and road flagging; or removal or harvest of incidental vegetation from forest lands such as berries, ferns, greenery, mistletoe, herbs, mushrooms, and other products which cannot normally be expected to result in damage to forest soils, timber or public resources."

Whether this rule change will be sufficient to ensure that ecosystem health is not negatively impacted by biomass harvest is an issue currently being discussed by the Washington's Forest Practice Board and will largely be determined by the forest practices Adaptive Management program.

Section 4: Carbon Neutrality of Forest Biomass

"In the long-term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustainable yield of timber, will generate the largest sustained mitigation benefit."
-Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report-

Clean and renewable energy continues to expand its role in Washington's energy sector. Examining the impacts of these new technologies on greenhouse gas concentrations in the atmosphere that contribute to climate change has become increasingly important. In 2SHB 2481 of the 2010 session, the Washington State Legislature directed the Department of Natural Resources (DNR) to "conduct a survey of scientific literature regarding the carbon neutrality of forest biomass. The department [is to] submit the survey results with any findings and recommendations to the appropriate committees of the legislature by December 15, 2010" (2SHB 2481 New Section 13).

This section provides a review of the discussions currently underway relating to the carbon neutrality of forest biomass as a renewable energy feedstock. This paper does not intend to provide original research on the topic; rather, its purpose is to provide a summary of the approaches currently being employed to address the question and to articulate the DNR position on the issue.[6] We have included, at the end of this document, a bibliography of the Works Cited in this section, as well as an expanded bibliography which includes other references that support one or more of the approaches outlined below in determining the carbon neutrality of forest biomass in energy production.

Information about the current policy landscape and the technological opportunities available for processing woody biomass provide important context for understanding both the approaches that will be described, as well as the Department's position. This paper does not intend, however, to provide a comprehensive treatment of either. Rather, the focus is on the range of recently expressed viewpoints on the topic of the carbon neutrality of forest biomass as an energy feedstock.

Forest Biomass and Public Policy

The use of forest biomass as an energy feedstock poses unique challenges for policy-makers: should the "biogenic" emissions – those resulting from the utilization of forest biomass and other plant-based fuel sources – be accounted for as arising from land use activities like forestry and farming, or as emissions from energy facility smoke stacks and auto tailpipes? How does the effect on atmospheric greenhouse gas emissions (GHG) from forest biomass use for energy compare to the effect from fossil carbon that is being reintroduced in the atmosphere? How are Washington's forest resources protected in harvesting forest biomass for use as an energy feedstock? A clear and consistent policy approach is necessary to avoid inaccurate emissions accounting and to ensure that forest biomass harvest does not occur in a way that is detrimental to Washington's forestlands.

Since the early 1990s, biogenic emissions have been considered carbon neutral by numerous state, national, and international policies. It was only recently suggested [7] that biogenic emissions (emissions that result from forest biomass) be accounted for in the same manner as are fossil based emissions. The following provides a brief overview of the policy landscape that has shaped this discussion.

Intergovernmental Panel on Climate Change (IPCC)

[6] 2SHB 2481 Forest Biomass on State Lands.
[7] U.S. Environmental Protection Agency. (2010c). Final Rule: Prevention of Significant Deterioration and Title V. Greenhouse Gas Tailoring Rule, Fact Sheet. U.S. Environmental Protection Agency 6 p. Washington, DC. Available online at www.epa.gov/nsr/documents/20100413fs.pdf

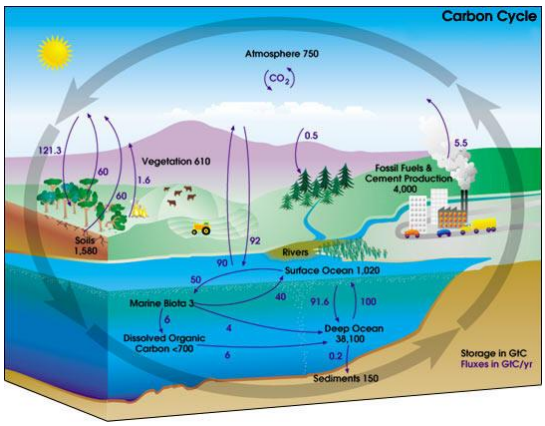
The international community has been accounting for GHG emissions for a number of years under commonly accepted protocols. The Intergovernmental Panel on Climate Change has concluded that emissions from biomass utilization "…should not be included in national CO2 emissions from fuel combustion. If energy use, or any other factor, is causing a long term decline in the total carbon embodied in standing biomass (e.g. forests), this net release of carbon should be evident in the calculation of CO2 emissions described in the Land Use Change and Forestry (LUCF) chapter."[8] Thus, so long as a nation's forest stocks remain constant or increase from year-to-year, the emissions associated with forest biomass are carbon neutral (or at least 'lower carbon'[9]). The GHG emissions status of a nation's forest resources results from the net effect of forest growth (sequestering carbon), forest harvest resulting in long-lived or short-lived wood products, and loss to fire and other disturbances such as insect kill (emitting carbon), as well as the conversion of forest land area to non-forest uses (emission) and the afforestation of new land (sequestration).

The United States government has adopted the IPCC approach to account for biogenic emissions on a non-regulatory basis. The GHG emissions from biogenic sources are considered carbon neutral so long as, consistent with IPCC recommendations, the nation's forest stocks remain stable or increasing. Washington State, consistent with this approach, requires that industrial facilities utilizing forest resources as an energy feedstock report their emissions; however, these emissions are not added to the State's cumulative total under the status of national neutrality.[10]

United States Environmental Protection Agency "Tailoring Rule"
The IPCC approach has been recently revisited by the United States Environmental Protection Agency (EPA), under authority of the Clean Air Act, through it's "Tailoring Rule." In the rule, EPA posed the question as to whether, under the Clean Air Act; CO2 emissions from biogenic sources should be counted as equivalent to those from fossil sources. This approach, counter to the approach offered by the IPCC, looks solely at emissions as originating from stacks and similar technological sources, rather than looking at land use as a whole. This approach neglects two primary ways that GHG's from forest biomass differ from those that come from fossil sources (the differences that formed the basis for the IPCC approach):

1. Biogenic CO2 emissions are not new to the atmosphere. Biogenic emissions are a natural part of the earth's carbon cycle[11]. Biogenic emissions may arrive into the atmosphere through a number of avenues including plant decomposition, wildfire, deforestation, and utilization in energy production. The emissions that result from these events are balanced by the simultaneous re-absorption by forests and other vegetation, as part of the continuous forest carbon cycle. Fossil based emissions are not associated with a re-absorptive capacity.

[8] IPCC 1996, Vol. 3, p. 1.10
[9] O'Laughlin, Jay. *Accounting for Greenhouse Gas Emissions from Wood Bioenergy*. University of Idaho, College of Natural Resources. Report No. 31. September 13, 2010.
[10] RCW 70.94 Washington Clean Air Act
[11] The forest carbon cycle is the natural process "where billions of tons of atmospheric CO2 are removed from the atmosphere by oceans and growing plants, also known as 'sinks,' and are emitted back into the atmosphere annually through natural processes also known as 'sources'" (http://www.epa.gov/climatechange/emissions/co2.html).



Courtesy NASA Source: http://earthobservatory.nasa.gov/Library/CarbonCycle/carbon_cycle4.html

2. The baseline level of biogenic emissions over time is dependent on the overall size of the biological system and that system's capacity to sequester carbon. There is no comparable system for reabsorbing CO2 from fossil sources.

Governor Christine Gregoire and Commissioner of Public Lands Peter Goldmark submitted a joint letter to Lisa Jackson, Director of the US Environmental Protection Agency,[12] requesting that the approach being proposed be reconsidered. In the letter they recommended that state-level carbon neutrality determinations, based on objective tracking of the volume of a state's forest resources, be used to determine the need for stack regulation.[13] This approach ensures that, on a state level, biogenic CO2 emissions do not exceed forest stock sequestration capacity.

On November 10, 2010, the U.S. Environmental Protection Agency (EPA) made available resources and guidance to permitting authorities as they implement their Clean Air Act (CAA) permitting programs for greenhouse gas (GHG) emissions. These tools include guidance on implementing the Prevention of Significant Deterioration (PSD) and Title V Operating Permit Programs for GHGs, and technical resources to assist states and sources in identifying control measures for GHG emissions.

The guidance "notes that biomass could be considered Best Available Control Technology (BACT) after taking into account environmental, energy and economic considerations and state and federal policies that promote biomass for energy-independence and environmental reasons."[14]

Washington's Forest Practice Act

In addition to the debate over how air quality and global climate policy should handle biogenic GHG emissions and their net impacts on atmospheric GHG concentrations, concerns related to the ecological sustainability of the utilization of forest biomass as an energy feedstock have also been raised. These concerns cover topics ranging from ecosystem health to soil and water implications of increased harvest of forest biomass.

Although the harvest of forest biomass in Washington is currently being regulated under the State Forest Practice Act, the Washington Forest Practices Board is considering amending the definition of "forest practice" in Washington's Forest Practice Rules to include forest biomass so that there is clear regulatory

[12] Letters to Environmental Protection Agency (EPA) Administrator Lisa Jackson indicating concern about the impacts of the "tailoring rule" on bioenergy projects in Washington were sent from Governor Gregoire and Public Lands Commissioner Peter Goldmark (September 10, 2010), nearly the entire Washington Congressional delegation (July 2010), the Western Governors' Association , and industry groups across the state.
[13] See Approach #2 below.
[14] EPA GHG Guidance Fact Sheet. Online at http://www.epa.gov/nsr/ghgdocs/ghgpermittingtoolsfs.pdf

authority (See proposed rule change in Section 3., Ecological Implications of a Forest Biomass-to-Energy Sector).

Under current Forest Practice Rules forest biomass removal is almost always viewed by landowners, operators, and DNR, as a forest practice. The Forest Practice Board will likely adopt the revised rule, removing any uncertainty that harvesting forest biomass must comply with all of Washington's existing forest practice rules currently governing traditional timber practices.

Other Federal and State Laws
National and state renewable energy policies support the use of forest biomass as a renewable energy feedstock. The Energy Independence and Security Act of 2007 requires significant increases in the volume of cellulosic biofuels through the year 2022. Additionally, millions of dollars were allocated for Research and Development, and deployment of bioenergy projects throughout the country. In Washington, under Chapter 194-37 WAC Energy Independence, forest biomass is included in the definition of "renewable resource" (WAC 194.37(25)(i)(i-iii) and can be counted towards a utility's renewable energy requirement. The state also requires that 2% of diesel sold in the state be from biological sources. [15]

Additionally, to ensure that the use of forest biomass for energy moves forward in a manner that is both ecologically and economically sustainable, the WDNR has launched a state-wide forest biomass supply assessment that will determine the sustainable (economically and environmentally) volumes of forest biomass from each region the state. This study will guide policy-makers in regards to issues related to scale, location, and ecological implications of future forest biomass-to-energy projects. See Section 2 for more information on WDNR's Forest Biomass Supply Assessment.

Addressing the conditions of the existing policy landscape surrounding the utilization of forest biomass as an energy feedstock is essential in understanding the dialogue and approaches being applied to the question of carbon neutrality of forest biomass in renewable energy[16] production.

Approaches to Analysis of Carbon Neutrality of Forest Biomass in Bioenergy Production

Defining the Spatial and Temporal Parameters
As forest biomass utilization has increased through efforts to promote and encourage renewable energy production in Washington State and nation-wide, the previously accepted assumption of 'carbon neutrality' of forest biomass in bioenergy production has been questioned. All conclusions related to the carbon neutrality (or not) of forest biomass as an energy feedstock ultimately stem from the boundaries in time and space used in an evaluation. When these parameters are not consistently applied, confusion ensues. Where these parameters are set largely determines whether forest biomass utilization in bioenergy production is, or is not, considered carbon neutral. Because the varying approaches to examining the question of carbon neutrality are inconsistent, the result has been significant confusion around the beneficial uses and the neutrality (or not) of forest biomass in bioenergy production.

Existing research and policy conclusions are based on a wide range of spatial parameters:

- Single plot
- Multiple plots,
- Supply circle, region, bioregion,
- State,
- Nation.

[15] Chapter 19.112 RCW Motor fuel quality act
[16] Chapter 194-37 WAC Energy Independence Act. (Initiative 937).

In addition to geographical boundaries, conclusions are also based on the time periods that are used. These parameters range from the forest carbon cycle over time (past, present, and future), or a subset of time within the cycle (only today, today and the future, the past through today). Viewing the whole cycle through time (past, present, and future), one accounts for all the carbon a tree has sequestered in its past lifetime up to the point of harvest in the present and balances this with the CO2 that may be released through its harvest and the utilization of the residuals. An alternative view of the cycle could include the period from when the tree is harvested in the present and when the biogenic CO2 is withdrawn from the atmosphere by sequestration in future tree growth.[17] Each perspective on relevant time periods and geographic areas, and combinations of the two, results in significantly different conclusions about neutrality.

The following summarizes four primary approaches that have been taken to evaluate the carbon neutrality, or not, of forest biomass utilization as an energy feedstock. Each, as is noted, applies different time periods and geographic areas and, in so doing, results in significantly different conclusions. The approach that has the support of Washington State and the Department of Natural Resources is identified.

Approach #1: Nationwide, Over Time (Past, Present, and Future)

In the nationwide approach, the relevant geographic area is the nation as a whole. Here neutrality is determined by the combination of the maintenance of a nation's forest stocks (based on the view that that forests have sequestered carbon in the past, are sequestering carbon now, and will sequester carbon into the future) coupled with an analysis of the emissions that result from the utilization of residual forest biomass resources in energy production and other natural and human-caused sources of forest emissions. So long as the forest resource base remains the same or increases, there is a determination of neutrality.

This approach to carbon neutrality determination has been applied by the IPCC. Stated simply, the utilization of forest biomass as an energy feedstock can be considered carbon neutral so long as the total forest resources are determined to be stable or increasing.

[17] Lee, Carrie et. al. "Greenhouse gas and air pollutant emissions of alternatives for woody biomass residues." Stockholm Environmental Institute. Olympic Region Clean Air Authority. November 2010.

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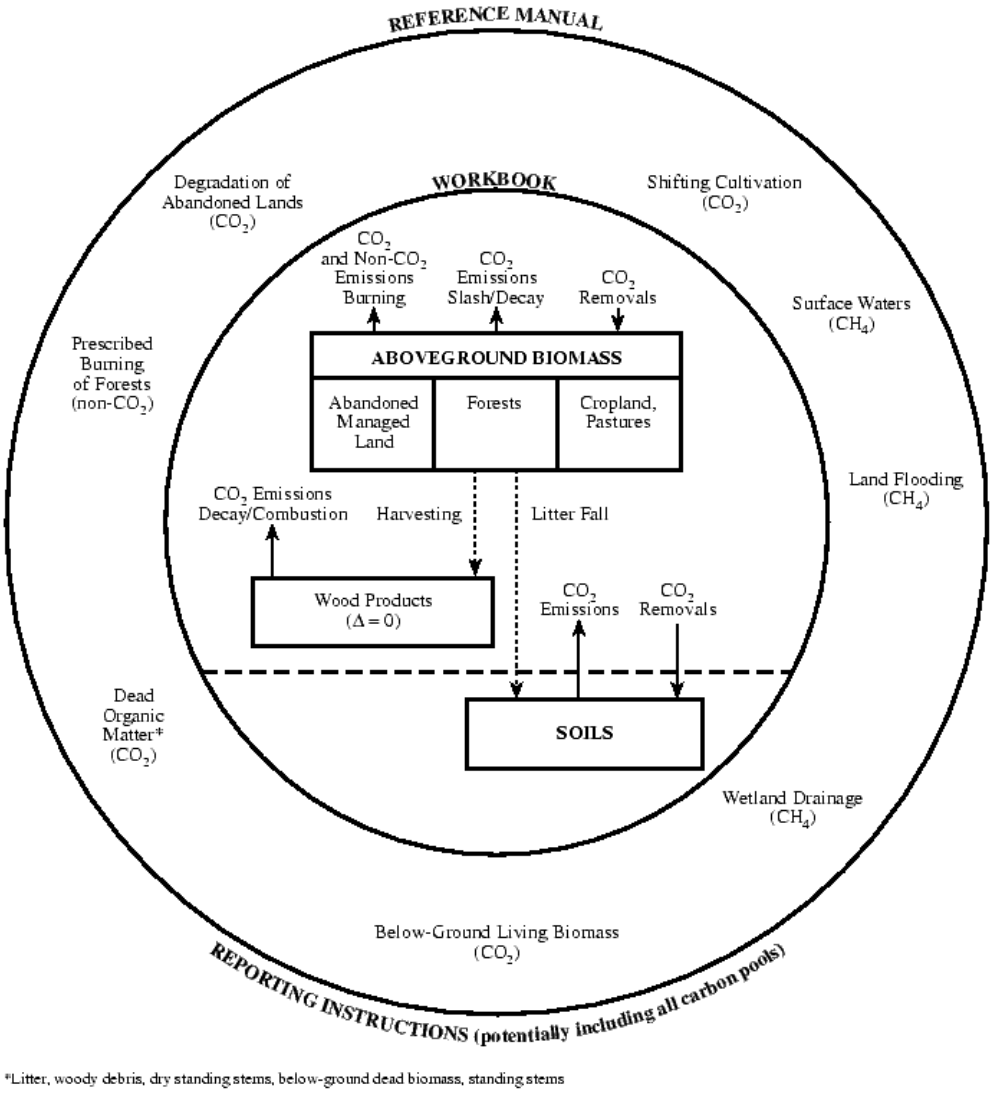

Figure 6-1: *Structure in the IPCC Guidelines to account for national changes in carbon pools. The Reference Manual describes all activities within the outer and inner circles. The Workbook accounts for all changes in pools due to activities within the inner circle only. Emissions and removals of greenhouse gases can be reported within the Reporting Instructions.*[18]

Applying the IPCC's approach to determining whether the use of forest biomass is carbon neutral in the United States results in a neutral (if not, carbon positive) finding. "Land use, land-use change, and forestry activities in 2008 resulted in a net C sequestration of 940.3 Tg CO2 Eq. (256.5 Tg C). This represents an offset of approximately 13.5 percent of total U.S. CO2 emissions. Total land use, land-use change, and forestry net C sequestration increased by approximately 3.4 percent between 1990 and 2008. This increase was primarily due to an increase in the rate of net C accumulation in forest C stocks."[19] Central to this finding is the maintenance (or increase) over time of the forest cover and the carbon density in the forests, in the United States (or any country being evaluated). If, at some point, utilizing this approach, it is determined that a nation's forest (carbon) resources are decreasing, the finding of neutrality will no longer apply.

[18] IPCC Guidelines (6.1.1).
[19] EPA GHG accounting report: U.S. EPA # 430-R-10-006. http://www.epa.gov/climatechange/emissions/usinventoryreport.html

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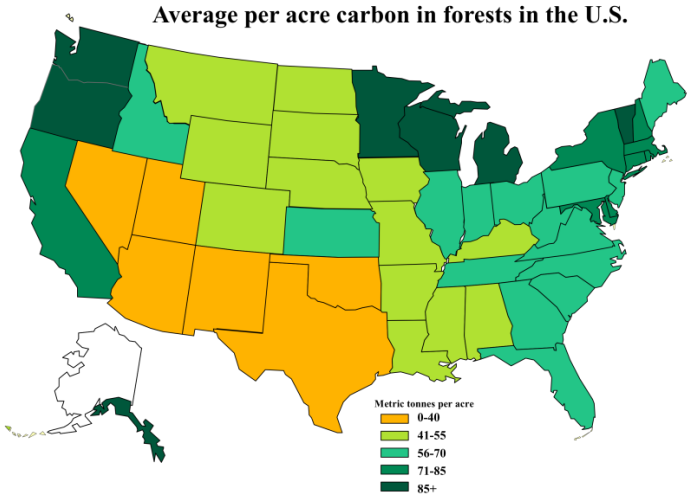
This approach, although a useful tool in crafting international protocols and national policies, poses numerous regulatory challenges to implementers on state and local levels. Because states implement federal air quality regulations, national findings do not address state-specific policies aimed at addressing a state's unique conditions and challenges. This approach can also mask poor practices in states with less strict regulatory landscapes than Washington because the states with stricter policies will neutralize the poor performers through the nationalization of the data.

Approach #2: Statewide, Over Time (Past, Present, and Future)

The statewide geographic area coupled with a "past through future" time period looks at the CO2 balance occurring on all of the lands in a given state over time (past, present, future). It is similar to the nationwide perspective described in Approach #1, except for a state-based geographic boundary. Neutrality is determined by the combination of the maintenance of a state's forest carbon stocks (assuming that forests have sequestered carbon in the past, are sequestering carbon now, and will sequester carbon into the future) coupled with an analysis of the utilization (both existing and planned) of residual forest biomass resources and other natural and human-caused sources of forest emissions. So long as the forest carbon resource base remains the same or increases, there is an assumption of neutrality.

GHG emissions from individual facilities need *not* be the evaluation point under this approach, since it is assumed that *so long as* a state's carbon stocks remain constant, the amount of CO2 being emitted through bioenergy generation is being balanced by the state's forests' continual re-absorption of CO2 from the atmosphere.

Washington's forests are some of the most carbon rich in the world and are continuing to increase. "The U.S. Forest Service provided its first 'snapshot' of how much carbon trees store at state and regional levels in new figures released [Friday, October 15, 2010]. Washington, Oregon, Minnesota, Michigan, Wisconsin and Vermont ranked highest in terms of average carbon stored per acre, trapping upward of 85 metric tons in an average forestland acre, the analysis found."[20] (Climate Wire, Oct.18, 2010).



United States Forest Service, October, 2010.

[20] Climate Wire, Forests: New analysis details trees' carbon storage at state level, Monday, October 18, 2010

This approach is consistent with recommendations made by Governor Christine Gregoire and Commissioner of Public Lands Peter Goldmark in a letter jointly submitted to the US Environmental Protection Agency (EPA) in response to the EPA's call for information in relation to the "Tailoring Rule:"[21]

> "…We recommend that the authority and responsibility for regulating biogenic GHG emission sources be triggered by an objective finding as to whether a system's biological stocks are increasing, decreasing, or stable over a given time interval. If systems are stable or increasing, any emissions associated with these systems are not new GHGs and are continually subject to re-sequestration. Conversely, for systems whose stocks are decreasing, emissions associated with these systems represent emission levels that will not be readily re-sequestered and their sources should be regulated while that stock condition persists.
>
> This logic requires that a clear distinction is drawn between the scale and legal mechanisms for objective findings on stock system changes, and those for source regulation. Until and unless a system's threshold of decreasing stocks is crossed, source-specific application of Best Available Control Technology (BACT) is inappropriate. Essentially, we suggest that the first, best, and most relevant BACT is biological systems' stocks that are in an increasing or stable condition. Only in the case that this control should fail would supplemental source-based technologies and controls be applicable.
>
> Furthermore, we suggest that the appropriate scale of objective stock status findings is at the state level. This scale acknowledges the variation among and within major biological systems such as forests and agricultural lands, differing rates of stock fluxes and overall sequestration capacity."[22]

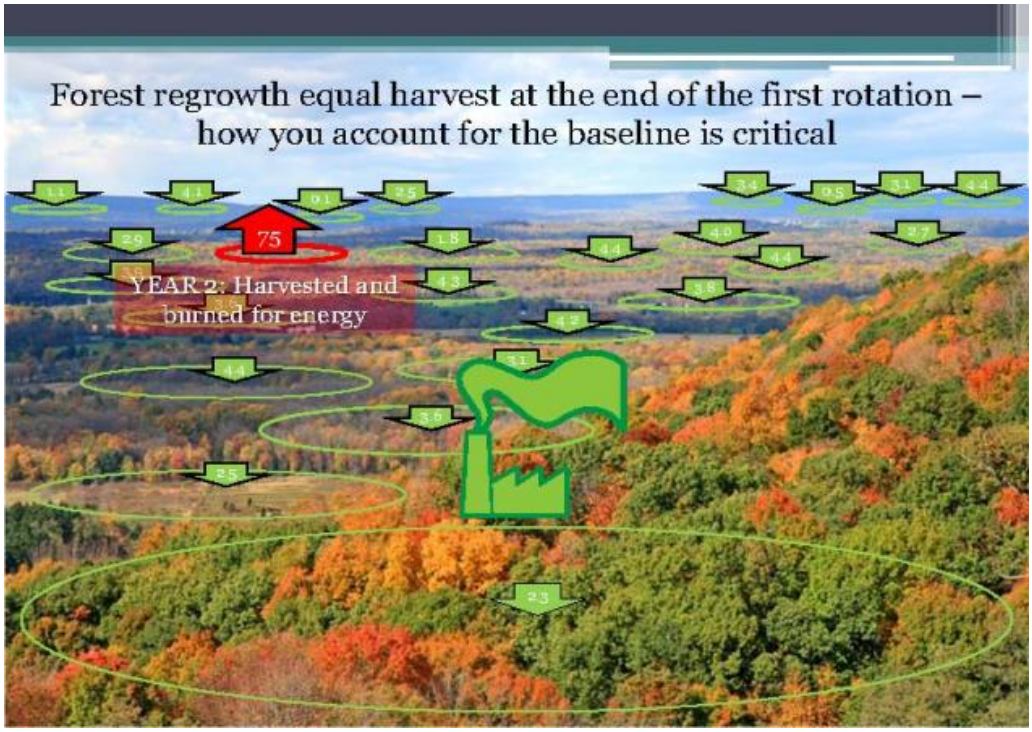
It is also important to note that Washington's existing Forest Practice rules require that forest be replanted after harvest, thus ensuring the continued sequestration capacity of forests under this approach to a neutrality determination.[23]

Approach #3: Facility Supply Circle (Multiple Plots), Right Now (Time Zero)

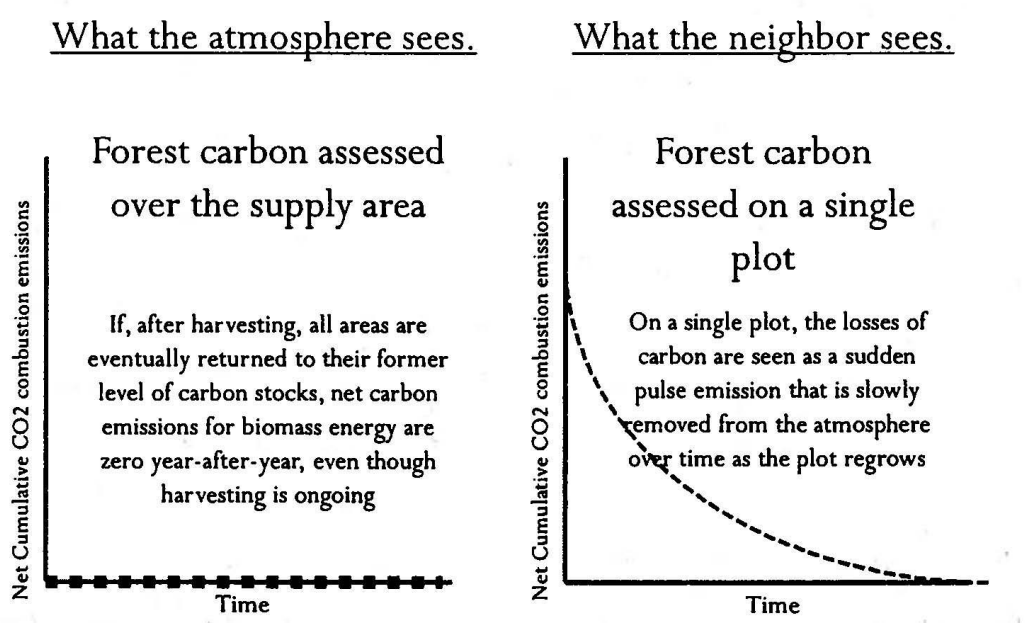
The multiple plot approach at 'time zero' looks at the CO2 balance occurring on all of the lands providing forest biomass to a particular facility (supply circle). Neutrality is determined by the area of forest needed (combined plots) to absorb the CO2 released from the utilization of the forest biomass by an energy conversion facility. In this approach, the on-going forest carbon cycling occurring within a supply circle is used to determine whether the carbon emissions that will result from the utilization of the forest biomass, are re-sequestered. This approach does account for CO2 being reabsorbed from the atmosphere by forested land surrounding the harvested area and providing supply to a particular facility.

To demonstrate, in year zero, a 15-acre plot (Plot 1) is harvested and the residual biomass from this plot is utilized for bioenergy production resulting in CO2 emissions. Concurrent to the harvest of this site, parallel sites (also allocated for supply) are sequestering CO2 from the atmosphere. Carbon neutrality is possible at the point that the combination of the all of the sites comprising a facility's supply radius absorbs the same amount of CO2 as that emitted as a result of the harvest and utilization of the biomass from Plot 1. So long as overall forest cover in a given supply circle stays the same (i.e. is not converted to other purposes), carbon neutrality is assumed to always be the case. In essence, the carbon being emitted from the facility and harvested from Plot 1 is in balance with the CO2 being absorbed by other plots in the facility's supply circle.

[21] See Approach #4.
[22] September 10, 2010. Letter to EPA Administrator Lisa Jackson from Governor Gregoire and Public Lands Commissioner Peter Goldmark.
[23] Chapter 222-34 WAC Reforestation.



When this approach is applied, *so long as the land in the facility's supply region is not converted to other purposes*, the process is considered carbon neutral.



Reid Miner, "Biomass Carbon Accounting" (from presentation delivered at the 2010 West Coast Regional Meeting of NCASI)

In the "*Facility Supply Circle, Right Now*" accounting scenario, there is surge of CO2 released to the atmosphere. This surge is balanced by the CO2 being simultaneously absorbed by other plots in the supply circle of the facility. Thus, the process can be considered carbon neutral. From a GHG into the atmosphere standpoint, this is a better option than the combustion of fossil fuels with constant emissions that do not have re-absorption capacity.

From a policy standpoint, this is a challenging approach. For example, it is common for a single facility to source forest biomass from multiple-landowners. The facility generally does not influence the forest practices on the land from which supply is received, nor does it affect whether the lands remain in active forestry (or are converted to other uses) after harvest has occurred. Regulating stack emissions from a facility based on assumptions about the forest practices on the lands that supply biomass becomes troublesome, if not impossible. An extensive system of verification, supply chain and long-term post-harvest monitoring would be required. Because such a system is unlikely to be implemented, basing policies on this approach does not ensure that neutrality is maintained over time.

Approach #4: Right Here (Single Plot), Right Now and Immediate Future (Time Zero – 20 years) Analyses

The single plot approach at 'time zero' looks at the CO2 balance occurring on a particular piece of land from which biomass has been removed and neutrality is determined by the length of time it takes this single plot to return to pre-harvest conditions. In this approach, this same piece of land is the only plot considered in determining when the "carbon debt" from forest biomass emissions is "re-payed." This approach does not account for CO2 being reabsorbed from the atmosphere by forested land surrounding the harvested area.

To demonstrate, in year zero, a 15-acre plot is harvested and the residual biomass from this plot is utilized for bioenergy production. After on-site regeneration begins, the re-growth of the site's forest resources begins to remove small volumes of CO2 from the atmosphere. This happens over the course of multiple years: the same plot, reabsorbing small increments of CO2 from the atmosphere. Carbon neutrality is possible only at the point that the site returns to its pre-harvest condition. In Washington, this is usually between 30 and 60+ years (depending on harvest patterns of various landowner types).

The time period used by those that subscribe to this approach begins at the point of use and tends to conclude approximately 20 years after utilization. With the temporal parameters set as such, it is unlikely that the particular site from which the utilized biomass was harvested will be restored to its pre-utilization state of carbon sequestration.[24] It is important to note that, in Washington State, twenty year harvest rotations are not common. As previously mentioned, Washington harvest cycles tend toward 30-60+ years, depending on type of landowner.

Additionally, carbon storage and re-absorption capacity of a given plot, when this approach is taken, are commonly compared to the carbon storage capacity of old growth forests.[25] In Washington State, forest biomass is not harvested from old growth forests. As a result, this comparison is not applicable.

In the "Right Here, Right Now and Immediate Future" scenario, there is surge of CO2 released to the atmosphere. Over time, this is reduced until carbon neutrality (based on a return to original conditions) is

[24] Law, J., B.E. Law, K Hibbard. 2007. "Post-fire carbon pools and fluxes in semi-arid ponderosa pine in Central Oregon." Global Change Biology. 13: 1748-1760

Law, B.E., P. Thornton, J.Irvine, S. Van Tuyl, P. Anthoni. 2001. "Carbon storage and fluxes in ponderosa pine forests at different developmental stages." Global Climate Biology. 7:755-777.

[25] Janisch, J.E., M.E Harmon. "Successional changes in live and dead wood carbon stores: implications for net ecosystem productivity." Tree Physiology. 22 (2-3): 77-89.

achieved, making biogenic energy production preferable over time from an emissions standpoint to fossil-based energy production which doesn't include the re-absorption capacity of forests.

A recently released study by the Manomet Center for Conservation Sciences in Massachusetts uses the "Right Here, Right Now" approach, and came to the following conclusions[26]:

- The initial carbon emitted into the atmosphere from the utilization of forest biomass in energy production is greater than an equivalent amount of fossil fuel that is released at the same point of use. Only after enough time has passed for the previously harvested site to reabsorb (through re-planting activities) the equivalent amount of CO2 that was released at the point of use, is the 'carbon debt' repaid. It is only beyond this point that the utilization of forest biomass can be viewed as having less of a GHG impact than fossil fuels.

- It is not accurate to accept forest biomass utilization as carbon neutral carte blanche. A number of factors need to be considered before conclusions can be drawn: where the forest biomass is from, the forest practices regulations governing the plot from which the biomass is being harvested, and the processing technologies being utilized.

- In order to ensure that all of the factors mentioned above lead to the lowest GHG profile of the end use, it is recommended that one of several options related to the verifiable sustainability of harvesting practices be employed.[27]

- Using biomass in combined heat and power (CHP) systems is the most efficient in reducing GHG's over time when compared to fossil fuels.
  (Walker, pgs. 95-113)

This approach focuses on the pulse of emissions that occur at the point of use and look out, as described earlier, only to approximately the 20-year horizon. The combination of these two approaches (emissions from today without accounting for the carbon cycle, looking out only to a 20-year time horizon, and accounting only for the site from which the biomass was harvested) result in the conclusion that the CO2 emissions at the point of combustion are not ever balanced by the site's re-absorption upon regrowth:

> "…harvesting existing forests for electricity[28] adds net carbon to the air. That remains true even if limited harvest rates leave the carbon stocks of re-growing forests unchanged, because those stocks would otherwise increase and contribute to the terrestrial carbon sink…. Maintaining the exemption for CO2 emitted by bio-energy use under the protocol (IPCC) wrongly treats bioenergy from all biomass sources as carbon neutral." (Searchinger, et. al)

Because the study focuses primarily on the emissions today, they fail to recognize that in the long term, fossil based emissions will always surpass the biogenic emissions that result from biomass utilization.

[26] The Manomet study related only to conditions (both industrial and in-forest) in Massachusetts and, as a result of forestry practices in Massachusetts, it was assumed that whole trees would be used (in addition to forestry by-products) for bioenergy production. These assumptions can are not applicable to economic conditions, forest practices and energy policies governing forest biomass utilization in Washington State.

[27] Options include (excerpted from pg 8):

- Option 1: Establish a transparent self-monitoring, self-reporting process for bioenergy facilities designed to foster sustainable wood procurement practices.
- Option 2: Require bioenergy facilities to purchase wood from forests with approved forest management plans.
- Option 3: Require bioenergy facilities to submit wood supply impact assessments.
- Option 4: Establish formal criteria for approval of wood supply impact assessments – possible criteria might include limits on the amount of harvests relative to anticipated forest growth in the wood basket zone.

[28] This, similar to the Manomet Study, implies that whole trees will be utilized for energy generation. In Washington, economics would not support this practice.

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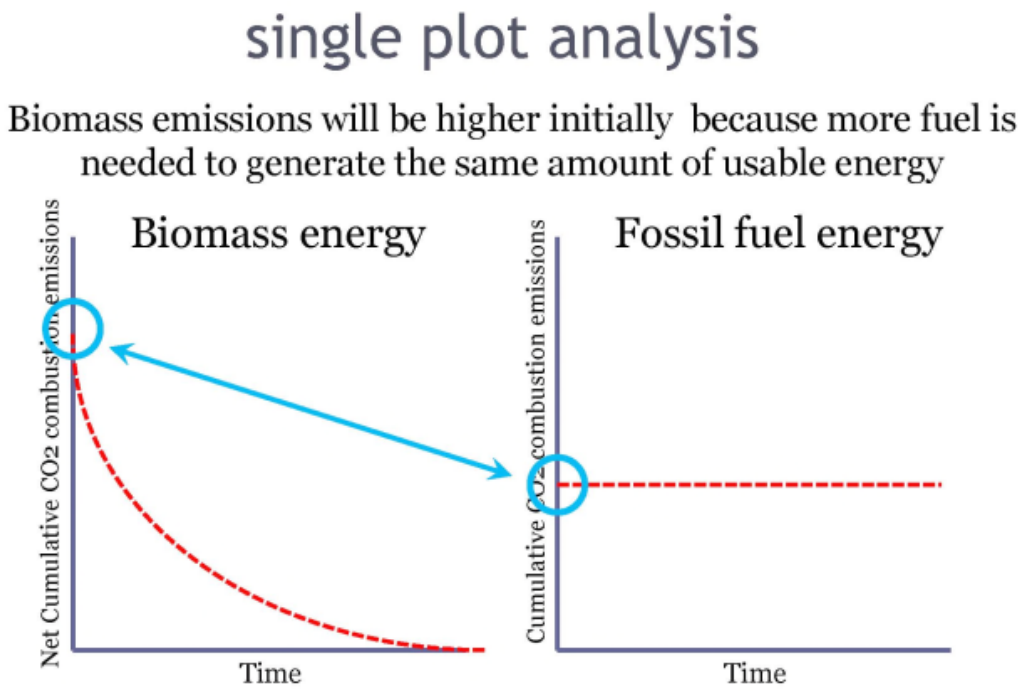

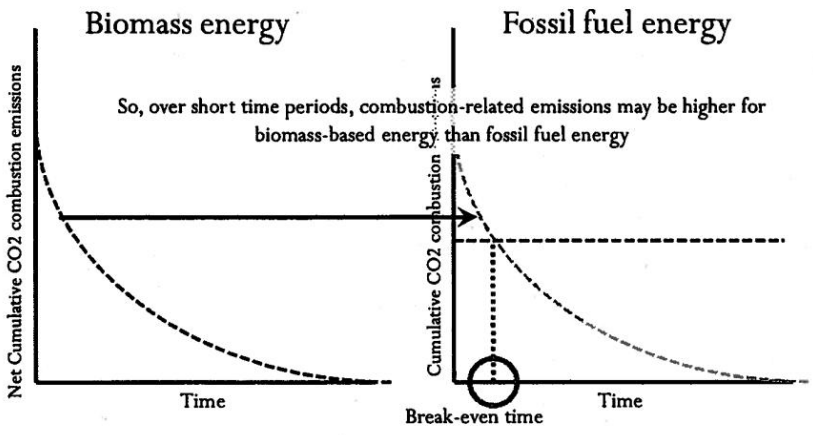

Reid Miner, "Biomass Carbon Accounting" (from presentation delivered at the 2010 West Coast Regional Meeting of NCASI)

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Summary
As demonstrated above, the geographic area and time periods used ultimately define whether or not forest biomass is considered carbon neutral.

Another approach to comparatively analyzing emissions from specific facilities is the "life cycle analysis" method. The GHG implications of the utilization of forest biomass for energy production, when looking at this issue from a life cycle standpoint, can vary significantly depending on the processing technology being employed by the end user and the efficiency of that technology. Combined heat and power (CHP) systems are thought to be the most efficient use of forest biomass from a ton/Btu of energy produced standpoint[29]. Other systems that are currently under development[30] are closed loop, meaning all of the 'waste' from the process (steam, heat, etc.) is used to power the process itself.

The other issue that must be addressed when looking at the atmospheric carbon implications of forest biomass utilization is that of the energy source(s) the forest biomass replaces. From a life cycle standpoint, the utilization of forest biomass in a highly efficient system will likely always have a smaller life-cycle GHG profile than the fossil-based products being replaced.

The Olympic Region Clean Air Agency (ORCAA) has recently completed a study that compared different 'fates' of forest biomass (from on-site decomposition to CHP to energy production) using a life cycle approach to analysis. Their study included emissions that resulted from transportation and pre-processing, as well as stack emissions. In most cases, utilization of forest biomass in an efficient system released a lower quantity of GHG's into the atmosphere than either leaving the slash on-site to decompose or burning it in a slash pile.[31] In nearly all of the scenarios evaluated, utilizing forest biomass released fewer GHGs than using fossil based fuel sources.

Policy Conclusions
Washington's forest biomass sector, if thoughtfully deployed, promises to significantly contribute to the State's renewable energy goals, enhance the health of Washington's forests, and create needed jobs in rural communities across the State. Washington's forests have played a central role in the State's heritage and can continue to do so if opportunities are explored to help maintain economic vitality in the sector while not jeopardizing ecological health.

The atmospheric impacts of the greenhouse gases that result from the utilization of forest biomass should be critically examined and policy should reflect a thoughtful and deliberate approach to addressing the issue. The Washington Department of Natural Resources views forest biomass as an essential element of the State's emerging renewable energy economy. The agency also holds the position that forest biomass utilization in the production of renewable energy is carbon neutral, so long as the state's forest inventory is maintained (as described in approach #2). The adoption of this approach points to the importance of ensuring that the sequestration capacity of our forests continues to be maintained through the maintenance of our forested lands. Looking to the near future, existing research on in-forest biomass recovery practices will be reviewed in the pending state-wide forest biomass supply assessment. The assessment will provide context and inform the state's Forest Practices Rules that govern in-forest activities to protect public resources.

[29] www.northwestcleanenergy.org
[30] Granastein, D. et. al. "Use of Biochar from the Pyrolysis of Waste Organic Material as a Soil Amendment." Center for Sustaining Agriculture and Natural Resources. Washington State University. July 2009.
Garcia-Perez, M. et. al. "New Bio-refinery Concept to Convert Softwood Bark to Transportation Fuels: Final Report to the Washington State Department of Ecology." Washington State Department of Ecology. Publication Number 09-07-061.
[31] Lee, Carrie et. al. "Greenhouse gas and air pollutant emissions of alternatives for woody biomass residues." Stockholm Environmental Institute. Olympic Region Clean Air Authority. November 2010.

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CERTIFICATION OF ENROLLMENT

HOUSE BILL 2165

61st Legislature
2009 Regular Session

Passed by the House April 18, 2009
Yeas 96 Nays 0

Speaker of the House of Representatives

Passed by the Senate April 7, 2009
Yeas 44 Nays 0

President of the Senate

Approved

Governor of the State of Washington

CERTIFICATE

I, Barbara Baker, Chief Clerk of the House of Representatives of the State of Washington, do hereby certify that the attached is **HOUSE BILL 2165** as passed by the House of Representatives and the Senate on the dates hereon set forth.

Chief Clerk

FILED

Secretary of State
State of Washington

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HOUSE BILL 2165

AS AMENDED BY THE SENATE

Passed Legislature - 2009 Regular Session

State of Washington 61st Legislature 2009 Regular Session

By Representatives Van De Wege, Haler, Blake, Kretz, McCoy, Hinkle, Ormsby, Nelson, Eddy, Hasegawa, Takko, Chase, Kenney, Warnick, and Morrell; by request of Department of Natural Resources

Read first time 02/11/09. Referred to Committee on Technology, Energy & Communications.

AN ACT Relating to authorizing the department of natural resources to conduct a forest biomass energy demonstration project; amending RCW 76.06.150 and 43.30.020; adding new sections to chapter 43.30 RCW; and creating a new section.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF WASHINGTON:

NEW SECTION. **Sec. 1.** The legislature finds that forest biomass is an abundant and renewable byproduct of Washington's forest land management. Forest biomass can be utilized to generate clean renewable energy.

In some Washington forests, residual forest biomass is burned on site or left to decompose. The lack of forest products markets in some areas means that standing forest biomass removed for forest health and wildfire risk reduction treatments must occur at substantial cost. Utilizing forest biomass to generate energy can reduce the greenhouse gases emitted by burning forest biomass.

The legislature further finds that the emerging forest biomass energy economy is challenged by: Not having a reliable supply of predictably priced forest biomass feedstock; shipping and processing

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costs; insufficient forest biomass processing infrastructure; and feedstock demand.

The legislature finds that making use of the state's forest biomass resources for energy production may generate new revenues or increase asset values of state lands and state forest lands, protect forest land of all ownerships from severe forest health problems, stimulate Washington's economy, create green jobs, and reduce Washington's dependence on foreign oil.

It is the intent of the legislature to support forest biomass demonstration projects that employ promising processing technologies. The demonstration projects must emphasize public and private forest biomass feedstocks that are generated as byproducts of current forest practices. The project must reveal ways to overcome the current impediments to the developing forest biomass energy economy, and ways to realize ecologically sustainable outcomes from that development.

NEW SECTION. **Sec. 2.** (1) The department may develop and implement forest biomass energy demonstration projects, one east of the crest of the Cascade mountains and one west of the crest of the Cascade mountains. The demonstration projects must be designed to:

(a) Reveal the utility of Washington's public and private forest biomass feedstock;

(b) Create green jobs and generate renewable energy;

(c) Generate revenues or improve asset values for beneficiaries of state lands and state forest lands;

(d) Improve forest health, reduce pollution, and restore ecological function; and

(e) Avoid interfering with the current working area for forest biomass collection surrounding an existing fixed location biomass energy production site.

(2) To develop and implement the forest biomass energy demonstration projects, the department may form forest biomass energy partnerships or cooperatives.

(3) The forest biomass energy partnerships or cooperatives are encouraged to be public-private partnerships focused on convening the entities necessary to grow, harvest, process, transport, and utilize forest biomass to generate renewable energy. Particular focus must be

given to recruiting and employing emerging technologies that can locally process forest biomass feedstock to create local green jobs and reduce transportation costs.

(4) The forest biomass energy partnerships or cooperatives may include, but are not limited to: Entrepreneurs or organizations developing and operating emerging technology to process forest biomass; industrial electricity producers; contractors capable of providing the local labor needed to collect, process, and transport forest biomass feedstocks; tribes; federal land management agencies; county, city, and other local governments; the department of community, trade, and economic development; state trust land managers; an organization dedicated to protecting and strengthening the jobs, rights, and working conditions of Washington's working families; accredited research institution representatives; an industrial timber land manager; a small forest landowner; and a not-for-profit conservation organization.

NEW SECTION. **Sec. 3.** By December 2010, the department shall provide a progress report to the legislature regarding its efforts to develop, implement, and evaluate forest biomass energy demonstration projects and any other department initiatives related to forest biomass. The report may include an evaluation of:

(1) The status of the department's abilities to secure funding, partners, and other resources for the forest biomass energy demonstration projects;

(2) The status of the biomass energy demonstration projects resulting from the department's efforts;

(3) The status and, if applicable, additional needs of forest landowners within the demonstration project areas for estimating sustainable forest biomass yields and availability;

(4) Forest biomass feedstock supply and forest biomass market demand barriers, and how they can best be overcome including actions by the legislature and United States congress; and

(5) Sustainability measures that may be instituted by the state to ensure that an increasing demand for forest biomass feedstocks does not impair public resources or the ecological conditions of forests.

NEW SECTION. **Sec. 4.** For the purposes of implementing this act,

the department may seek grants or financing from the federal government, industry, or philanthropists.

Sec. 5. RCW 76.06.150 and 2004 c 218 s 2 are each amended to read as follows:

(1) The commissioner of public lands is designated as the state of Washington's lead for all forest health issues.

(2) The commissioner of public lands shall strive to promote communications between the state and the federal government regarding forest land management decisions that potentially affect the health of forests in Washington and will allow the state to have an influence on the management of federally owned land in Washington. Such government-to-government cooperation is vital if the condition of the state's public and private forest lands are to be protected. These activities may include, when deemed by the commissioner to be in the best interest of the state:

(a) Representing the state's interest before all appropriate local, state, and federal agencies;

(b) Assuming the lead state role for developing formal comments on federal forest management plans that may have an impact on the health of forests in Washington; ((~~and~~))

(c) Pursuing in an expedited manner any available and appropriate cooperative agreements, including cooperating agency status designation, with the United States forest service and the United States bureau of land management that allow for meaningful participation in any federal land management plans that could affect the department's strategic plan for healthy forests and effective fire prevention and suppression, including the pursuit of any options available for giving effect to the cooperative philosophy contained within the national environmental policy act of 1969 (42 U.S.C. Sec. 4331)<u>; and</u>

<u>(d) Pursuing agreements with federal agencies in the service of forest biomass energy partnerships and cooperatives authorized under sections 2 through 4 of this act</u>.

(3) The commissioner of public lands shall report to the chairs of the appropriate standing committees of the legislature every year on progress under this section, including the identification, if deemed

appropriate by the commissioner, of any needed statutory changes, policy issues, or funding needs.

Sec. 6. RCW 43.30.020 and 1965 c 8 s 43.30.020 are each amended to read as follows:

((~~For the purpose of this chapter, except where a different interpretation is required by the context:~~)) The definitions in this section apply throughout this chapter unless the context clearly requires otherwise.

(1) "Department" means the department of natural resources((~~,~~)).

(2) "Board" means the board of natural resources((~~,~~)).

(3) "Administrator" means the administrator of the department of natural resources((~~,~~)).

(4) "Supervisor" means the supervisor of natural resources((~~,~~)).

(5) "Agency" and "state agency" means any branch, department, or unit of the state government, however designated or constituted((~~,~~)).

(6) "Commissioner" means the commissioner of public lands.

(7) "Forest biomass" means the byproducts of: Current forest practices prescribed or permitted under chapter 76.09 RCW; current forest protection treatments prescribed or permitted under chapter 76.04 RCW; or the byproducts of forest health treatments prescribed or permitted under chapter 76.06 RCW. "Forest biomass" does not include wood pieces that have been treated with chemical preservatives such as: Creosote, pentachlorophenol, or copper-chrome-arsenic; wood from old growth forests, except wood removed for forest health treatments under chapter 76.06 RCW and RCW 79.15.540; wood required by chapter 76.09 RCW for large woody debris recruitment; or municipal solid waste.

NEW SECTION. **Sec. 7.** If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provision to other persons or circumstances is not affected.

NEW SECTION. **Sec. 8.** Sections 2 through 4 of this act are each added to chapter 43.30 RCW under the subchapter heading "duties and powers--forested lands."

--- END ---

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CERTIFICATION OF ENROLLMENT

SECOND SUBSTITUTE HOUSE BILL 2481

61st Legislature
2010 Regular Session

Passed by the House March 6, 2010
Yeas 94 Nays 1

Speaker of the House of Representatives

Passed by the Senate March 3, 2010
Yeas 47 Nays 0

President of the Senate

Approved

Governor of the State of Washington

CERTIFICATE

I, Barbara Baker, Chief Clerk of the House of Representatives of the State of Washington, do hereby certify that the attached is **SECOND SUBSTITUTE HOUSE BILL 2481** as passed by the House of Representatives and the Senate on the dates hereon set forth.

Chief Clerk

FILED

Secretary of State
State of Washington

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SECOND SUBSTITUTE HOUSE BILL 2481

AS AMENDED BY THE SENATE

Passed Legislature - 2010 Regular Session

State of Washington 61st Legislature 2010 Regular Session

By House General Government Appropriations (originally sponsored by Representatives Van De Wege, Kretz, Blake, Hinkle, Ormsby, Dunshee, McCoy, Eddy, Upthegrove, Carlyle, Haler, Morrell, Warnick, and Kessler; by request of Commissioner of Public Lands)

READ FIRST TIME 02/09/10.

AN ACT Relating to the department of natural resources authority to enter into forest biomass supply agreements; amending RCW 79.02.010, 43.30.020, 76.06.180, 79.15.100, 79.15.220, 79.15.510, and 79.15.510; adding a new chapter to Title 79 RCW; creating a new section; providing an effective date; and providing expiration dates.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF WASHINGTON:

NEW SECTION. **Sec. 1.** The legislature finds that the utilization of forest biomass materials located on state lands will assist in achieving the purposes of the forest biomass energy demonstration project under RCW 43.30.835, facilitate and support the emerging forest biomass market and clean energy economy, and enable the department to encourage biomass energy development on state trust lands for the trust land's potential long-term benefits to trust beneficiaries. The legislature finds that biomass utilization on state forest lands must be accomplished in a manner that retains organic components of the forest necessary to restore or sustain forest ecological functions.

NEW SECTION. **Sec. 2.** (1) The department may maintain a list of all potential sources of forest biomass on state lands for the purposes

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of identifying and making forest biomass, as defined in RCW 79.02.010, available for sale, exploration, collection, processing, storage, stockpiling, and conversion into energy, biofuels, for use in a biorefinery, or any other similar use. Prior to entering an agreement authorized by section 3(1) or 4 of this act, the department shall complete an inventory of the available biomass in the area that will be subject to the agreement, except that no inventory will be required as a prerequisite for demonstration projects authorized pursuant to RCW 43.30.835. The inventory must contain, at a minimum, an estimated amount of the forest biomass available in the area that will be subject to the agreement and a determination of the ecological and operational sustainability of the volumetric limit established by the agreement under section 3(5) of this act.

(2) The data developed for each inventoried area will be compiled for the list authorized by this section. In order to utilize the list to limit or terminate any agreement authorized under this act, the department must determine that the overall supply of forest biomass in a region or watershed has been reduced to a point such that further exploration and collection of forest biomass may not be ecologically or operationally sustainable or might otherwise threaten long-term forest health.

NEW SECTION. **Sec. 3.** (1) The department is authorized to enter forest biomass supply contracts on terms and conditions acceptable to the department for terms of up to five years, except as provided in subsection (4) of this section, for the purpose of providing a supply of forest biomass during the term of the contract except as the term of the contract may be limited under subsection (2) of this section, provided that such a contract must terminate automatically upon the removal of the agreed volume of biomass and the completion of other conditions of the contract.

(2) The department may authorize the sale of forest biomass in a contract for the sale of valuable materials under chapter 79.15 RCW provided that the department complies with the provisions of this chapter and: (a) Requires a separate bid and selects an apparent highest bidder for the forest biomass separately from the sale of valuable materials; (b) expressly includes forest biomass as an element of the sale of the valuable materials to be sold in the sales contract;

or (c) a combination of (a) and (b) of this subsection. The term of the contract for the removal of biomass, if the sale is made in conformance with this subsection, must not exceed the term of the contract for valuable materials sold under chapter 79.15 RCW.

(3) The department may: (a) Enter into direct sales contracts for forest biomass, without public auction, based upon procedures adopted by the board to ensure competitive market prices and accountability; or (b) enter into contracts for forest biomass at public auction or by sealed bid to the highest bidder in a manner consistent with the sale procedures established for the sale of valuable materials in chapter 79.15 RCW or as may be adopted by the board.

(4) In the event a contracting entity makes a qualifying capital investment of fifty million dollars or more, the department may enter into an agreement for up to fifteen years. Such an agreement must include provisions that are periodically adjusted for market conditions. In addition, the conditions of the contract must include provisions that allow the department, when in the best interest of trust beneficiaries, to maintain the availability of biomass resources on state lands to existing pulp and paper operations or other existing biomass processing operations that are using such resources, in quantities typical for the period of five years preceding the effective date of this section. For the purposes of this section, "qualifying capital investment" means a planned and committed investment at the time the contract is set with the requirement that at least fifty million dollars be invested before the removal of any biomass under the contract.

(5) The department must specify in each contract an annual volumetric limit of the total cubic volume or tons of forest biomass to be supplied from a specific unit, geographically delineated area, or region within a watershed or watersheds on an ecologically and operationally sustainable basis. The department shall adopt general procedures for making the biomass supply availability determinations under this subsection. The procedures must be written to ensure that biomass utilization on forest lands managed by the department is accomplished in a manner that retains organic components of the forest necessary to restore or sustain forest ecological functions. The department shall develop utilization standards and operational methods in recognition of the variability of on-site conditions. The

department may unilaterally amend the volume to be supplied by providing the contracting party with a minimum of six months notice prior to reducing the contract volume to be supplied if the department determines, under section 2 of this act, that the available supply has been reduced to a point such that further removal of forest biomass may not be ecologically or operationally sustainable or may adversely affect long-term forest health.

(6) At the expiration of the contract term, the department may renew the contract for up to three additional five year periods on terms and conditions acceptable to the department, if the department finds: (a) An ecologically and operationally sustainable supply of forest biomass is available for the term of the contract; (b) the payment under the contract represents the fair market value at the time of the renewal; and (c) the purchaser agrees to the estimated amount of biomass material available.

(7) Where the department sells forest biomass in a contract for sale of valuable materials under subsection (2) of this section, any valuable material conveyed as timber in such a contract must count toward the achievement of annual or decadal targets developed in the sustainable timber harvest calculation required by RCW 79.10.320, or similar targets for timber harvest volume, even where the purchaser uses that material as a biomass energy feedstock. All other biomass volume conveyed as authorized in this chapter must not be counted toward such sustainable timber harvest targets.

(8) All contractors and their operations authorized under this section shall comply with all applicable state and federal laws and regulations.

NEW SECTION. **Sec. 4.** The department is authorized to lease state lands for the purpose of the sale, exploration, collection, processing, storage, stockpiling, and conversion of biomass into energy or biofuels, the development of a biorefinery, or for any other resource use derived from biomass if the department is able to obtain a fair market rental return to the state or the appropriate constitutional or statutory trust and if the lease is in the best interest of the state and the affected trust, as follows:

(1) Leases authorized under this chapter may be entered into by

public auction, in accordance with the provisions of RCW 79.13.140, or by negotiation.

(2) All leases must contain such terms and conditions as may be prescribed by the department in accordance with the provision of this act and to ensure that removal of forest biomass is ecologically and operationally sustainable. Leases authorized under this act may be for a term of no more than fifty years.

(3) For leases that involve the development of biomass processing, biofuel manufacturing, or biomass energy production facilities, the department may include provisions for reduced rent until an approved plan of development is completed and the facility is operational, provided that provisions are included to require: (a) Adequate assurances to protect the department's interest in a future rental income stream; (b) the demonstration of reasonable progress consistent with an approved plan of development; and (c) a lump sum payment to the department in the amount of the difference between the fair market rent and the reduced rent, if the approved plan of development is not completed in the time required in the plan.

(4) The department may require the payment of production rent or other compensation for the use of the land and biomass materials on the land. If the department is not entering a supply contract under section 3 of this act for any forest biomass to be supplied for the lease purposes from the leased land, then the department must require a royalty payment for the contribution to value of any product created by the lessee that is associated with forest biomass removed from the leased land in an amount fixed by the board.

(5) All lessees and their operations authorized under this section shall comply with all applicable state and federal laws and regulations.

NEW SECTION. **Sec. 5.** (1) For the purpose of improving forest health on state trust lands, and to better clarify the relationship of forest biomass with the by-products of forest health and fuel reduction treatments that have been traditionally utilized for other products, the department of natural resources shall evaluate how the supply agreements in sections 3 and 4 of this act could be utilized to sustain or create rural jobs and timber manufacturing infrastructure, and to sell state timber to traditional types of timber purchasers. The

department shall report its findings to the appropriate committees of the legislature by December 15, 2010, and the evaluation must at a minimum identify how such supply agreements could:

(a) Ensure the department of natural resources meets its fiduciary responsibility to the state's trust beneficiaries;

(b) Restore or sustain a competitive market for state timber sales;

(c) Generate returns for the trust that are commensurate with fluctuating market prices; and

(d) Ensure environmental compliance with all pertinent state and federal laws, and provide for ecologically and operationally sustainable biomass removal.

(2) For the purposes of proving the concepts evaluated in this section, the department may, in addition to the authorities granted in section 3 of this act, establish a five-year forest health and fuel reduction supply agreement demonstration project. Solicitation of private industry partners for such a project must be competitive, must focus on areas where traditional forest products manufacturing infrastructure and rural jobs have been lost, and should consider prioritizing partners utilizing materials for both traditional forest products and biomass energy conversion.

Sec. 6. RCW 79.02.010 and 2004 c 199 s 201 are each amended to read as follows:

The definitions in this section apply throughout this title unless the context clearly requires otherwise.

(1) "Aquatic lands" means all state-owned tidelands, shorelands, harbor areas, and the beds of navigable waters as defined in ((~~chapter 79.90~~)) RCW 79.105.060 that are administered by the department.

(2) "Board" means the board of natural resources.

(3) "Commissioner" means the commissioner of public lands.

(4) "Community and technical college forest reserve lands" means lands managed under RCW 79.02.420.

(5) "Department" means the department of natural resources.

(6) "Improvements" means anything considered a fixture in law placed upon or attached to lands administered by the department that has changed the value of the lands or any changes in the previous condition of the fixtures that changes the value of the lands.

(7) "Land bank lands" means lands acquired under RCW 79.19.020.

(8) "Person" means an individual, partnership, corporation, association, organization, cooperative, public or municipal corporation, or agency of a federal, state, or local governmental unit, however designated.

(9) "Public lands" means lands of the state of Washington administered by the department including but not limited to state lands, state forest lands, and aquatic lands.

(10) "State forest lands" means lands acquired under RCW 79.22.010, 79.22.040, and 79.22.020.

(11) "State lands" includes:

(a) School lands, that is, lands held in trust for the support of the common schools;

(b) University lands, that is, lands held in trust for university purposes;

(c) Agricultural college lands, that is, lands held in trust for the use and support of agricultural colleges;

(d) Scientific school lands, that is, lands held in trust for the establishment and maintenance of a scientific school;

(e) Normal school lands, that is, lands held in trust for state normal schools;

(f) Capitol building lands, that is, lands held in trust for the purpose of erecting public buildings at the state capital for legislative, executive, and judicial purposes;

(g) Institutional lands, that is, lands held in trust for state charitable, educational, penal, and reformatory institutions; and

(h) Land bank, escheat, donations, and all other lands, except aquatic lands, administered by the department that are not devoted to or reserved for a particular use by law.

(12) "Valuable materials" means any product or material on the lands, such as forest products, forage or agricultural crops, stone, gravel, sand, peat, and all other materials of value except: (a) Mineral, coal, petroleum, and gas as provided for under chapter 79.14 RCW; and (b) forest biomass as provided for under chapter 79.-- RCW (the new chapter created in section 14 of this act).

(13)(a) "Forest biomass" means the by-products of: Current forest management activities; current forest protection treatments prescribed or permitted under chapter 76.04 RCW; or the by-products of forest health treatment prescribed or permitted under chapter 76.06 RCW.

(b) "Forest biomass" does not include wood pieces that have been treated with chemical preservatives such as: Creosote, pentachlorophenol, or copper-chrome-arsenic; wood from existing old growth forests; wood required to be left on-site under chapter 76.09 RCW, the state forest practices act; and implementing rules, and other legal and contractual requirements; or municipal solid waste.

Sec. 7. RCW 43.30.020 and 2009 c 163 s 6 are each amended to read as follows:

The definitions in this section apply throughout this chapter unless the context clearly requires otherwise.

(1) "Administrator" means the administrator of the department of natural resources.

(2) "Agency" and "state agency" means any branch, department, or unit of the state government, however designated or constituted.

(3) "Board" means the board of natural resources.

(4) "Commissioner" means the commissioner of public lands.

(5) "Department" means the department of natural resources.

(6) ((~~"Forest biomass" means the by-products of: Current forest practices prescribed or permitted under chapter 76.09 RCW; current forest protection treatments prescribed or permitted under chapter 76.04 RCW; or the by-products of forest health treatments prescribed or permitted under chapter 76.06 RCW. "Forest biomass" does not include wood pieces that have been treated with chemical preservatives such as: Creosote, pentachlorophenol, or copper-chrome-arsenic; wood from old growth forests, except wood removed for forest health treatments under chapter 76.06 RCW and RCW 79.15.540; wood required by chapter 76.09 RCW for large woody debris recruitment; or municipal solid waste.~~

~~(7)~~)) "Supervisor" means the supervisor of natural resources.

Sec. 8. RCW 76.06.180 and 2007 c 480 s 7 are each amended to read as follows:

(1) Prior to issuing a forest health hazard warning or forest health hazard order, the commissioner shall consider the findings and recommendations of the forest health technical advisory committee and shall consult with county government officials, forest landowners and forest land managers, consulting foresters, and other interested parties to gather information on the threat, opportunities or

constraints on treatment options, and other information they may provide. The commissioner, or a designee, shall conduct a public hearing in a county within the geographical area being considered.

(2) The commissioner of public lands may issue a forest health hazard warning when he or she deems such action is necessary to manage the development of a threat to forest health or address an existing threat to forest health. A decision to issue a forest health hazard warning may be based on existing forest stand conditions and:

(a) The presence of an uncharacteristic insect or disease outbreak that has or is likely to (i) spread to multiple forest ownerships and cause extensive damage to forests; or (ii) significantly increase forest fuel that is likely to further the spread of uncharacteristic fire;

(b) When, due to extensive physical damage from wind or ice storm or other cause, there are (i) insect populations building up to large scale levels; or (ii) significantly increased forest fuels that are likely to further the spread of uncharacteristic fire; or

(c) When otherwise determined by the commissioner to be appropriate.

(3) The commissioner of public lands may issue a forest health hazard order when he or she deems such action is necessary to address a significant threat to forest health. A decision to issue a forest health hazard order may be based on existing forest stand conditions and:

(a) The presence of an uncharacteristic insect or disease outbreak that has (i) spread to multiple forest ownerships and has caused and is likely to continue to cause extensive damage to forests; or (ii) significantly increased forest fuels that are likely to further the spread of uncharacteristic fire;

(b) When, due to extensive physical damage from wind or ice storm or other cause (i) insect populations are causing extensive damage to forests; or (ii) significantly increased forest fuels are likely to further the spread of uncharacteristic fire;

(c) Insufficient landowner action under a forest health hazard warning; or

(d) When otherwise determined by the commissioner to be appropriate.

(4) A forest health hazard warning or forest health hazard order shall be issued by use of a commissioner's order. General notice of the commissioner's order shall be published in a newspaper of general circulation in each county within the area covered by the order and on the department's web site. The order shall specify the boundaries of the area affected, including federal and tribal lands, the forest stand conditions that would make a parcel subject to the provisions of the order, and the actions landowners or land managers should take to reduce the hazard. If the forest health hazard warning or order relates to land managed by the department, the warning or order may also contain provisions for the department's utilization of any forest biomass pursuant to chapter 79.-- RCW (the new chapter created in section 14 of this act).

(5) Written notice of a forest health hazard warning or forest health hazard order shall be provided to forest landowners of specifically affected property.

(a) The notice shall set forth:

(i) The reasons for the action;

(ii) The boundaries of the area affected, including federal and tribal lands;

(iii) Suggested actions that should be taken by the forest landowner under a forest health hazard warning or the actions that must be taken by a forest landowner under a forest health hazard order;

(iv) The time within which such actions should or must be taken;

(v) How to obtain information or technical assistance on forest health conditions and treatment options;

(vi) The right to request mitigation under subsection (6) of this section and appeal under subsection (7) of this section;

(vii) These requirements are advisory only for federal and tribal lands.

(b) The notice shall be served by personal service or by mail to the latest recorded real property owner, as shown by the records of the county recording officer as defined in RCW 65.08.060. Service by mail is effective on the date of mailing. Proof of service shall be by affidavit or declaration under penalty of perjury.

(6) Forest landowners who have been issued a forest health hazard order under subsection (5) of this section may apply to the department for the remission or mitigation of such order. The application shall

be made to the department within fifteen days after notice of the order has been served. Upon receipt of the application, the department may remit or mitigate the order upon whatever terms the department in its discretion deems proper, provided the department deems the remission or mitigation to be in the best interests of carrying out the purposes of this chapter. The department may ascertain the facts regarding all such applications in such reasonable manner and under such rule as it deems proper.

(7) Forest landowners who have been issued a forest health hazard order under subsection (5) of this section may appeal the order to the forest practices appeals board.

(a) The appeal shall be filed within thirty days after notice of the order has been served, unless application for mitigation has been made to the department. When such an application for mitigation is made, such appeal shall be filed within thirty days after notice of the disposition of the application for mitigation has been served.

(b) The appeal must set forth:

(i) The name and mailing address of the appellant;

(ii) The name and mailing address of the appellant's attorney, if any;

(iii) A duplicate copy of the forest health hazard order;

(iv) A separate and concise statement of each error alleged to have been committed;

(v) A concise statement of facts upon which the appellant relies to sustain the statement of error; and

(vi) A statement of the relief requested.

(8) A forest health hazard order issued under subsection (5) of this section is effective thirty days after date of service unless application for remission or mitigation is made or an appeal is filed. When an application for remission or mitigation is made, the order is effective thirty days after notice setting forth the disposition of the application is served unless an appeal is filed from such disposition. Whenever an appeal of the order is filed, the order shall become effective only upon completion of all administrative and judicial review proceedings and the issuance of a final decision confirming the order in whole or in part.

(9) Upon written request, the department may certify as adequate a forest health management plan developed by a forest landowner, before

or in response to a forest health hazard warning or forest health hazard order, if the plan is likely to achieve the desired result and the terms of the plan are being diligently followed by the forest landowner. The certification of adequacy shall be determined by the department in its sole discretion, and be provided to the requestor in writing.

Sec. 9. RCW 79.15.100 and 2004 c 177 s 5 are each amended to read as follows:

(1) Valuable materials may be sold separately from the land as a "lump sum sale" or as a "scale sale."

(a) "Lump sum sale" means any sale offered with a single total price applying to all the material conveyed.

(b) "Scale sale" means any sale offered with per unit prices to be applied to the material conveyed.

(2) Payment for lump sum sales must be made as follows:

(a) Lump sum sales under five thousand dollars appraised value require full payment on the day of sale.

(b) Lump sum sales appraised at over five thousand dollars but under one hundred thousand dollars may require full payment on the day of sale.

(c) Lump sum sales requiring full payment on the day of sale may be paid in cash or by certified check, cashier's check, bank draft, or money order, all payable to the department.

(3) Except for sales paid in full on the day of sale or sales with adequate bid bonds, an initial deposit not to exceed twenty-five percent of the actual or projected purchase price shall be made on the day of sale.

(a) Sales with bid bonds are subject to the day of sale payment and replacement requirements prescribed by RCW 79.15.110.

(b) The initial deposit must be maintained until all contract obligations of the purchaser are satisfied. However, all or a portion of the initial deposit may be applied as the final payment for the valuable materials in the event the department determines that adequate security exists for the performance or fulfillment of any remaining obligations of the purchaser under the sale contract.

(4) Advance payments or other adequate security acceptable to the

department is required for valuable materials sold on a scale sale basis or a lump sum sale not requiring full payment on the day of sale.

(a) The purchaser must notify the department before any operation takes place on the sale site.

(b) Upon notification as provided in (a) of this subsection, the department must require advanced payment or may allow purchasers to submit adequate security.

(c) The amount of advanced payments or security must be determined by the department and must at all times equal or exceed the value of timber cut and other valuable materials processed or removed until paid for.

(d) Security may be bank letters of credit, payment bonds, assignments of savings accounts, assignments of certificates of deposit, or other methods acceptable to the department as adequate security.

(5) All valuable material must be removed from the sale area within the period specified in the contract.

(a) The specified period may not exceed five years from date of purchase except for stone, sand, gravel, fill material, or building stone.

(b) The specified period for stone, sand, gravel, fill material, or building stone may not exceed thirty years.

(c) In all cases, any valuable material not removed from the land within the period specified in the contract reverts to the state. The department may utilize any remaining forest biomass in accordance with chapter 79.-- RCW (the new chapter created in section 14 of this act).

(6) The department may extend a contract beyond the normal termination date specified in the sale contract as the time for removal of valuable materials when, in the department's judgment, the purchaser is acting in good faith and endeavoring to remove the materials. The extension is contingent upon payment of the fees specified below.

(a) The extended time for removal shall not exceed:

(i) Forty years from date of purchase for stone, sand, gravel, fill material, or building stone;

(ii) A total of ten years beyond the original termination date for all other valuable materials.

(b) An extension fee fixed by the department will be charged based on the estimated loss of income per acre to the state resulting from

the granting of the extension plus interest on the unpaid portion of the contract. The board must periodically fix and adopt by rule the interest rate, which shall not be less than six percent per annum.

(c) The sale contract shall specify:

(i) The applicable rate of interest as fixed at the day of sale and the maximum extension payment; and

(ii) The method for calculating the unpaid portion of the contract upon which interest is paid.

(d) The minimum extension fee is fifty dollars per extension plus interest on the unpaid portion of the contract.

(e) Moneys received for any extension must be credited to the same fund in the state treasury as was credited the original purchase price of the valuable material sold.

(7) The department may, in addition to any other securities, require a performance security to guarantee compliance with all contract requirements. The security is limited to those types listed in subsection (4) of this section. The value of the performance security will, at all times, equal or exceed the value of work performed or to be performed by the purchaser.

(8) The department does not need to comply with the provisions of this chapter for forest biomass except as described in the provisions of chapter 79.-- RCW (the new chapter created in section 14 of this act). Forest biomass may not be included in any sales contract authorized under this chapter unless the department has complied with the provisions of chapter 79.-- RCW (the new chapter created in section 14 of this act).

(9) The provisions of this section apply unless otherwise provided by statute.

Sec. 10. RCW 79.15.220 and 2001 c 250 s 14 are each amended to read as follows:

When the department finds valuable materials on state land that are damaged by fire, wind, flood, or from any other cause, it shall determine if the salvage of the damaged valuable materials is in the best interest of the trust for which the land is held, which may include the salvage of forest biomass under chapter 79.-- RCW (the new chapter created in section 14 of this act). If salvaging the valuable materials is in the best interest of the trust, the department shall

proceed to offer the valuable materials for sale. The valuable materials, when offered for sale, must be sold in the most expeditious and efficient manner as determined by the department. In determining if the sale is in the best interest of the trust the department shall consider the net value of the valuable materials and relevant elements of the physical and social environment.

Sec. 11. RCW 79.15.510 and 2009 c 418 s 2 are each amended to read as follows:

(1) The department may establish a contract harvesting program for directly contracting for the removal of timber and other valuable materials from state lands and for conducting silvicultural treatments consistent with RCW 79.15.540.

(2) The contract requirements must be compatible with the office of financial management's guide to public service contracts.

(3) The department may not use contract harvesting for more than twenty percent of the total annual volume of timber offered for sale. However, volume removed primarily to address an identified forest health issue under RCW 79.15.540 may not be included in calculating the ((~~ten [twenty] percent~~)) annual limit of contract harvesting sales. Forest biomass resulting from harvesting to address an identified forest health issue under RCW 79.15.540 may be utilized in accordance with chapter 79.-- RCW (the new chapter created in section 14 of this act).

Sec. 12. RCW 79.15.510 and 2004 c 218 s 6 are each amended to read as follows:

(1) The department may establish a contract harvesting program for directly contracting for the removal of timber and other valuable materials from state lands and for conducting silvicultural treatments consistent with RCW 79.15.540.

(2) The contract requirements must be compatible with the office of financial management's guide to public service contracts.

(3) The department may not use contract harvesting for more than ten percent of the total annual volume of timber offered for sale. However, volume removed primarily to address an identified forest health issue under RCW 79.15.540 may not be included in calculating the ((~~ten percent~~)) annual limit of contract harvesting sales. Forest

biomass resulting from harvesting to address an identified forest health issue under RCW 79.15.540 may be utilized in accordance with chapter 79.-- RCW (the new chapter created in section 14 of this act).

NEW SECTION. **Sec. 13.** The department of natural resources must conduct a survey of scientific literature regarding the carbon neutrality of forest biomass. The department must submit the survey results with any findings and recommendations to the appropriate committees of the legislature by December 15, 2010.

This section expires January 1, 2011.

NEW SECTION. **Sec. 14.** Sections 1 through 5 of this act constitute a new chapter in Title 79 RCW.

NEW SECTION. **Sec. 15.** Section 11 of this act expires January 1, 2014.

NEW SECTION. **Sec. 16.** Section 12 of this act takes effect January 1, 2014.

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