

# Wood to Energy in Washington: Imperatives, Opportunities, and Obstacles to Progress

May 2009

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Washington State lacks a cohesive strategy to reduce green house gases and for renewable energy development. Significant obstacles to progress must be addressed. Three fundamental imperatives compel changes in energy policy: climate change mitigation, energy independence, and sustainability.

At the request of the Washington State Legislature, a thorough investigation into the barriers to increasing utilization of woody biomass for energy production in Washington has been conducted by University of Washington scientists. Early on it became apparent that identifying barriers and recommending solutions could not be adequately addressed without expanding the investigation to include an assessment of the broader energy policies of the state.

## Conclusions

Nationally, climate change mitigation efforts focus on reducing greenhouse gas emissions (primarily carbon dioxide) released when burning carbon based fossil fuels to produce electrical energy or when used as transportation fuels. Woody biomass is an attractive alternative energy source; it is carbon neutral (carbon released into the atmosphere from wood-to-energy production has been previously removed from the atmosphere by the growing woody plants), renewable and abundant in Washington State. Efforts to identify barriers to increased utilization of renewable, carbon neutral woody biomass as an energy source are critical.

Energy independence is a national energy policy objective. Washington state is a net exporter of clean, electrical energy and a nearly 100% importer of transportation fossil fuel energy. More than half of the greenhouse gases released into the atmosphere from Washington State comes from use of transportation fuels and from catastrophic wild fires. Washington State produces an excess of clean, electrical power from hydro and nuclear power sources. For Washington State, finding carbon neutral substitutes for the 100% imported transportation fossil fuels and reducing catastrophic forest fires is the logical pathway to energy independence for the state and net greenhouse gas reductions for the nation.

Plant biomass energy is the only renewable resource that can be converted to biofuels for transportation such as ethanol. Wood is the dominant biomass resource in Washington; accounting for two-thirds of all potentially available biomass. Production of renewable biofuels in Washington will necessarily require wood as a primary feedstock and efforts to reduce State greenhouse gas emissions must fully consider forests and forest resources. Forest play a unique role in climate change mitigation by absorbing carbon dioxide through photosynthesis, storing carbon in tree biomass and building products, offsetting use of polluting building product alternatives such as steel and concrete and by providing biomass for clean energy. Thinning forests will help to avoid carbon dioxide emissions from catastrophic wildfires while providing wood resources for green building materials and renewable biofuels and will deliver double greenhouse gas emission reduction benefits while sustaining forest ecosystems. Greenhouse gas emissions from wildfires in Washington State in 2006 were greater than total emissions from electrical power generation. The forest industry represents the State's largest biomass collection system, is the largest industrial provider of renewable energy, and has potential to significantly improve wood-to-energy recoveries and outputs.

While use of woody biomass for direct heat or electrical energy production may be appropriate for some regions of the state, development of renewable in-state sources of transportation fuel should be the State's highest energy priority. Energy recovery of liquid fuels from woody biomass will require large integrated biorefinery installations. Significant production of biofuels in Washington will be dependent upon regular collection of millions of tons of wood biomass augmented, where possible, with recovered biomass from cities and fields. Fortunately, in Washington State, over 11 million dry tons of forest biomass is potentially available, renewable each year. Co-location of biorefineries with pulp and paper mills represents the greatest potential opportunity to maximize energy recovery of liquid fuels, electricity, and process steam from woody biomass resources in Washington State. Co-locating will bring reduced capital costs, access to needed infrastructure, synergies for integrated raw materials and product streams, and an engaged corps of highly-skilled chemical engineers and union workers.

Sustainable development of renewable energy alternatives to fossil fuels will require careful planning, resource conservation, and committed policy support. However, a lack of a cohesive strategy for renewable energy development is an obstacle to progress and represents the single most significant barrier to increased utilization of woody biomass for energy production in Washington State.

Washington does not have a Department of Energy or other organizational framework for effective scientific participation in policy consideration of the interrelated topics of energy, climate and sustainable forest resources. Criteria

for comparisons of potential alternative energy and resource applications have not been developed to inform State energy policy priorities, i.e. woody biomass for electricity generation vs. transportation fuels. The public benefits of carbon neutral energy alternatives to fossil fuels are not readily captured by consumer markets and, in lieu of integrated planning, are not adequately characterized in State energy policy. Current State energy policies, such as I-937, inadvertently favor small-scale and inefficient conversions of biomass to electricity which fails to address energy independence, has poor raw material-to-energy yields and compromise biofuels development. In the absence of integrated planning and enduring commitment to change, opportunities for wood to energy are compromised while combustion of imported fossil fuels and associated green house emissions continue to increase in Washington State.

### Recommendations

A lead state agency is needed to coordinate policy development for the interrelated energy policy imperatives of climate change mitigation, energy independence and sustainable management of State natural resources. Energy priorities need to be identified to inform development of a cohesive State energy plan. Significant progress in addressing energy policy imperatives in Washington State can only be made by pursuing policies that support large-scale biofuels projects rather than inefficient small-scale power projects. A State commitment to development of a cohesive energy strategy supported by interdisciplinary research to target priority objectives for achievement will be needed to spur investment for Wood to Energy in Washington.

*Climate Change.* Policy mechanisms to identify and include non-market values and avoided costs in energy accounting are needed.

*Energy Independence.* An assessment of costs and benefits that could derive from reduced reliance upon imported fossil fuels in Washington resulting from development of wood biomass for ethanol should be conducted.

*Forest Health.* Washington needs a plan to integrate biomass removals for forest health with climate change mitigation and energy development.

*Wood Biomass Resources.* Arbitrary constraints that limit biomass availability for renewable energy such as appear in I-937 should be revised. If a cohesive strategy for biomass supply assurance and utilization is not developed quickly, Washington resources may be exported into other markets, like Oregon, where biofuels development is further advanced.

*Guidelines for Slash Removal.* As evidenced by successes in other states, forest biomass collection guidelines should be developed and incorporated into Washington forest practice rules.

*Integrated Infrastructure and Product Hierarchies.* Biomass energy priorities should favor liquid fuels conversions at integrated biorefineries that can optimize energy yields through recovery of heat, electricity, and chemical byproducts. As possible, biorefineries will be best sited with pulp and paper mills. State investment in support of biorefinery development would be the most effective biomass-to-energy approach for response to the three imperatives of climate change mitigation, energy independence, and sustainability.

*Conversion Technology Advancement.* Continued research investment to develop superior conversion technologies for liquid fuel production from Washington biomass resources will help to identify advancements that provide maximum energy yields at least costs. Investment in a pilot project towards development and demonstration of a commercial, integrated biorefinery is highly recommended as an important next step.

*Social License.* Outreach programs that facilitate public education and dialogue towards consensus solutions to contemporary resource and energy challenges are worthy of State support, as demonstrated in many other states.

*Green Jobs.* State leaders should acknowledge forest biomass-to-energy as a cornerstone element of a clean future economy. State agencies should work with universities and community colleges to establish training programs for forestry workers that cover the spectrum from collection through conversion.

*Green Building Products.* Green building standards should be revised to include product comparisons based upon rigorous scientifically-supported performance standards such as Life Cycle Analysis and Net Energy Balance.

*Policy Guidance.* Liquid transportation fuels, such as ethanol, should be the State energy priority. Counterproductive contradictions in current policy require formal scientific review and potential policy alternatives to examine barriers to wood for biofuels conversion. Investigation of contradictions in I-937, the Western Climate Initiative and the Energy Independence and Security Act of 2007 should be undertaken.

*Interdisciplinary Science Support for Energy Policy Development.* Programmatic investment in sustained in-state interdisciplinary research to inform policy makers and stakeholders in the development of realistic and effective strategies to address the difficult and complex challenges of renewable energy development and climate change is essential.

*Research.* To address the lack of integrated understanding of complex climate change mitigation, energy independence and sustainability issues, we recommend Washington establish a permanent interdisciplinary program of research and outreach to address emerging topics concerning biomass energy development with implications for environment and the State economy.

