Economics and Policy for Washington State Biofuel Markets: Interim Report

Interim report to the Governor's Office and the Washington State Legislature as directed in E2SSHB 1303 section 402.

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Executive Summary

In April 2007, the Washington State Legislature passed SHB 1303, an "act relating to providing for the means to encourage the use of cleaner energy". This omnibus bill contains four chapters. The first focuses on clean air legislation, the second focuses on public sector fuel use, the third on amending the Energy Freedom Program and the fourth contains a number of research and planning initiatives for energy markets and climate change. Section 402 of Chapter 4 directs Washington State University to provide biofuel market information and recommendations for market incentives and research and development grants. In addition to the information requested regarding feedstocks, we interpret the language of section 402 to mean that we should deliver policy recommendations that:

1) Advance economically viable instate production of biofuel and biofuel feedstocks;
2) Encourage environmentally sustainable instate production of biofuel and biofuel feedstocks;
3) Encourage private investment in the feedstock, distribution, and fuel production sectors;
4) Deliver the greatest net reductions of carbon emissions;
5) Reduce petroleum dependence.

The primary goal for this study is to develop a set of policy recommendations that provides a menu of recommended actions for pursuing the five goals outlined above. In pursuit of this goal, we will be performing several tasks. First, we will provide a description of current and potential feedstock sources for the state of Washington. Second, we will develop, motivate, compare and contrast a broad set of policy alternatives and relate them to the goals outlined in the legislation. Third, we will develop an instrument for assessing research and development alternatives for Washington State public investment in biofuel markets. Fourth, we will perform impact analyses to quantitatively compare the most promising set of policy suites to address the goals of SHB1303*§402*. Fifth, we will make specific recommendations for market incentives and for research directions. An interim report is due December 1 2007, and the final report is due December 1 2008.

The objectives of this interim report are to:

1) Satisfy the reporting requirements with respect to progress and plans for completion,
2) To provide a common foundation for the members of the research team as we proceed with our analysis in the coming year,
3) To provide preliminary findings and publicize basic approaches to policy design in order to elicit early and substantive feedback from stakeholders.

This report includes preliminary estimates of Washington feedstocks and biofuel production and consumption; a summary of existing biofuel market policies; an economic comparison of a broad set of options for market incentive and R&D; an overview of impact analyses we will perform for the final report; a status report; and a plan of work. Although we

present a wide range of policy approaches and ideas in this interim report, the contents of this report are not to be taken as recommendations. They are included to stimulate discussion and debate between and among stakeholders and the research team. Nothing in this report is to be interpreted as final.

This interim report contains preliminary estimates of current feedstock production, inventories and use, with an associated appendix that includes provisional estimates of production costs, prices, and revenue for selected feedstocks as well as estimates of biofuel production and a description of existing biofuel infrastructure. Our preliminary overview of agricultural-crop feedstocks suggests:

1) Currently, Washington state has very few acres of any major feedstock for sugar/starch-based alcohol feedstocks (e.g. corn, sugarcane, sugarbeets),
2) Currently, Washington has relative few acres of the oilseed crops that could support a biofuel industry. Oilseed crops such as spring and winter Canola and mustard are grown in the state, but are generally junior partners in field crop rotations. Historically, these crops have been non-competitive with the traditional dryland and irrigated field crops in the state (e.g., wheat and potatoes, respectively).
3) Our research will continue to explore the agronomic and economic conditions under which larger acreages of sugar crops and/or oilseed crops might be viable in Washington. For successful feedstock market development, these potential feedstocks must prove agronomically feasible and economically competitive with traditional crops under proposed market incentives. Targeted research and development may spur agronomic and technological advances to improve competitiveness in the long run.

There are a wide range of feedstocks that might provide the basis for a cellulosic ethanol production industry. We inventoried a large number of potential cellulosic feedstocks and have begun an analysis of this inventory. Preliminary analysis of the inventory reveals a potentially large stock of cellulosic feedstocks, including:

1) Agricultural byproducts (e.g., wheat straw),
2) Dedicated agricultural or agro-forestry crops (e.g., switchgrass and hybrid poplars)
3) Forest and other wood residues,
4) Manures, municipal wastes.

Appendices to the report contain some preliminary estimates of the magnitude of these feedstocks. However, great care should be taken in using these estimates because the feedstock supplies that may actually materialize are highly situational. The material which might actually be available to supply a cellulosic feedstock market depends on many factors such as:

1) Competing land uses for the possible dedicated crops such as switchgrass or poplars,
2) Competing uses for the feedstocks themselves such as the forest/timber by-broducts that are already used for thermal energy co-production and the straw used for soil enrichment,
3) Transportation infrastructure facilities and costs for these weighty, bulky, awkward, and difficult substances.

4) The requirements of the eventually most competitive conversion technology.

These factors will be considered carefully in the coming year as we develop and implement methods for estimating potential feedstock availability.

This preliminary report also contains a brief discussion of instate biofuel production and demand. Although no ethanol is currently being produced in Washington State, 666 million gallons per year of capacity are either in planning or permitting stages, and up to 380 million gallons per year of biodiesel production capacity online or in permitting/proposal stages. Ethanol currently exceeds the 2% content standard for the state, and although biodiesel consumption is below 2%, consumption is increasing rapidly. A discussion of the current status of infrastructure and transportation issues relating to biofuel markets in Washington is also provided.

As background for policy analysis, the research team has summarized current state and federal policies in the United States. Different states and the national government are experimenting with a wide array of market incentives and public investment policies. Some have been adopted; others are under consideration. Because of the more recent emphasis on greenhouse gas emissions reduction, the structure of emerging policies are in many cases substantially different than older policy approaches. This menu of policies will provide a foundation of ideas and some experience to inform policy deliberations in Washington. These existing policy approaches include various forms of

1) consumption incentives,
2) biofuel and feedstock production incentives,
3) distribution incentives,
4) research and development investment incentives, and
5) regulatory standards, including quantity/content standards and performance standards.

In this interim report we begin the economic analysis of the various market incentives and public approaches to support research and development in biofuel markets. This component of the report integrates several general economic goals of public policy with the stated goals of HB1303§402. In particular, we note that much useful economic analysis of policy has been developed around the economic goal of efficiency. The efficiency goal closely relates to, and supports, the legislatively mandated goals noted above -- particularly the goals of promoting viable and sustainable development. The tools of efficiency analysis can also be applied to an examination of the least costly means of pursuing energy independence and security and to reducing carbon emissions. In the United States, it is generally taken as a starting point that economic decisions are best left in the hands of the private market unless substantive reasons compel direct governmental action.

Unfortunately, the energy and environmental sectors of the economy both contain characteristics (labeled “market failures” by economists) that often call for active governmental intervention and/or oversight. The core of our analysis in this interim report is a careful

preliminary and general analysis of the potential impacts of a wide variety of governmental policies, with specific reference to the policy goals described above and directed by the legislature. We discuss the fundamentals of fuel-volume-based content standards and tax/subsidy programs, feedstock market support options, and performance based standards and tax/subsidy programs with an emphasis on net carbon emissions as the performance metric. This section of the interim report ends with a discussion of several tradeoffs inherent in the stated goals of HB1303§402, including the tension between inexpensive biofuel and the desire for instate feedstock production given current markets and technology; addressing market imperfections for a specific set of feedstocks including wildfire-prone forest biomass and municipal waste; the tension between energy independence and energy security; the relevance of a carbon-based standard for Washington State specifically, and the potential difficulties that may arise due to market power in the existing petroleum fuel markets.

We then examine different strategies for public research and development efforts for biofuel market development. Public and private investment can either be economic substitutes or complements. That is, public R&D can either take the place of (crowd out) or support and promote private investment. In the interim report this discussion is of a generic nature. Some general principals emerge, but such principles must be applied carefully, because actual situations usually involve many factors that the generic discussion may ignore. Examples of general principles include:

1) Where the "public goods" nature of information is significant, private markets generate weak incentives to invest,
2) Public sector research tends to perform better in basic research, whereas private sector research tends to be more agile and better performing towards later stages of research and development,
3) A balanced approach to focusing on regional needs and global needs for investment in R&D is important,
4) Industry infrastructure development calls in some cases for the public sector to "pick winners," but potential for "lock-in" of existing technology may have adverse effects for market development in the long run.

These principles provide guidance for specific public investment strategies to promote biofuel market development in Washington.

For the final report we will perform a set of impact analyses to compare the effects of various policy suites. To do this, we will use the Washington State Computable General Equilibrium (CGE) Model previously developed by a subset of our research team, and we will be augment this model to focus on biofuel markets. In this interim report, we summarize the methods and process of quantitatively assessing and comparing the impacts of different sets of policies as applied to Washington State biofuel markets. We will also be performing several ancillary impact analyses to complement the CGE analysis. These analyses will allow a

qualitative and quantitative assessment of the tradeoffs among policies discussed above. Several appendices provide supplementary supporting materials for the interim report.

We have the following work to complete for the final report: 1) we will further develop and analyze feedstock availability and potential from a market perspective; 2) we will focus on the most promising market incentive programs and R&D recommendations; 3) we will perform a set of analyses intended to assess the impacts of the alternative policies, and 4) we will make policy recommendations.