
OREGON BIOFUELS AND BIOMASS

*Potential Project Survey including
Regulatory Barriers*



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Preface

This report was funded jointly by the Oregon Economic and Community Development Department (OECDD) and the Oregon University System (OUS) to determine the existing interest in the production of biofuels in the State of Oregon. This information was sought to help policy and economic decision makers in the State to determine the importance of promoting the establishment of a new signature research center, the Bioeconomy and Sustainable Technology Research Center (BEST). BEST is one of two new research centers proposed by the Oregon Innovation Council (Oregon InC) for the 2007-08 biennium.

The project was directed by Kenneth J. Williamson, Department of Chemical Engineering, Oregon State University. The report is comprised of two documents:

Oregon Biofuels and Biomass: Potential Project Survey including Potential Barriers,
and Oregon Biofuels and Biomass: Woody Biomass in Oregon-Current Uses, Barriers
and Opportunities for Increased Utilization, and Research Needs.

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Project Approach

Environmental Strategies, LLC and Northwest Environmental Business Council collaborated to inventory the biofuels and biomass projects pending in Oregon, and to gather information from a selected smaller group of individuals and organizations about any permitting regulatory barriers that face new or expanding biofuels or biomass facilities in Oregon including suggesting possible solutions.

Biomass and Biofuel Potential

The purpose of the study is to gauge the scope of bioenergy opportunities by identifying and profiling bioenergy projects and potential projects in Oregon, and learning directly from developers the key challenges and issues this nascent sector faces.

Bioenergy projects are defined as projects that would produce biofuels (ethanol and biodiesel) and electric power from biomass or biogas.

To gauge the potential of the bioenergy sector in Oregon and determine prominent regulatory and technology issues, the study included:

1. Telephone interviews with informed individuals to learn of Oregon projects, and
2. An electronic survey with a smaller group of individuals to identify permitting or regulatory barriers to siting biofuel projects in Oregon, and identify possible roles for a university-based research center to assist in promoting Oregon's biofuel economy.

Phone Interviews for Project Identification

To identify possible biofuel, biomass, and biogas projects, over four weeks in March and April, 2007, a series of phone interviews were conducted with people engaged in the bioenergy sector in Oregon, along with a few meetings and some e-mail correspondence. The goal was to seek information of a non-confidential nature directly from the developers or managers of projects and potential projects. In general, completed projects were excluded unless expansions were planned. Also excluded were conceptual projects without defined business strategies. For a complete list of completed renewable energy projects, please refer to the comprehensive list compiled by the Oregon Department of Energy in 2006, titled "*Timeline of Oregon Renewable Projects Based on Northwest Power and Conservation Council Data (2006)*" (see <http://www.oregon.gov/ENERGY/index.shtml>)

A total of 122 people were interviewed to identify potential projects, including interviews with 95 developers, managers or owners of projects. Over 120 projects and rumored projects were investigated; after removing duplicates and abandoned projects, the list was reduced to 90 projects, of which profiles were completed of 80 projects and potential bioenergy projects in Oregon (including five projects outside the survey's scope). Additional projects could be identified and profiled, however many developers do not want to share information on their projects at this time.

Electronic Survey for Permitting Barriers

A separate electronic survey was used to gather information from informed individuals involved in biofuels and biomass projects about permitting and regulatory barriers faced when siting and permitting biomass, biofuel, or biogas facilities. Fifty-six (56) surveys were distributed. Thirty-two (32) surveys were returned. Results of the survey are summarized later in the report.

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Key Results

The Bioenergy Projects Survey identified 75 projects and potential projects that intend to produce either biofuel or electricity from biomass or biogas: 10 ethanol plants, 21 biodiesel, 5 cellulosic ethanol, 17 biomass, and 22 biogas projects. If all these projects were to be built, Oregon bioenergy projects could produce 400 million gallons per year (MGY) ethanol, 315 MGY biodiesel, cellulosic ethanol from three pilots and two or three 20 MGY plants, and also 150 megawatts (MW) of power from biomass and 30 MW from biogas projects.

Not including plants currently in operation, the following capacity is in construction or expansion: 153 MGY ethanol, 7 MGY biodiesel, 15 MW biomass power, 2.25 MW biogas power from dairy manure and 3.5 MW biogas from wastewater treatment facilities.

In addition, projects due to start construction in 2007, according to the developers, would produce: 80 MGY ethanol, 225 MGY biodiesel, and 29 MW biomass power. However, it is by no means certain that all these plants will be built.

Many challenges impede completion of bioenergy projects, most notably competition for feedstocks and low projected returns. Key findings include:

- Oregon's business energy tax credit, pro-active development by the Oregon Department of Energy, and passionate advocacy by non-profits and private business have been very successful in stimulating project development in Oregon.
- All bioenergy sectors need incentives and market creation efforts to grow.
- Biofuel projects face tough competition for feedstock, and face the risk of maneuvers by oil companies to prevent loss of market share.
- The sale of co-products of ethanol and biodiesel production is essential to profitability. Development of higher-value uses and new markets will help establish the biofuels sector.
- To achieve substantial market share, biofuels need research and development on the next generation of feedstock and processes such as cellulosic ethanol and algae for biodiesel.
- Biomass and biogas projects suffer from low regional electricity prices, which undermine project viability.
- Biomass projects need a secure, long-term fuel supply. The value of sawmill residue will increase. Thus, the supply of logging slash and forest residue must increase and be secure over a ten-year planning horizon.

- Biogas projects face difficult issues of scale. Small-scale gas scrubbers and other equipment are needed, as well as a higher price for electricity, in order to capture methane and convert manure or wastewater biosolids to energy and useful co-products.
- Given the number of plants planned or underway in Oregon, few major permitting and regulatory barriers exist. The individuals surveyed had a number of ideas for incremental improvements to the permitting system.
- A number of areas where the State might play a larger role in research and technical assistance, and technology transfer were identified.

Table 1
Summary of Bioenergy Projects Identified in Oregon¹

<i>Type of Project</i>	<i>Total</i>	<i>Operating and Expansion</i>	<i>In Construction</i>	<i>Site Acquired & Funded</i>	<i>Site Secured & partially funded</i>	<i>Advanced Project, need financing</i>	<i>Project in Planning</i>	<i>Pre-project, need feasibility or grants</i>
BIOFUEL								
Ethanol	10		2	1	6		1	
Biodiesel	21	3	2	4	2	4	5	1
Cellulosic Ethanol	5				1		3	1
BIOMASS								
Mill Co-Gen	8	4	1		2	1		
Mixed / Forest Fuels	9			1	1		2	5
BIOGAS								
Dairy	6	1	2		1		2	
Wastewater	16	7				1	8	
OTHER								
	5						1	4
TOTALS	80	15	7	6	13	6	22	11

¹ As of April 17, 2007

Biofuels

There is a surprising amount of development activity in biofuels. Biofuels projects have been easier to finance and build than other bioenergy projects. Government subsidies and guaranteed markets have helped biofuels more than other bioenergy projects. However, high feedstock costs have slowed the flow of capital to both ethanol and biodiesel projects.

Ethanol

Ten ethanol plant projects were identified in Oregon (plus another one in Vancouver, WA). Two ethanol plants are in construction (Pacific Ethanol at Boardman, and Cascade Grain at Clatskanie), one has nearly closed on financing (Treasure Valley Renewable Resources, in Ontario), and three others speak confidently of starting construction by the end of 2007 (Oregon Ethanol, Inland Pacific, and Evergreen Biofuels). The other four are uncertain, or not willing to reveal details.

The primary challenges facing ethanol plant developments are obtaining financing for these projects that are typically require \$100 million of capital. High corn prices and volatile gas prices have squeezed profit margins, making investors and banks less willing to commit. This margin compression is forcing the ethanol build-out to slow down.

Five companies are pursuing cellulosic ethanol projects in Oregon. One of these (HM3) is focused on the hybrid poplar tree farm at Boardman, and will start with a pilot project at Mt. Hood Community College in Gresham. They have plans to build a production plant in the Boardman area with one of the companies developing an ethanol project there. Two companies intend to utilize the straw from grass seed growers in the Willamette Valley (Trillium Fiberfuels and Montana Microbials). Another company has plans in the Willamette Valley, but prefers to keep their plans confidential. There is also a group looking into developing a demonstration project utilizing softwood debris in Lane or Douglas County. A project is also in the works to convert municipal solid waste and/or wastewater biosolids to liquid fuels, by gasification.

Conversion of biomass to ethanol, referred to as cellulosic ethanol, includes a number of technologies that are just now coming out of the lab into demonstration projects. These projects face many challenges – including financing, feedstock sourcing, logistics and technology.

Biodiesel

Biodiesel is the most active bioenergy sector, with 21 projects identified in Oregon. There are already three biodiesel plants in operation: SeQuential Pacific (Salem), Madison Farms (Umatilla County), and Green Fuels (Klamath Falls). An additional three

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facilities are in construction: American Biodiesel (Clackamas), Imerjent (Biodiesel system manufacturer), and Pendleton Grain Growers (Pendleton). All six of these are relatively small, and sized for locally available feedstock.

Four larger projects intend to start construction within 12 months, having secured sites and /or sufficient funding to be considered highly probable projects. Two large projects in particular (Renewable Energy Group and Terra Fuels) are poised to finalize their projects in the next few months – and start construction on facilities that would produce a total of nearly 200 million gallons of biodiesel. If these projects get built, the region will be amply supplied very soon. A likely consequence is that feedstock will be difficult to source, and impossible to secure with the advance certainty financiers would expect.

The greatest challenge facing biodiesel projects is securing feedstock. Small projects (less than 1 million gallons/year) generally use waste vegetable oil or rendered fats, and contract with local farmers for oilseed crops. Big projects, particularly those over 20 MGY, will source vegetable oil from the mid-West (soy), Canada (canola), and overseas (palm), and will also try to secure local production. The dynamic of competing for sites and future market share is fundamentally a competition for securing oil feedstock supply.

One solution that some see as holding promise is the development of algae propagation. One Oregon company conducts research in this area, though they declined to participate in the survey. A developer is trying to arrange an algae bioreactor project at the PGE Boardman coal plant. One benefit is that algae convert the CO₂ in flue gas from the existing coal plant to biomass or oil, which can be converted to biofuel.

Biomass

Seventeen biomass projects were identified that are either in construction, expansion, development or planning.

Three biomass co-generation projects are in construction or expansion including: Biomass 1 (Medford), CoGen Co (Prairie City), and Freres Lumber (Lyons). Two sawmills have started constructing co-generation projects on new biomass boilers (Hampton and Rough & Ready), but are holding back on the financial commitment to the generating turbines. Another sawmill nearly did a co-generation investment, but pulled its plans when the production tax credit window proved unreliable (Swanson). Roseburg Forest Product's President was not available for an interview, but may participate in the future.

Three new large co-generation projects have power purchase contracts and advanced projects that should start construction this year (in Lakeview, Warm Springs and La Pine). These project opportunities arise out of the biomass being made available due to the desire to improve forest health and prevent catastrophic fires. Vulcan's La Pine project may have been shelved, due to dynamics in the fuel supply market.

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Five new biomass projects are in the feasibility study and planning stages (Applegate Valley, Coquille Tribe, Cow Creek Tribe, Hood River, Klamath Tribes).

Three tough challenges face these projects: (1) secure long-term fuel supply; (2) low price of electricity; and (3) competition for fuel. Most developers said the projects are not economical, and are only do-able if many things are aligned. Projects owned by sawmills are generally more feasible because mills have a large steam demand and plentiful sawmill residuals and fiber on site. Adding co-generation to a large heat demand makes sense, though switching to wood-fired boilers and steam turbines is a major investment and may not meet return expectations.

However, projects whose biomass supply is based on the desire to reduce forest debris and prevent forest fires face additional costs and risks: the expense of collecting, shipping and transporting forest debris and logging slash, and the risk of losing fuel supply. This is compounded by the Northwest's low power rates, which results in unimpressive financials.

As these biomass plants get built, the price of fiber will probably increase. There is also pressure on fuel supply from pellet manufacturers, pulp plants, particleboard plants and hog fuel boilers. Only if the federal forest lands return to active forest management will fuel supply be economical and reliable. Otherwise, the competition for fuel will keep the price uncomfortably high, making biomass power projects marginally profitable.

Biogas

Twenty-two biogas projects were identified: six at dairies, converting manure to methane, and 16 at wastewater treatment plants. In addition there is an innovative biosolids conversion project (also mentioned under cellulosic ethanol above) in the planning stage with a number of cities (considered confidential). There are also some landfill gas projects that may have expansion plans, though they were not covered in this study.

The MEAD Hooley digester in Tillamook has plans to expand at its current site and also build digesters near other Tillamook dairies. Eight dairies currently supply manure to the MEAD. Seven other sites are penciled in, each serving a cluster of dairies. A few of these may be developed. Digesters are in construction at Country Lane Dairy in Carlton, and Rickreall Dairy near Dallas. Two dairies have decided, after much study, to cover their lagoons rather than build digesters for power production (Columbia River Dairies at Threemile Canyon Farms and Lochmead Dairy in Junction City). These two opted for a simple flare-off, partly because a company (Environmental Credit Corp) has offered to build them in exchange for the carbon credits.

Rickreall Dairy contracted with a natural gas production company, RealEnergy, which will finance and build a state-of-the-art digester for maximum methane production. Their

model is to clean the gas to pipeline quality and sell it through the gas pipeline to its clients in California (rather than generate electricity).

Other dairies may decide to build digesters, if a development partner or other incentives make it worthwhile. Lochmead Dairy, Gervais Dairy, and the dairies and feedlots at Threemile Canyon farms (including Columbia River Dairies) could be motivated by the right project.

Nine Oregon wastewater treatment plants have been generating power from excess biogas at digesters since 1999-2000. Most gas produced is needed to heat the digester. Only relatively large plants can produce electricity, typically with a capacity of 300 to 800 kW. This power is used for their internal power needs.

Wastewater treatment plants of the Metropolitan Wastewater Management Commission (MWMC, serving Eugene, Springfield and a portion of Lane County), Portland, and Clean Water Services (serving the urbanized portions of Washington County) are all expanding their digesters and power production. Clean Water Services – Durham will add 500kW capacity, Clean Water Services – Rock Creek will add 1 MW capacity, Portland’s Columbia Blvd Treatment Plant 1.6 MW, and MWMC is adding 200 – 400 kW this year. Eight other plants are evaluating options to increase power production.

The main obstacle to growth of biogas projects is the lack of small-scale gas scrubbing equipment or generators not susceptible to corrosion from biogas. To convert biogas to pipeline quality natural gas (methane), very expensive gas scrubbers are required. Alternatively, a plant can burn the impure biogas in a generator, and plan on costly maintenance. This is particularly a problem with the biogas produced from sewage, which has compounds that leave scale deposits (siloxane).

Many smaller treatment plants were looking forward to the Stirling Engine in development by STM. This external combustion engine seemed an elegant, right-scale solution – until the company recently folded. The Corvallis wastewater treatment plant still has a pre-production model of this generator that was not susceptible to corrosion. This bioenergy application has considerable potential.

Other Bio-economy Projects

This survey identified five other interesting projects.

Trellis Earth is a Portland-based manufacturer of bio-plastic disposable products, such as flatware, dishware and biodegradable bags. Corn oil and corn starch are converted to various types of resin and formed into common products that are normally made of petrochemicals and disposed of. Recently the company learned that the used products can be converted to biodiesel. They are now planning how to implement this process, enabling

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major users, like hospitals, prisons, and airlines, to re-use the eating utensils and dishes as fuel.

Another interesting application is a residential scale digester that converts domestic waste into biogas, which can fuel the kitchen stove. This is common in developing countries, and is being adapted for America in a Eugene demonstration project.

Also noteworthy are two projects that would demonstrate feedstock production for biodiesel: algae propagation at Oregon's only coal-fired power plant, and soybeans adapted to conditions in eastern Oregon and Washington.

This survey identified 80 projects that demonstrate the range and early success of sustainable bioenergy applications. This should be considered a valid sample indicating the breadth of opportunity, rather than an exhaustive inventory of projects and potential projects.

Permitting and Regulatory Barriers

A separate electronic survey was used to gather information from informed individuals involved in biofuels and biomass projects about permitting and regulatory barriers faced when siting and permitting biomass, biofuel, or biogas facilities. Fifty-six (56) surveys were distributed. A list of those that received the survey is included as Attachment A. Thirty-two (32) surveys were returned.

Permitting Barriers Respondents' Profile

Of those returning the surveys, the majority of those returning the surveys were state agencies (26% or eight). Sixteen percent (16% or 5) were consultants or law firms; 6% (2) were local economic development organizations; and 6% were other local agencies. Others interested in biofuels and biomass projects include:

- Research and development
- Investor
- Feedstock producer
- Biobased product distributor
- Public benefit fund manager
- Producer and user (50+ years in the motor fuels business)

All respondents but two had worked on biofuel and biomass permitting issues.

Environmental and Permitting Barriers

The survey requested respondents to identify the greatest environmental or land use barrier to successfully permitting biofuel and biomass projects in Oregon and asked respondents to provide possible solutions.

General environmental regulations and the length of the permitting process were mentioned in general terms by some respondents. Others mentioned specifically that DEQ has been very supportive in their permitting process.

Allowing biofuel processes outright in Exclusive Farm Use (EFU) zoned land was mentioned, and the passage of pending HB 2210 (2007 session) was suggested as the solution.

Availability of “shovel ready” properly zoned industrial lands, especially in the Portland area, was a barrier identified by several respondents. Additional work to research and resolve possible environmental contamination problems at brownfield sites was suggested as a solution, along with more state investment in continuing the Industrial Lands Inventory (see <http://www.oregonprospector.com/>).

The availability of long-term forest contracts was identified as a barrier for biomass projects, and the Oregon Forest Resources Institute report on biomass and fuels was cited as an excellent reference for additional information (Biomass Energy and Biofuels from Oregon Forests, Oregon Forest Resources Institute, 6/30/06, see <http://www.oregonforests.org>, ‘publications’). Suggestions for improving long term fuel availability from federal lands included:

- Increasing Bureau of Land Management (BLM) and US Forest Service staffing at the local level to process sales
- Increasing funding for the necessary studies under the National Environmental Policy Act
- Developing Coordinated Resource Offering Protocols which are needed on all federal forest and range land in Oregon (see the work developed by the Central Oregon Intergovernmental Council, <http://www.coic.org/copwrr/>)
- Funding the \$40 per green ton bounty for biomass from stewardship projects as authorized in the 2005 Healthy Forest Initiative but never appropriated.

Outreach and education to the public was mentioned as one tool to overcome ‘*Not In My Back Yard*’ or NIMBY concerns related to biomass and biofuel siting decisions at the local level. One respondent suggested that additional information to local government permitting and land use staff might be useful, including a possible handbook or workshop. Providing high quality information on biofuels and biomass might also be useful, suggested one individual.

For smaller biomass and biofuel projects, some suggested that appropriate general permits for air quality and water quality issues might be written that would simplify permitting for smaller projects without sacrificing any environmental protections.

One environmental barrier mentioned by several individuals was water - - for both growing crops and for processing crops. Additional research and development of technologies to produce and process crops in the most efficient manner were suggested as solutions, along with tackling water allocation issues for both surface and ground water.

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Inability to withdraw water from the Columbia River was specifically mentioned as a concern.

On a larger scale, one individual suggested that carbon dioxide regulation and how these projects might fit into a regulatory scheme regulating carbon emissions needs to be clarified, including if there might be a grandfather clause.

For smaller communities, having adequate public utility infrastructure such as domestic water supplies and wastewater treatment plant capacity is an issue. Also, smaller communities may not have adequate permitting capacity to tackle complex industrial type facilities.

Comprehensive information about biomass permitting and regulatory requirements is available on the Oregon Department of Energy web site at <http://www.oregon.gov/ENERGY/RENEW/Biomass/permits.shtml>

State of Oregon Incentives for Siting Facilities

Many of the responses suggested a ‘one-stop’ permitting system for biofuel, biomass, and biogas projects. The Energy Facilities Siting Council (EFSC) process operated by the Oregon Department of Energy coordinates a one-stop permitting system for larger energy facilities related to biomass, biogas, and biofuels that exceed these permitting thresholds:

- Electric power plants with a nominal electric generating capacity of 25 megawatts or more from thermal power or combustion turbines.
- Synthetic fuel plants that convert a natural resource including, but not limited to, coal or oil to a gas, liquid or solid product intended to be used as a fuel and capable of being burned to produce the equivalent of 2 billion BTU of heat a day (except plants that use biomass as the raw material);
- Plants that convert biomass to a gas, liquid or solid fuel product, or combination of products, intended to be used as a fuel if any one of such products is capable of being burned to produce the equivalent of six billion BTU of heat a day.

For additional information on the Energy Facility Siting Process, see <http://egov.oregon.gov/ENERGY/SITING/process.shtml>.

The one-stop process is unavailable, however, for smaller projects. Some suggested that a ‘one-stop’ permitting system be established for smaller facilities. One respondent suggested an examination of the current EFSC process.

Expanding the Oregon Business Energy Tax Credit (see <http://oregon.gov/ENERGY/CONS/BUS/BETC.shtml>) and allowing a greater percentage of the tax to be passed-through was mentioned often, along with providing additional project financing beyond the existing Department of Energy incentives. One individual suggested waiving all permit fees for biofuel and biomass projects.

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Many respondents focused on how the state might best encourage small scale facilities by passing the pending HB 2210 and 2211 (2007 Session), developing general air and water discharge permits for smaller facilities, and developing a statewide general air and water discharge permit for mobile facilities.

Several individuals mentioned that permitting is not much of an issue in Oregon - - and offered the number of proposed and pending biofuel and biomass projects in Oregon as an example of the current system working fine. Another suggested that an oversight committee with the authority to waive specific regulations for creative projects would be useful.

Another suggested that the State should focus on setting standards for the highest and best use of certain waste products - - for instance, food wastes should be co-digested with wastewater treatment plant biosolids to create energy and useful soil amendment.

The prohibition on canola production in the Willamette Valley was mentioned by several respondents. They suggested that the prohibition should be re-examined on a scientific, not political basis, and continued that examining canola species that are not a hybrid-risk, along with species that have high oil content, should be examined for allowed growing in the Willamette Valley.

One Best Thing Oregon Could Do To Promote Biofuels and Biomass

Survey respondents were asked the one best thing Oregon could do to promote biofuels and biomass energy projects. A variety of actions were suggested including:

- Increasing Oregon's current Business Energy Tax Credit
- Increasing Oregon's current Renewable Energy Tax Credit
- Setting a statewide Renewable Portfolio Standard and a Renewable Fuels Standard (with a specific definition of a sustainable biofuel criteria that all suppliers, producers and biofuel companies in the State would be held to)
- Researching the life-cycle ecological impacts of feedstocks
- Establishing a one-stop permitting system; the current permitting system for aggregate mining was suggested as a model
- Researching feedstock crops best suited to Oregon for biofuel production
- Issuing long term contracts to recover forest slash to resolve air quality issues and decrease forest fire danger
- Providing a tax credit for consumption of Oregon-sited plants and Oregon-produced fuels.

Items Working Well

The items that respondents thought were working well included:

- Local ordinances that facilitate siting energy facilities

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- Using data from existing facilities in permitting new facilities
- Work to allow biofuel production in Exclusive Farm Use (EFU) zoned land (HB 2210, 2007 Session)

One individual indicated that DEQ had been very helpful in their permitting process, but the local land use decision making process had been very difficult.

Another individual indicated that environmental permitting on the West Coast never works well - it is time consuming and expensive. He continued that he permitted a project in Tennessee in four months, and in Oregon it would take at least three times that long. He added that DEQ permits and modifications take an extremely long time to process compared to other states, and are quite expensive compared to other states.

Other Issues and Suggestions

Several individuals strongly advocated that the State play a larger role in assisting “appropriately-scaled” biomass production and biofuel facilities. Providing incentives, permitting assistance, technical information, and business models for communities to collaboratively develop community-sized and based biofuel and biomass projects was seen as a large need in Oregon. Specific equipment and technology such as scaleable tank cover technologies, small-scale digesters, and methane gas recovery systems that were packaged and easy to use are needed.

For biogas installations, setting Oregon standards for connections to the power grid are necessary. The Oregon Public Utility Commission has started to address this issue in its **Uniform Interconnection Technical Standards, Procedures and Agreements** project (see http://www.puc.state.or.us/PUC/admin_rules/intercon.shtml)

Technical Assistance/Technology Transfer

The survey asked respondents to rank (from #1 – *Excellent* to #5 – *Poor*) the available environmental technical assistance to Oregon businesses on the emerging biofuel and biomass market. The majority of respondents indicated that the available technical assistance is “average” (14) explained as:

If you are diligent about searching, you can find the information you need on environmental technical assistance on biofuels and biomass development and technologies.

An additional 8 respondents thought that the available technology assistance was either “good” or “fair”. One person thought that the available technical assistance was “excellent”.

A well-organized web site and technical sessions (one-half or full day) were ranked the highest for providing technical assistance. One respondent complimented the existing biofuels and biomass information posted on the Oregon Department of Energy web site (see <http://egov.oregon.gov/ENERGY/RENEW/Biomass/BiomassHome.shtml>)

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The most logical state agency to provide information was the Oregon Department of Energy (20 respondents) followed by Department of Agriculture and Department of Environmental Quality (8 respondents each). Three individuals thought that the Oregon Department of Forestry was the most logical agency. Two other organizations to provide technical assistance were suggested: Extension Service and consultants. One respondent commented that the appropriate state agency for technical assistance was related to the type of information being sought. One respondent commented that state agencies are not a logical source of technical assistance; providing technical assistance outside of government is the best way to provide information.

BEST Services and Research

The survey included information on the possible Oregon Bio-economy and Sustainable Technology (BEST) Research Center services that would be of most use in the emerging Oregon biofuels industry. The responses are sorted into general responses, biomass related, biofuel related, and biogas related.

General

General responses included:

- Liaison and information on federal and state funding opportunities
- Water related research for both production and processing
- Development of new technologies for more efficient processing of carbon-based feedstock
- Scaling processing facilities to community-based size that can efficiently handle local feedstock inputs
- Local owner investment models so communities, farmers and local businesses can own and share in the benefits and profits of these projects rather than outside investors
- Develop a business model and technical plan for cooperatively owned and operated cellulosic ethanol production using agricultural waste including wheat straw, grass seed straw and other feedstocks
- Research national and international policy and technology trends
- Define the markets that are leading and what they are doing
- Research and develop models for smaller-scale applications that can adopt to customized local needs (10 to 20 kW wood biomass generators; on-farm oil seed crop biodiesel production and management practices template)
- Conduct the analysis to track, observe, and forecast market trends and changes regarding biomass recovery, biofuel production, scale of production and local impacts
- Create a “reference hub” linking researchers to those doing projects in Oregon – building on the Oregon Department of Energy existing information
- Document work that has already been done - consider using the Oregon Food Innovation Center as an example

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- Establish strong working relationship with regionally important resources for technical assistance such as the Idaho National Laboratory, the Pacific Northwest National Laboratory, along with other universities including Washington State, University of Idaho, University of Oregon, Portland State and others
- Seek advice and participation from the many groups active in this topic in Oregon (Oregon Biofuels Network, Oregon Entrepreneurs Network, The Climate Trust, Climate Solutions, Sightline Institute and others) to carefully craft a focused BEST mission and role that adds value and does not replicate other work
- Focus on keeping the costs of raw materials down and finding markets for by-products
- Practical, non-political information geared to serving the needs of the entire state (not Portland-centric)
- Take the “shelved” ideas from companies and finalize the research, developing a *Strengths, Weaknesses, Opportunities and Threats* analysis and working directly with the companies with the most expertise to determine the feasibility, time, and money required to take the idea to market
- State sponsored project biographies, post startup, itemizing all the permits involved, land use issues dealt with, infrastructure hurdles, marketing and retailing issues, etc.
- Quantify the net air quality benefit of using biomass/biofuel facilities vs. burning in the forest (piles or wild fire)
- Continue to bridge the gap between research and quick delivery to use of good technologies in real world situations
- Quantification and qualification of sites, feedstock, infrastructure bottlenecks (storage, blending, distribution) and all the regulatory issues impacting development (i.e. lists of regulations that affect siting, feedstocks etc.)
- Focus on small-scale research of biochemical and agricultural departments. These departments should consider becoming a testing resource as a revenue generator
- The most valuable resource at this point in the development of these alternative fuels would be a clearinghouse and technology resource center, such as a University program. There’s lots of information and technical learning out there, and it seems that there needs to be some way for potential investors and developers to understand that market and the technologies available

Biomass

Biomass-related responses included:

- Further research into the logistics of collecting and hauling forest thinning debris for biomass production
- Identify the best practices for woody biomass recovery
- Woody biomass cellulosic ethanol demonstration plant - feasibility studies in SB 949 (2007 Session) are a good starting point

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- For biomass to electrical energy and other product uses, look at other successful business models, then work with Oregon Economic and Community Development Department (OECDD) and others to encourage these markets to develop around a biorefinery concept by co-locating
- BTU content and research on underutilized species of trees and other vegetation
- Research CO₂ capture from woody biomass combustion and cellulosic biofuel from woody biomass
- Identify economically efficient, “light impact” harvesting systems (both equipment and processes) for woody biomass
- Develop model to identify the highest value for use of woody biomass (solid wood products, oils, energy production, etc.)

Biofuel

Biofuel-related responses included:

- Research on purifying glycerol byproducts from biodiesel production
- Investigate algae as a biofuel feedstock
- Develop better methods for biodiesel than present methanol technology with 20% waste and environmentally unfriendly chemicals
- Processor technology transfer and pilot plants
- Oil feedstock crop research including sunflower and algae options
- Technical research into commercially viable cellulosic ethanol conversion processes
- Get away from fermentation and build a gasification/pyrolysis demonstration plant
- Funding research that develops appropriate-scaled technologies to convert woody and straw residuals into liquid fuels and fuel intermediates.

Biogas

Biogas-related responses included:

- Better biogas generators similar to the external combustion Stirling Engine
- Effective gas scrubbers for medium sized wastewater treatment plants and dairies
- Funding for digesters is the key issue

Specific environmentally-related technical assistance and technology transfer topics mentioned in the returned surveys included:

- Continuous processor technology (oscillatory flow reactors)
- Combined heat and power facilities
- Microwave Separation Technology (MST)
- Compliance assistance with ASTM 6751, *Standard Specification for Biodiesel Fuel Oils* – might focus assistance on smaller biodiesel producers

- Cold pour point and filter point technologies (especially using styrene co-polymer esters)
- Focus on marketing the by-products
- Biofuels feedstocks
- Methanol recovery and other new biodiesel production technologies that are currently available
- Research on purifying the glycerol by-products from biodiesel production
- Air pollution control technology
- Moisture measurement technologies for hog fuel
- The best current opportunity for rural Oregon is installation of off-the-shelf small-scale biomass heating systems for schools and other public buildings. These systems require funding and champions for feasibility studies, capacity building and project development
- Opportunities for environmental services such as carbon credits
- Filling in the gaps for research needs by finding the best practices related to harvesting and transportation of forest biomass removal
- Research of softwood species for cellulosic ethanol
- Expand air quality emissions standards to analyze what would have happened to the materials in the woods, including wildfire and pile burning vs. being burned in a controlled biomass system
- Focus on the systems that are economically viable
- Long term economics, basic design with simple equipment, operator time/management required by project type
- Awareness of biobased lubricants
- Easy access to information (time is a valuable commodity on everyone's part)

Attachment A

Survey Instrument

**Oregon Biofuels and Biomass Market Sector
Bio-economy and Sustainable Technology
(BEST) Research Center Regulatory
Barriers, Solutions and Opportunities – A Survey**

Name:			
Organization:			
Title:			
Mailing Address:			
	Street	City	State
			Zip
e-mail:			

Interest and Experience

<p>Interest in Biofuels and Biomass (<i>choose one</i>)</p> <p><input type="checkbox"/> Developer</p> <p><input type="checkbox"/> Local economic development</p> <p><input type="checkbox"/> State agency</p> <p><input type="checkbox"/> Local agency</p> <p><input type="checkbox"/> Supporter of renewable energy</p> <p><input type="checkbox"/> Consultant or law firm</p> <p><input type="checkbox"/> Venture capitalist</p> <p><input type="checkbox"/> Feedstock supplier</p> <p><input type="checkbox"/> Other (<i>please describe</i>)</p>
<p>Experience in biofuels and biomass (<i>please choose the statement that best matches your experience</i>)</p> <p><input type="checkbox"/> I have worked on or been involved in the permitting of a biofuel or biomass project that has been successfully permitted and is operating.</p> <p><input type="checkbox"/> I have worked on or been involved in a the permitting of a biofuel or biomass project that has been permitted and is under construction.</p> <p><input type="checkbox"/> I am currently working on getting permits for or reviewing permit applications for a biofuel or biomass project.</p> <p><input type="checkbox"/> I am not involved directly in permitting or permit review issues, but am keenly interested in the permitting process.</p> <p><input type="checkbox"/> Other (<i>please describe</i>)</p>
<p>From your point of view, please rank the biofuel from biomaterials projects likely to have the greatest potential in Oregon (#1-top potential to #10- lowest potential):</p> <p>_____ Direct combustion in a boiler</p> <p>_____ Direct combustion in a combined cycle process</p> <p>_____ Gasification</p> <p>_____ Pyrolysis</p> <p>_____ Anaerobic digestion</p> <p>_____ Ethanol production from corn</p> <p>_____ Ethanol production from cellulosic materials</p> <p>_____ Biodiesel from imported oils</p> <p>_____ Biodiesel from agriculturally produced oils</p> <p>_____ Methanol production from woody biomass</p> <p>_____ Other (<i>please list</i>)</p>

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**Oregon Biofuels and Biomass Market Sector
Bio-economy and Sustainable Technology
(BEST) Research Center Regulatory
Barriers, Solutions and Opportunities – A Survey**

Regulatory Barriers

What do you believe is the greatest environmental or land use regulatory barrier to successfully permitting biofuel and biomass projects in Oregon? What are your ideas for possible solutions? *Please be as specific as possible.*

<i>Environmental or Land Use Barrier</i>	<i>Possible Solutions</i>

What opportunities exist for the State of Oregon to provide incentives to siting biomass and biofuel projects in Oregon? Please try to think beyond financial incentives including items such as one-stop permitting, general discharge permits for facilities of a certain size, environmental permits for smaller mobile biofuel stills that apply statewide, and other innovative permitting solutions.

What would be the one best thing could the State of Oregon do to promote the siting of biomass and biofuel projects in Oregon?

What types of items incorporated in the state land use and environmental permitting process work well for siting biomass and biofuel projects?

**Oregon Biofuels and Biomass Market Sector
Bio-economy and Sustainable Technology
(BEST) Research Center Regulatory
Barriers, Solutions and Opportunities – A Survey**

Environmental Technical Assistance/Technology Transfer

How would you rank the level of available environmentally-related technical assistance to Oregon businesses on the emerging biofuels and biomass market? <i>(choose one)</i>
<input type="checkbox"/> #1 – Excellent <i>There is abundant available environmental technical assistance on biofuel and biomass development and technology available</i>
<input type="checkbox"/> #2 – Good <i>There is good available environmental technical assistance on biofuel and biomass development and technologies.</i>
<input type="checkbox"/> #3 - Average <i>If you are diligent about searching, you can find the information you need on environmental technical assistance on biofuel and biomass development and technologies.</i>
<input type="checkbox"/> #4 – Fair <i>There is some information on environmental technical assistance on biofuel and biomass development and technologies, but not all the information needed is available.</i>
<input type="checkbox"/> #5 – Poor <i>There is very little useful environmental technical assistance on biofuel and biomass technology</i>
Technical information is most useful to me via <i>(chose all that apply)</i> :
<input type="checkbox"/> Technical sessions – one-half or one day <input type="checkbox"/> Well-organized web site <input type="checkbox"/> Providing information to existing trade associations and existing information channels <input type="checkbox"/> Other <i>(please describe)</i>
What Oregon state agency is most logical for you to turn to for technical assistance?
<input type="checkbox"/> Oregon Department of Energy <input type="checkbox"/> Oregon Department of Forestry <input type="checkbox"/> Oregon Department of Agriculture <input type="checkbox"/> Oregon Department of Environmental Quality <input type="checkbox"/> Other <i>(please list)</i>
What environmentally related technical assistance and technology transfer topics would be useful to you? <i>(Please list)</i>

**Oregon Biofuels and Biomass Market Sector
Bio-economy and Sustainable Technology
(BEST) Research Center Regulatory
Barriers, Solutions and Opportunities – A Survey**

BEST Services and Research

The areas that the Oregon University System Bio-economy and Sustainable Technology (BEST) program might best serve the biofuels and biomass market in Oregon is by...

(Please fill in areas of technical assistance, research, technology transfer or other services well suited to a university setting)

Please add any additional thoughts

Thank you for your time. You will be provided with an electronic copy of the final report. If you have any questions, please contact Janet Gillaspie at Environmental Strategies, 503/233-3980 or by e-mail at janet@envirostrategies.com

Attachment B

Individuals Surveyed for the Project - Not All Individuals returned the Electronic Survey Provided

First name	Last name	Organization
Bill	Almquist	Resource Innovations
Darren	Anderson	NESCO Group
Eric	Anderson	Evergreen Biofuels
Scott	Aycock	COIC – Central Oregon Intergovernmental Council
Jeff	Ball	City of Klamath Falls
Gary	Banowetetz	USDA/ARS
Kim	Barte	City of The Dalles Wastewater Treatment Plant
Chris	Bates	Corvallis Biodiesel Pilot Project
Chris	Beatty	Trillium Fiber Fuels
Larry	Benford	Citadel Int. LLC and Northwest Engineering
Kevin	Best	RealEnergy
Chad	Biasi	Trellis Earth
Greg	Blair	Biomass One
Eric	Bowman	NW Coop Development Center
Jeff	Brandt	Sun Break Biofuels
Bill	Briggs	Oil Re-Refining Co.
Charles	Carlson	Cascade Grain Products LLC
Brian	Carmichael	e Biofuels
Mike	Carpenter	Energy Recovery Group LLC
Jim	Cathcart	OR. Dept. of Forestry
Nils	Christofferson	Wallowa Resources
Sidney	Clouston	Clouston Energy Research
Kevin	Considine	Oregon Environmental Council
Aaron	Courtney	Perkins Coie
Jack	Crider	MEAD Hooley Digester
Jack	Crider	Port of Tillamook
Michele	Crim	Portland Office of Sustainable Development
Chris	Crowley	Columbia Energy Partners
Dan	Davis	SUN Biodiesel Corp
Larry	Dawley	Oregon Ethanol
Martin	Desmond	Lane MicroBusiness
Bob	Doughty	Inland Pacific Energy Center
Mark	Drisdelle	Evergreen Biofuels (Canada)
Howard	Dunn	Inland Biodiesel / American Biodiesel (of Idaho)
Ron	Eber	Oregon Department of Land Conservation & Development
John	Ewald	American Beef Processing and American Biodiesel
Scott	Fairley	Oregon DEQ
Brian	Finneran	Oregon DEQ
Allyn	Ford	Roseburg Forest Products
Bill	Ford	

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Allen	Foreman	Klamath Tribes Biomass Project
Kyle	Freres	Freres Lumber
Mike	Gamroth	OSU - Dairy Extension
Brian	Gannon	Biogas Energy Systems
Chris	Gibson	Lochmead Dairy
Ivan	Gold	Perkins Coie
Dan	Golden	Klamath County Biofuels Task Force
Al	Gosiak	Pendleton Grain Growers
Fritz	Graham	Senator Ron Wyden's Field Office
Steve	Grasty	Harney County Judge, for Harney County Economic Development
Dave	Green	CH2M Hill
Rick	Green	City of Coos Bay Wastewater Treatment Plants
Robert	Grott	NW Biofuels Association
Robert	Grott	NW Environmental Business Council & NW Biofuels Association
Dean	Guess	Hood River County Biomass Fuels
Steve	Gunther	ORRCO, NW Biofuels Association
Andrew	Haden	Ecotrust
John	Hamilton	Treasure Valley Renewable Resources
Dan	Hanthorn	City of Corvallis Wastewater Treatment Plant
Doug	Harbaugh	Clackamas County Service District #1, Kellogg Creek Plant & for Tri-City Service District
Walt	Hawkins	City of Salem: Willow Lake Wastewater Treatment Plant
Dave	Hoffman	
Mark	Hughey	NRCS - Energy Team
Patty	Jacobs	Oregon DEQ
Brian	Jamison	GoBiodiesel
Alan	Johnston	City of Gresham Wastewater Treatment Plant
Randy	Joseph	Baker County Renewable Energy Committee
Sandy	Jumonville	OBEC
Edward	Karoll	
Louis	Kazemeier	Rickreall Dairy
Bob	Kearns	Montana Microbials
Tyson	Keever	SeQuential
Mark	Kendall	Oregon Dept. of Energy
Pat	King	Lakeview Biomass Project
Patrick	King	DG Energy
Will	Klausmeier	Bioenergy Consultant, Eugene
Dr. David	Kmetovic	Thriving LLC
Tom	Koehler	Pacific Ethanol
Jim	Krahm	Oregon Dairy Farmers Association
Tom	Lindley	Perkins Coie
Tracy	Livingston	Biodiesel Inc
Tracy	Livingston	Terra Fuels
Sandy	Lonsdale	Vulcan
Michael	Luther	City of Bend Wastewater Treatment Plant
Tamara	Mabbott	Umatilla County
Kent	Madison	Madison Farms

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John	Martin	Pacific Energy Systems
Tad	Mason	TSS Consultants
Rick	Matthews	Douglas County Forest Products
David	McMahon	Cloudburst Recycling
Roy	McMillan	Gervais Biopower
Marty	Meyers	Columbia River Dairies
Don	Miller	WEVCO
John	Miller	Wildwood Farms
Mark	Milne	City of Pendleton Wastewater Treatment Plant
Joe	Misek	Oregon Dept. of Forestry
Roy	Mohr	Bio-Gem Services Inc.
Glenn	Montgomery	Oregon EOECDD
Hiroshi	Morihara	HM 3/OR Science & Technology Partnership; Persimmon Group
Peter	Moulton	Climate Solutions
Cal	Mukamoto	Warm Springs Biomass Project
Mark	Mullen	Altra Biofuels
Jim	Munyon	CoGen Co
Randy	Naef	Clean Water Services: Durham
Gary	Neal	Port of Morrow
Pam	Neal	Portland Development Commission
Jon	Norling	Portland Biodiesel
Richard	Obrist	Fairview Acres Dairy
Michael	Owens	City of Cottage Grove Wastewater Treatment Plant
Uri	Papish	Oregon DEQ
Dennis	Penneiro	
Ben	Phelps	City of Albany Wastewater Treatment Plant
Link	Phillippi	Rough & Ready Lumber
Ms	Receptionist	Malheur Lumber Company & Ochoco Lumber
Howard	Robb	Autumn Seed Co
Jerome	Rosa	Gervais Dairy
Jeff	Rouse	Carson Oil, for Renewable Energy Group
Duane	Sanger	City of Portland: Columbia Blvd. and Tryon Creek Wastewater Treatment Plants
Daniel	Schafer	
David	Schmidt	Sustainable Northwest
Roger	Schoonover	Extractica
Denny	Schultz	
Brent	Searle	Oregon Agriculture Department
Trey	Senn	Klamath County Economic Development
Adam	Serchuk	Energy Trust of Oregon
Daniel	Shafer	Imerjent
Martin	Shain	Polaris Energy
Wayne	Shammel	Cow Creek Tribe
Rachel	Shimshak	Renewable NW
Jack	Shipley	Applegate Valley Biomass Project
Clint	Shock	Soybean Farming
Warren	Shoemaker	Pacific Ethanol

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Dana	Siegfried	David Evans & Associates
Frank	Sinclair	City of Woodburn Wastewater Treatment Plant
Sam	Sirkin	Sam Sirkin
Kirk	Snyder	
Kent	Squires	Oak Lodge Sanitary District
Matt	Stein	Greenfields LL
Erhart	Steinborn	Country Lane Dairy
Perry	Sunderland	Clean Water Services - Rock Creek Wastewater Treatment Plant
Steve	Swanson	Swanson Group
John	Taylor	DEQ
Randy	Turner	Roseburg Urban Sanitary Authority
Tim	Vredenburg	Coquille Tribe
Jim	Walls	Lake County Resources Initiative
Rick	Walsh	Green Fuels of Oregon
Greg	Watkins	Eugene/Springfield Regional Water Pollution Control Facility
Mark	Webb	Grant County Judge
Warren	Weisman	Residential Biogas Demonstration Project, Eugene
Tim	Wetzel	WevCo
Amy	Wilson	SW Oregon Resource & Conservation & Dev'mt Council
Tim	Wilson	City of Grants Pass Wastewater Treatment Plant
Scott	Winkel	League of Oregon Cities
Tom	Wood	Stoel Rives
Steve	Ziga	Hampton Lumber
Glen	Zimmerman	PLC Recycling
Alex	Zub	Pacific NorthStar,LLC